



University of East Anglia Initial Environmental Review

Conducted by Students on ENV M542:
Environmental Management Systems and
Auditing

Project managed and collated by Elaine
Colk, Environmental Consultant, Pro-vision
Environmental

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Photograph : Orange-tip butterflies (*Anthocaris
cardamines*)

Courtesy of Iain Barr (BIO)

OVERVIEW

INTRODUCTION

The University of East Anglia (UEA) has recognised its role in promoting and demonstrating sustainable development and has made a commitment to *“To seek to become a leader in environmental management, and particularly carbon reduction, at UK HEIs through the adoption of environmentally sympathetic and low carbon policies and practices taking resource constraints into account”* (UEA Environmental Policy 2008).

This report documents the results of an Initial Environmental Review (IER) undertaken for the UEA. It forms the first stage of work to develop an EMS in line with specific commitments made in the environmental policy (<http://www.uea.ac.uk/Estates/energy> see General Operational Objectives), and presents a systematic and comprehensive assessment of UEA's current activity and performance in relation to environmental management. ISO14001 has been used as a framework, allowing for third party certification of the EMS at a later stage, if desired. This report also establishes the foundation of a carbon management plan and reduction strategy, working to demonstrate UEAs leadership role in carbon reduction.

The IER was conducted by students on the ENV-M542, EMS and Auditing module, and project managed and collated by Elaine Colk, Module Tutor and Environmental Consultant, Pro-Vision Environmental, undertaken in partnership with Martyn Newton, Risk and Sustainability Manager at UEA. Its findings will be taken forward via the Sustainability Group.

KEY FINDINGS

To date, UEA's environmental progress has been focused on a few large-scale, cutting edge projects driven by the Estates and Buildings Division (EST), with the Biomass Gasification Plant driving carbon reduction targets. Whilst impressive, it is important to distinguish between these and the systemic institutional transformation¹ required to achieve effective environmental and sustainability management. The implementation of an EMS will address this and set these projects within a more progressive environmental context, enhancing their credibility. Environmental impacts will be managed systematically, without stifling such innovative projects. There is also a need to coordinate existing activity and begin to effectively communicate the considerable progress UEA has made to date and stimulate continual and sustainable performance improvement.

The Sustainability Group has achieved significant progress in formalising UEAs commitment to becoming an *‘exemplary low carbon campus’* (UEA Environmental Policy 2008). Much of the impetus to implement environmental management has come from the bottom-up², both from staff and students. Clearer environmental and more broadly, wider sustainability leadership is now required to transparently demonstrate top-down, senior management, active support, and harness and consolidate the momentum for change which already exists.

¹ Sharp, L. (2002) Greening Campuses: The road from little victories to systemic transformation, in, International Journal of Sustainability in Higher Education, 3 (2), 128-145

² Julie Worrall, CUE East, 2009

UEA's current environmental policy (2008) establishes a clear commitment to becoming 'a leader in environmental management, and particularly carbon reduction...' The supporting objectives and targets however, will lack credibility if they are not effectively reported on. As the foundation on which the EMS is built, the environmental policy needs to reflect a comprehensive set of issues (identified within this report) and underpin leadership and carbon neutrality in this field. Significantly, there is a need to embrace management of sources of carbon other than those from direct energy use, if UEA is to truly commit to leadership in this field.

Effective stakeholder engagement is crucial if systemic institutional transformation is to be achieved. The UEA has implemented a wide range of awareness schemes and campaigns promoting environmental and sustainability issues. UEA is successful at promoting outward facing projects with external stakeholders. It is also necessary to improve engagement to effect internal behavioural change. In order to inform the development of a stakeholder engagement strategy, these schemes have been assessed for effectiveness (see appendices 3a and 3b). The key recommendations in the tables below reflect this review.

Engaging stakeholders and maintaining momentum for change requires public reporting. Reporting on the commitments and actions has to date been limited by the availability of information. The current web pages (<http://www.uea.ac.uk/Estates/energy>) need more exposure and although representing a true reflection of current action, a more coordinated and systematic approach is needed to demonstrate credibility.

Key Strategic Recommendations
Build on the success of the Sustainability Group by formalising roles and responsibilities and its relationship with the Executive Team and gaining formal endorsement by Council. Provide clear job descriptions for those with EMS responsibilities, recognising achievements within the performance evaluation process.
The Assistant Energy Manager job description should include EMS responsibilities and focus on developing and delivering the stakeholder engagement strategy (see later recommendation). Additional committed staff resource should be made available for EMS implementation, as a minimum through reinvestment of savings.
Review the environmental policy, objectives and targets ensuring consistency with the scope and priorities identified within this report. Public recognition for the policy should be made at the highest level of management. Establish and implement an environmental management programme to operationalise the policy.
Implement the EMS via a staged process developing on existing objectives and targets. Prioritising resources and action using the aspect register and reinvesting savings made.
Continue with the transparent and open approach to reporting commitments and action, and develop this into comprehensive on-line environmental reporting.
Undertake, and record a stakeholder identification and prioritization exercise with the Sustainability Group and other relevant senior management groups, and develop a strategy for stakeholder engagement (both internal and external).

Key Recommendations: Internal Stakeholder Engagement Strategy

- Consider branding the EMS as the vehicle for delivering the carbon reduction strategy, engaging stakeholders in creative and effective ways.
- Provide general environmental awareness training to all staff and students
- Introduce environmental/sustainability issues into the agendas of staff meetings at all levels.
- Create a “stakeholder panel” (of experts, company representatives, NGOs, local community groups, etc) to develop sustainable decision making processes³.
- Improve the communication of current schemes.
- Find ways to incorporate incentives into existing schemes to increase the participation rates.
- Train resident tutors in sustainability issues so they are more equipped in promoting sustainability to students in their respective residences. Resident Tutors should not only introduce schemes when students first arrive at the residences but also work on promoting them throughout the year.
- Expand existing schemes to involve more staff/departments e.g CRed Energy Awareness Scheme

THE EMS CHALLENGE

UEA (2008) set itself a challenge to become a leader in environmental management and particularly carbon reduction...’ Benchmarking performance against other HEIs (e.g. 64th in the 2008 People and Planet Green League), it is clear that there is much work to be done if UEA is to gain appropriate credit for its actions to date and go on to demonstrate leadership performance in the future. Best practice guidance⁴ recommends an EMS as a tool for achieving and demonstrating such commitments.

The organisational structure and range of activities undertaken at UEA make EMS implementation a potentially complex process, but with careful prioritisation and resource allocation significant performance improvement can be achieved. Monitoring the range of cost savings (and other benefits) achieved will establish a clear business case for reinvestment in the EMS.

The costs involved will be primarily determined by savings made and the staff resource employed, but carefully placed investment can achieve significant benefits. Procurement is an area where significant gains can be achieved both in carbon reduction and environmental management more generally with additional expert resource. Recommended priorities (based on the results of the significance evaluation undertaken within the Environmental Aspects Register) are identified below. These form the basis of the environmental programme.

³ Dupre, S., Knight, A. Oelschlaegel, J. (2007) *Critical friends – the emerging role of stakeholder panels in corporate governance, reporting and assurance*

⁴ E.g. EAUC, HEEPI, Environment Agency.

Key Recommendations: Improved Environmental Performance

Develop, implement and report on a grounds maintenance and conservation plan

Develop and implement a comprehensive environmental review process for campus development and refurbishment projects

Engage staff and students in debate on the most effective approaches to incorporating Education for Sustainable Development into the curriculum, with the aim of developing a strategy for implementation

Extend carbon reduction targets to incorporate other direct and indirect sources of emissions e.g. refrigerants, waste, transport (establish baseline data and monitoring systems)

Review procurement policy and procedures to embed environmental criteria into procurement processes, specifically establishing ways of monitoring and reducing the carbon and water footprints, and biodiversity impact of purchasing decisions. Develop and implement staff training and auditing to ensure procedures are complied with.

Establish appropriate data collection, monitoring and auditing of waste management practices. Establish guidelines/tender specifications in order to ensure the waste management objectives of UEA are fully addressed.

Develop and implement a long term strategy for reduction in electricity and water consumption and waste management (as part of the stakeholder engagement strategy)

Monitor, evaluate and report on progress of the UEA travel plan. Extend the Plan to adequately reflect UEA's transport impacts

Undertake an emergency planning exercise to establish the operational controls required to effectively safeguard the environment in the event of e.g. fire, vehicle crash

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1. INTRODUCTION

As institutions for research and teaching, producing the decision-makers of tomorrow Higher Education Institutions (HEIs) need to take the lead in promoting sustainability. HEIs are also in a key position to demonstrate sustainability as they have been described as ‘microcosms’ of society as a whole and the environmental issues it faces⁵. They also have considerable influence in relation to operational environmental impacts through procurement and waste management practices. The University of East Anglia (UEA) has recognised their role in this context and has made a commitment to *“To seek to become a leader in environmental management, and particularly carbon reduction, at UK HEIs through the adoption of environmentally sympathetic and low carbon policies and practices taking resource constraints into account” (UEA Environmental Policy 2008).*

An Environmental Management System (EMS) is an organisational tool with the aim of reducing the environmental impact of an organisation’s activities, and moreover contributing to sustainable development. This report documents the results of an Initial Environmental Review (IER) undertaken for the UEA. It forms the first stage of work to develop an EMS in line with specific commitments made in the environmental policy⁶, and presents a systematic and comprehensive assessment of UEA’s current activity and performance in relation to environmental management. ISO14001 has been used as a framework, allowing for third party certification of the EMS at a later stage, if desired. An ISO14001 gap analysis is recommended to take this forward.

The HEI sector generally has been realising its environmental responsibility since the Toyne Report⁷ (1993). The latest driver comes from HEFCE, who are in the process of producing a sector wide carbon reduction strategy and setting related targets. In the next round of capital funding HEFCE will link funding to performance against carbon management plans and institutions will be required to report on progress in implementing the plans, and on the results achieved⁸: Making the systematic management of carbon emissions an essential element of the UEA EMS. This report thus also establishes the foundation of a carbon management plan and reduction strategy, working to demonstrate UEAs leadership role in carbon reduction.

Key Recommendations are made throughout the report establishing a practical and achievable way forward. Translating these into an effective environmental programme will ensure proposed actions are taken forwards through prioritised objectives and SMART targets embedding the EMS into UEA’s organisation and culture.

⁵ Dahle, M. and Neumayer, E. (2001) Overcoming barriers to campus greening: A survey among Higher Education Institutions in London, in, International Journal of Sustainability in Higher Education, 2, 139-160

⁶ <http://www.uea.ac.uk/Estates/energy> see General Operational Objectives

⁷ DoE (Department of Education) (1993) Environmental responsibility: An agenda for further and higher education, Report of the Committee on Environmental Education in Further and Higher Education, HMSO: London

⁸ HEFCE (2009/03) Sustainable Development in Higher Education: 2008 Update to Strategic Statement and Action Plan

2. SCOPE AND METHODOLOGY

The IER covers the entire UEA campus and associated residences (NR4 7TJ). All activities relating to research, education, facilities and services management are included in the scope of this review. The environmental impacts of new or proposed developments which might extend this scope e.g. UEA London, should be assessed at the earliest opportunity.

The IER was conducted by students on the ENV-M542, EMS and Auditing module delivered by the School of Environmental Sciences from January to April 2009, and project managed and collated by Elaine Colk, Module Tutor and Environmental Consultant, Pro-Vision Environmental. This work was undertaken in partnership with Martyn Newton, Risk and Sustainability Manager at UEA.

The objective of this IER was to comprehensively identify and assess the environmental aspects of the UEA, and to propose recommendations for further action where current controls are insufficient. An “environmental aspect” represents those elements of the business activity of UEA which interface with, and could have an effect on the surrounding environment, whilst an “environmental impact” is the change to the environment brought about by that aspect. This report is concerned with identifying the environmental aspects of the UEA’s activities and providing information in order to assess the significance of the impacts brought about by them (see UEA Aspects Register, April 2009).

Data was gathered for the IER using a checklist of information required created by specialist teams of students (selected on the basis of their training and interests) to identify and assess the relevant environmental aspects. Additional data were then sourced as necessary. The teams were:

- Emissions to Air
- Water and Land
- Resources – Waste and Procurement
- Biodiversity and Landscape
- Education for Sustainable Development (ESD)

Each specialist group also made consideration of chemical management, carbon emissions, campus development and emergency preparedness and response, so as to ensure these issues were addressed comprehensively. The available data supplied were then compiled and evaluated by the specialist teams, and a template completed for each of the aspects identified. These have been collated into the following report. Each template includes baseline data, existing management, and relevant legislation and other requirements to which the University subscribe. This element forms the basis of a legislation register, a key part of the EMS. Related information sources are also presented in appendix 1.

The data was also used by students on the ENV3A20 Global Environmental Change module to develop an ecological footprint of UEA activities. This work is being coordinated by Erik Buitenhuis (ENV) and the results will be drawn into the EMS implementation process.

The IER presents a snap-shot of UEA’s performance and it is proposed that this will be reviewed annually by subsequent ENV M542 cohorts to ensure this is complete and up to date and results fed back to senior management through the Sustainability Group (see section 3.1).

3. THE UEA CONTEXT

UEA occupies over 320 acres of land (see appendix 2), which contains wildlife sites of county significance, Biodiversity Action Plan species and listed buildings (see section 5). The surrounding natural environments of the Yare Valley and Earlham Woods, and local communities of Earlham, Bowthorpe, Cringleford, Colney, and Eaton are also of significance as environmental 'receptors' and 'emitters' e.g. via community access to UEA grounds.

The UEA has over 14,000 students and over 2600 staff. As a small community with a rapid turnover (e.g. most students are only resident on campus for one year), there are a number of subcultures⁹ (e.g. staff, faculty, students, operations managers) which need to demonstrate commitment to the EMS if it is to be successful.

Previously a golf course, historical contamination on campus is limited: Herbicides and pesticides will have been used but these are generally short lived in the environment. An extensive history of the campus is outlined in the Conservation Development Strategy (<http://www.uea.ac.uk/Estates/construction/Conservation>).

UEA's current environmental impact varies according to the teaching semesters, where certain environmental aspects e.g. transport will be affected by 'seasonal' activity. The impact will also change with student demographics e.g. a higher proportion of overseas students will increase the indirect carbon emissions from this source.

3.1 ENVIRONMENTAL PERFORMANCE IMPROVEMENT

To date, UEA's environmental progress has been focused on a few large-scale, cutting edge projects (namely the Biomass plant, Combined Heat and Power plant (CHP), District Cooling via Absorption Chilling, Academic Building East, Elizabeth Fry and Zicer Buildings) driven by the Estates and Buildings Division (EST). Whilst impressive, it is important to distinguish between these and the systemic institutional transformation¹⁰ required to achieve effective environmental and sustainability management. The implementation of an EMS will address this and set these projects within a more progressive environmental context, enhancing their credibility. Environmental impacts will be managed systematically, without stifling such innovative projects. There is also a need to coordinate existing activity and begin to effectively communicate the considerable progress UEA has made to date and stimulate continual and sustainable performance improvement.

Other action has been driven by students and groups or individual staff, e.g. Go Green, Iain Barr (BIO) and Keith Tovey (ENV). The Union of UEA Students has been particularly active, forming a Green Wing and achieving a Silver standard in the NUS Sound Environmental Impact Awards (2008/9). There is a need to coordinate this activity and begin to effectively communicate the considerable progress UEA has made to date and stimulate continual and sustainable performance improvement through the EMS.

⁹ Barnes, P. and Jerman, P. (2002) Developing an environmental management system for a multiple university consortium, in, *Journal of Cleaner production*, 10, 33-39

¹⁰ Sharp, L. (2002) Greening Campuses: The road from little victories to systemic transformation, in, *International Journal of Sustainability in Higher Education*, 3 (2), 128-145

Current management responsibilities in relation to sustainability (incorporating environmental management) lie with Martyn Newton, the Risk and Sustainability Manager Estates and Building Division (EST). He does however hold other responsibilities and the appointment of dedicated staff will be a necessity if the EMS is to succeed (required resources are discussed in section 4.1). Dawn Dewar, Transport Coordinator (EST), Mel Pascoe (EST), Energy Manager and Janice Bone Deputy Director Waste of and Recycling, (Residences and Services Division) hold specific responsibility for their issue areas. A commitment has been made to an assistant energy manager post, a role which could encompass EMS implementation and maintenance. Additional resources should be made available through reinvestment of savings in the longer term.

Key Recommendation: The Assistant Energy Manager job description should include EMS responsibilities and focus on developing and delivering the stakeholder engagement strategy (see later recommendation). Additional committed staff resource should be made available for EMS implementation, as a minimum through reinvestment of savings.

The recent (April 2008) establishment of the Sustainability Group, Chaired by Professor Trevor Davies, Pro-Vice Chancellor has enabled significant progress in formalising UEAs commitment to becoming an ‘*exemplary low carbon campus*’ (UEA Environmental Policy 2008). Commissioning the IER, which has already supported the UEA’s Business in the Environment, Universities that Count¹¹ survey return, and the People and Planet Green League¹² survey, reaffirms UEA’s commitment to systematically addressing its environmental impacts through an EMS. The Sustainability Group currently meets quarterly but additional meetings are likely to be required during EMS implementation.

Sustainability is referred to in UEA’s Corporate Plan (2008-2012)¹³: “We value sustainability because we know that we can achieve nothing in the longer run if our activities are not sustainable both economically and environmentally”. However, sustainability is not explicit within the following objectives. To date much of the impetus to implement environmental management has come from the bottom-up¹⁴, both from staff and students. Clearer environmental and more broadly, wider sustainability leadership is now required to transparently demonstrate public and active support, and harness and consolidate the momentum for change which already exists.

Key Recommendation: Build on the success of the Sustainability Group by formalising roles and responsibilities and its relationship with the Executive Team, and gaining formal endorsement by Council. Provide clear job descriptions for those with EMS responsibilities, recognising achievements within the performance evaluation process.

¹¹ <http://www.bitc.org.uk/>

¹² www.peopleandplanet.org/gogreen/greenleague

¹³ <http://www.uea.ac.uk/vco/corpplan>

¹⁴ Julie Worrall, CUE East (April 2009)

UEA's current environmental policy (2008) establishes a clear commitment to becoming '*a leader in environmental management, and particularly carbon reduction...*' The supporting objectives however reflect the level of dedicated staff resource within that issue area (i.e. energy, waste, and transport have well defined objectives) and not overall policy commitments. The related targets are often not SMART (specific, measurable, achievable, realistic, and time bound) making them difficult to report on and thus lacking credibility e.g. transport was not specifically reported on in the BiTC Universities that Count survey return due to a lack of recent evidence to support achievements.

As the foundation on which the EMS is built, the environmental policy needs to reflect a comprehensive set of issues (identified within this report) and underpin the leadership status which UEA will need to demonstrate. It should be more comprehensive and systematic; including commitments to Education for Sustainable Development (ESD), emissions and discharges, emergency preparedness and stakeholder engagement. Carbon reduction needs to be clearly reflected in the objectives and targets. There is also a need to embrace management of sources of carbon other than those from direct energy use, if UEA is to truly commit to leadership in this field¹⁵. A clear position on Corporate Social Responsibility (CSR) issues also need to be illustrated e.g. the UEAs official fair-trade status, ethical investment, and Healthy UEA.

Public recognition for the policy should be made at the highest level of management, and a commitment made to review the policy regularly (annually in the initial stages of EMS implementation). Positioning the policy on the key policies page (<http://www.uea.ac.uk/about/keypolicies>) of the UEA web site will demonstrate initial commitment.

The related objectives and targets require baselines to be established to monitor and report on progress (some of which are presented here within the relevant templates) and appropriate actions implemented through an environmental programme to ensure they are achieved.

Key Recommendations: Review the environmental policy, objectives and targets ensuring consistency with the scope and priorities identified within this report. Public recognition for the policy should be made at the highest level of management. Establish and implement an environmental management programme to operationalise the policy.

3.2 STAKEHOLDER ENGAGEMENT

Stakeholder engagement is an essential element of CSR, and motivating stakeholders and positive feedback after application is the key to raising awareness and overcoming many of the barriers to effective EMS implementation. Carbon reduction is underpinned by such action. Student stewardship¹⁶ can be implemented directly through curriculum 'greening'

¹⁵ <http://www.carbontruststandard.com/>

¹⁶ HEFCE (2009)

(see section 7) but wider stakeholder engagement is required if systemic institutional transformation is to be achieved.

Stakeholders are defined as “individuals or groups that affect or could be affected by an organisations activities, products or services and associated performance.”¹⁷ “Any analysis or attempt to include stakeholders’ voices in business decisions must begin with an understanding of who these stakeholders are and how they seek to influence corporate decision making”¹⁸. To be effective in demonstrating CSR, stakeholder engagement needs to be participatory, building partnerships and ultimately enabling sustainable decision making.

This process begins with identifying and prioritising both the internal (e.g. staff, students) and external (e.g. general public, businesses) stakeholders of significance in the EMS (and the integral Carbon Reduction Strategy). The UEA has implemented a wide range of awareness schemes and campaigns promoting environmental and sustainability issues. In order to inform the development of a stakeholder engagement strategy, these have been assessed for effectiveness based on a ranking scheme devised specifically for this purpose (see appendices 3a and 3b).

UEA is successful at promoting outward facing projects with external stakeholders. Many of these projects are conducted by CUE East¹⁹ (e.g. Students for Sustainable Choices Challenge). Their work encompasses various outside stakeholders from the local community to overseas universities (see appendix 3a). The CUE East (2008) report²⁰ also outlines the baseline perception of public engagement in UEA academic staff.

UEA’s poor ranking in the People and Planet Green League²¹ on carbon emissions per head (e.g. energy use) and water usage, is an indicator of the need to improve performance through internal behavioural change. There are a range of internal schemes (see appendix 3b). Some simply provide information, and although this is important this does not necessarily effect the required behavioral change (e.g. UEA Bicycle User Group have a website with information on cycling that has limited updates). Schemes that provide incentives, however, such as CRed Energy Awareness Campaign have proven to be more successful.

There are a variety of schemes that, in theory, have the potential to be very effective. However, due to poor communication their messages prove not to be reaching their target audiences (e.g. interviews have provided evidence to show that many students are unaware of the Switch Off Campaign in the residences). There is also a need for schemes to be continual. Schemes have achieved initial success but are discontinued, or interest is not sustained: Both these scenarios could lead to an otherwise good scheme ultimately becoming ineffective. Staff Energy and Recycling Champions are involved across campus but the current effectiveness of these roles is questioned (see sections 8 and 10).

¹⁷ Dupre, S., Knight, A. Oelschlaegel, J. (2007) *Critical friends – the emerging role of stakeholder panels in corporate governance, reporting and assurance*

¹⁸ Ibid

¹⁹ Julie Worrall. CUE East. j.worrall@uea.ac.uk

²⁰ McDaid, L. (2008) A qualitative report on the perceptions of public engagement in UEA academic staff (CUE East/UEA)

²¹ People and Planet (2009). The Green League 2008. Available online: <http://peopleandplanet.org/gogreen/greenleague2008> (18/03/09)

The Centre for Staff Education and Development (CSED) provides courses and support for staff that cover a variety of different issues. However, there are none which currently focus to educate staff in sustainability issues. A proposal developed in conjunction with the Low Carbon Innovation Centre²² to provide ‘Carbon Coaches’ training to 10% of staff with the aim of promoting, implementing and evaluating UEA’s corporate commitments to carbon reduction, and more broadly sustainability, is currently being considered by the Sustainability Group.

Key Recommendation: Undertake, and record a stakeholder identification and prioritization exercise with the Sustainability Group and other relevant senior management groups, and develop a strategy for stakeholder engagement (both internal and external).

Key Recommendations: Stakeholder Engagement Strategy

- Consider branding the EMS as the vehicle for delivering the carbon reduction strategy, engaging stakeholders in creative and effective ways.
- Provide general environmental awareness training to all staff and students.
- Introduce environmental/sustainability issues into the agendas of staff meetings at all levels.
- Create a “stakeholder panel” (of experts, company representatives, NGOs, local community groups, etc) to develop sustainable decision making processes²³.
- Improve the communication of current schemes.
- Find ways to incorporate incentives into existing schemes to increase the participation rates.
- Train resident tutors in sustainability issues so they are more equipped in promoting sustainability to students in their respective residences. Resident Tutors should not only introduce schemes when students first arrive at the residences but also work on promoting them throughout the year.
- Expand existing schemes to involve more staff/departments e.g CRed Energy Awareness Scheme.

Engaging stakeholders and maintaining momentum for change requires public reporting. Demonstrating commitment and performance in environmental management is likely to have an impact on student numbers. “45% of young people intending to study education, social sciences, architecture and building and planning said that a good track record on sustainable development was important or very important in choosing where to study”²⁴.

Reporting on the commitments and actions has to date been limited by the availability of information. The current web pages (<http://www.uea.ac.uk/Estates/energy>) need more exposure and although representing a true reflection of current action, a more coordinated and systematic approach is needed to demonstrate credibility.

²² www.cred-uk.org, www.carbon-connections.org.uk

²³ Dupre, S., Knight, A. Oelschlaegel, J. (2007) *Critical friends – the emerging role of stakeholder panels in corporate governance, reporting and assurance*

²⁴ *People and Planet, 2009: Forum for the Future Survey*

The ecological footprint work being undertaken by Erik Buitenhuis (ENV) through the ENV3A20 Global Environmental Change module has significant potential to communicate and report performance.

Key Recommendation: Continue with the transparent and open approach to reporting commitments and action, and develop this into comprehensive on-line environmental reporting.

4. THE EMS CHALLENGE

UEA (2008) set itself a challenge to become a leader in environmental management and particularly carbon reduction...’ Benchmarking performance against other HEIs (e.g. 64th in the 2008 People and Planet Green League), it is clear that there is much work to be done if UEA is to gain appropriate credit for its actions to date and go on to demonstrate leadership performance in the future. Best practice guidance²⁵ recommends an EMS as a tool for achieving and demonstrating such commitments.

The organisational structure and range of activities undertaken at UEA make EMS implementation a potentially complex process, but with careful prioritisation and resource allocation significant performance improvement can be achieved.

The resources required to effectively implement and maintain the EMS need to be balanced against cost savings and other benefits. These can be categorised as:

- Direct savings e.g. reduction in energy consumption, the relatively high water and energy use per head (People & Planet, 2008) suggests there is significant potential here.
- Indirect savings e.g. improved relationships with stakeholders (internally, improved staff and student morale, externally, reduced insurance premiums).
- Reputational benefits e.g. The School of Environmental Sciences research is recognised internationally but the UEA’s environmental performance has been deemed inadequate (People and Planet, 2008). The new biomass plant is attracting significant attention in the sector and the media, and is likely to place attention on UEAs other environmental management activities. Reputation can also affect future student numbers and therefore funding²⁶. Although the position of the UEA in the Good University Guide is reasonably strong at 23, it cannot automatically attract the highest caliber students in the way that Oxford or Cambridge can, thus ways of increasing attractiveness and enticing students into the UEA are important.
- Avoidance costs e.g. fines avoided due to effective control of environmental aspects through the EMS, avoidance of pollution remediation costs and fines.

²⁵ E.g. EAUC, HEEPI, Environment Agency.

²⁶ Creighton, S.H. (1999) Greening the ivory tower: Improving the environmental track record of universities, colleges and other institutions, MIT Press: Massachusetts

The costs involved will be primarily determined by savings made and the staff resource employed (see previous key recommendation). However, wider implementation will also require a consistent budget for engagement. HEIs generally have higher personnel turnovers (both staff and students) than industry, and with it valuable knowledge can disappear²⁷. Many examples exist within UEA where ‘champions’ have pushed initiatives to be implemented, only for these to be abandoned when that individual leaves or restructuring has taken place and the initiative is not revisited. Awareness also needs to be maintained, e.g. recycling and energy efficiency awareness schemes in accommodation need to be reinforced on a termly basis to address quick turnover of residents.

Staff time will also be required to establish and maintain monitoring and reporting systems. Ensuring performance improvement can be demonstrated. The Building Management System (BMS) and STARK monitoring and targeting system have significant potential to contribute to this. Procurement is an area where significant gains can be achieved both in carbon reduction and environmental management more generally with additional expert resource.

Key Recommendation: Implement the EMS via a staged process developing on existing objectives and targets. Prioritising resources and action using the aspects register and reinvesting savings made.

The following sections comprise the IER templates produced by the specialist teams (see section 2). The recommendations made here form the basis of the environmental programme.

5. BIODIVERSITY AND LANDSCAPE

5.1 ISSUE OVERVIEW

Introduction	<p>UEA is situated within the largest natural landscape of any UK university and therefore issues related to biodiversity and landscape are prominent in its maintenance. Biodiversity and Landscape are important because they provide direct educational and developmental benefits at all ages, enhance health and well-being and encourage interest from a range of stakeholders.</p> <p>As well as the environmental and social impacts of direct use, indirect impacts on biodiversity occur from procurement (see sections 6 and 9).</p>
Baseline Environment	<p>Built environment: The UEA Conservation Development Strategy (CDS) (2006) (http://www.uea.ac.uk/polopoly_fs/1.50472!conservation%20strategy.pdf) covers the site and buildings of the main campus. The main aim of the CDS is to implement the Heritage Partnership Agreement. It sets out a framework through which informed decisions about alterations to listed buildings on campus: the library, teaching wall and associated walkways (grade II), and the ziggurats (grade II*). The CDS covers</p>

²⁷ UEA (2009) Corporate Plan 2008-2012. Available online: <http://www.uea.ac.uk/vco/corpplan> (18/03/09)

the built environment and landscape across the whole campus, developing on successive Master Plans which have viewed the campus as a set of interconnected buildings and landscapes.

Natural environment: The UEA Landscape Strategy consultation draft launched on 14.05.09 aims to compliment the CDS, and establish a connected and coherent approach to landscape management with the aim of fulfilling the environmental policy objectives on biodiversity (see <http://www.uea.ac.uk/Estates/energy> see Strategic and Specific Operational Objectives).

The UEA campus is of high nature conservation value as it contains six County Wildlife Sites (CWSs) recognised by Norfolk County Council as areas of local beauty or wildlife interest (see Appendix 4). However, anecdotal evidence suggests a general decline in diversity has been slowly occurring, alongside a degradation of the state and appearance of some areas of habitat. Appropriate assessment and management of these habitats is required to ensure degradation is reversed.

Alongside important habitats there are records in the past 5 years of many Biodiversity Action Plan (see: <http://www.norfolkbiodiversity.org/>) species on site including; **skylark, bittern, linnet, reed bunting, spotted flycatcher, bullfinch, song thrush, water vole, brown hare, otter and pipistrelle bat**. Very recent evidence of otter has been recorded, and they are thought to be using the landscape more and more frequently (pers comm. Iain Barr, 03.04.09). Other species are however, considered to be in decline, or have not been seen on site in the past 2 years (pers comm., Iain Barr 04.03.09).

Rare bird species such as cettis warbler, garden warbler, goosander, willow tit, willow warbler, and lesser spotted woodpecker have been regularly recorded as breeding on campus. However, the generally degrading ecosystems are accelerating loss of these sensitive species.

Work is ongoing to establish the gaps in knowledge of the campus ecosystems, habitats and species. A semi-comprehensive biodiversity assessment was undertaken in 1987 (A natural History of UEA, by Dr Gibson, BIO), and for the last three years Dr Iain Barr (BIO) has been collecting data on several taxa to compare against this. The scope of this is outlined in table B1.

Table B1. Existing Monitoring Data

Taxa	Information Currently Available
Birds	<ul style="list-style-type: none"> • details of breeding status and population number of all birds on campus • details of nesting records for a lot of birds on campus • Ringing details of birds caught on campus- and those that were caught on campus and had been somewhere else- or have gone somewhere else- recoveries • maps of bird distributions on campus • details of nest boxes and breeding success of these.
Mammals	<ul style="list-style-type: none"> • lists of all mammals recorded on campus • very rough estimates of the population size of some species • evidence of rare species- water vole, otter etc • some detailed studies and quantitative data.
Reptiles and amphibians	<ul style="list-style-type: none"> • Records of all species found on campus

	<table><tr><td>Dragonflies</td><td><ul style="list-style-type: none">Records of all species recorded on campusdetailed weekly transect records for some species- e.g. banded demoiselle</td></tr><tr><td>Butterflies</td><td><ul style="list-style-type: none">records of all species recorded on campusa couple of butterfly transects from recent years</td></tr><tr><td>Plants</td><td><ul style="list-style-type: none">Very rough list of the plants on campushistorical records</td></tr><tr><td>other taxa</td><td><ul style="list-style-type: none">anecdotal records and some experimental stuff- I.e. a good idea of the parasite fauna of birds.Fungi survey carried out by Kay Yeoman each year.some insect surveys etc.</td></tr></table>	Dragonflies	<ul style="list-style-type: none">Records of all species recorded on campusdetailed weekly transect records for some species- e.g. banded demoiselle	Butterflies	<ul style="list-style-type: none">records of all species recorded on campusa couple of butterfly transects from recent years	Plants	<ul style="list-style-type: none">Very rough list of the plants on campushistorical records	other taxa	<ul style="list-style-type: none">anecdotal records and some experimental stuff- I.e. a good idea of the parasite fauna of birds.Fungi survey carried out by Kay Yeoman each year.some insect surveys etc.
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	<p>Some of this data is collected through the curriculum (see table B2). There is significant potential for further collaboration with existing BIO/ENV modules to undertake specific surveys and extend this good practice in ESD e.g. Fieldwork and projects could be directed to campus biodiversity work in; BIO 2B18 Behavioural Ecology, ENV 2A35 Populations and Interactions, BIO2B26 Community Ecology in addition to BIO undergraduate projects. This will however require resources to ensure this work is appropriately coordinated.</p> <p>Table B2. Monitoring Data Collected Via the Curriculum</p> <table><tr><th>Module</th><th>Data collection activity</th></tr><tr><td>BIO 1A8Y first year ecology</td><td><ul style="list-style-type: none">detailed plant and abundance data for selected areas of the campus stretching back a few yearsLeaf litter sampling from three woodland types</td></tr><tr><td>MSCAEC applied ecology and conservation</td><td><ul style="list-style-type: none">rough bird survey and population estimates for several speciesmammal trapping going back several yearsprojects on comparing census techniques- so the students complete a survey and then repeat using a different technique and analyze the differencebird ringing</td></tr></table> <p>A range of improvement actions are planned, again coordinated by Dr Iain Barr.</p> <ul style="list-style-type: none">Moth monitoring- set site(s) trapped at 2 week intervals- more if students wish to get involved) trapping occasionally at other habitats using portable traps- aim to get a campus list+ teach moth ID skillsBird Nest finding and recording-as 2008 (where 130 nest found) train 3 more students to find nests of birds all over campus.Nest boxes- put up starling boxes and establish a jackdaw colony to replace the holes in trees that are not there due to existing management regimeGrant applied for to purchase wildlife cameras- nest box cameras plus 3 remote trap cameras and activity monitors. Plans to pipe images into various areas and create website for reporting.Continued monitoring of dragonflies- one ENV student working on this over the summer.Continue bird monitoring.Develop a fungi monitoring plot and assess Lusty hills for waxcap-grassland status (summer/autumn 2009)Another BIO person will be doing beetle surveys over the campus this summer.	Module	Data collection activity	BIO 1A8Y first year ecology	<ul style="list-style-type: none">detailed plant and abundance data for selected areas of the campus stretching back a few yearsLeaf litter sampling from three woodland types	MSCAEC applied ecology and conservation	<ul style="list-style-type: none">rough bird survey and population estimates for several speciesmammal trapping going back several yearsprojects on comparing census techniques- so the students complete a survey and then repeat using a different technique and analyze the differencebird ringing		
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Legislation, codes of	<ul style="list-style-type: none">Wildlife and countryside act, 1981: Bans certain methods of killing or taking wild animals/birds. Also outlines some rules surrounding public access								

practice etc.	<ul style="list-style-type: none"> • Conservation (natural habitats), 1994: Protects European protected animal and plant species from being disturbed and destroyed, including habitats and breeding sites. Also has legislation on planning and pollution control measures. • Conservation (natural habitats), amendments, 2007: This outlines a need to ensure surveillance of conservation status in habitats of community interest and species of Community interest, and in particular priority natural habitat types and priority species. And also the protection of specific species from exploitation. • Countryside Rights of Way Act (CROW), 2000: Overall this sets out rule on public access and also nature conservation protection of wild species and habitats of outstanding natural beauty. Including rules against the disturbance of wild birds. • Control of pollution regulations, 1996: Sets out procedures for applying for/varying consents for discharge into controlled waters. Details the information the Environment Agency keeps in water pollution control registers. • Natural environment and rural communities, 2006: Outlines the duty to conserve biodiversity, and creation of biodiversity protection and action lists, alongside rules for possession and use of pesticides and biocides. Also this legislation outlines the duty to maintain and enhance the natural beauty of the broads and also encourage public understanding and enjoyment of their qualities. • Environmental permitting, 2007: Educational and research facilities are exempt from environmental permitting regime and the pollution prevention and control regime. • Environmental damage (prevention and remediation), 2009: outline rules on preventing environmental damage and its remediation. Indicates that organization causing environmental damage will be made responsible for dealing with remediation of damage which will return the environment back to its previous state. • Local and National Biodiversity Action Plans http://www.ukbap.org.uk/ Local Biodiversity Action Plan (LBAP) http://www.norfolkbiodiversity.org/ identifies both priority action as well as long term implementation through local partnerships • EAUC: http://www.eauc.org.uk/biodiversity • Planning: e.g. Environmental Impact Assessment Regulations • Heritage Partnership Agreements: See Conservation Development Strategy
Environmental Aspects	<ul style="list-style-type: none"> • Grounds maintenance and conservation (includes use of herbicides and pesticides, see section 12) • Site use by stakeholders • Effluent release (see section 12)

	<ul style="list-style-type: none"> • Campus development (see section 6) • Purchasing (see sections 6 and 9)
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Key Recommendation:

Provide appropriate resources for BIO/ENV (led by Dr Iain Barr) to undertake and report a comprehensive biodiversity assessment and implement a regular monitoring procedure as part of the implementation of the UEA Landscape Strategy.

Minimum baseline survey:

- Habitat assessment- surveys undertaken in each habitat on campus- catalogue of presence and abundance of all BAP species. This should be undertaken over a 12-18 month period.
- General surveys- key habitats to receive general habitat surveys as part of ongoing monitoring to include- Birds, mammals, reptiles, amphibians, butterflies, moths, dragonflies, beetles, plants, trees, fungi. Also general insect surveys of each habitat - sweep netting, trapping, pitfall trapping.

5.2 GROUNDS MAINTENANCE AND CONSERVATION

Environmental Impact	Positive grounds maintenance will enhance biodiversity through improvements made to habitats on site, which will also increase the sites appeal to stakeholders. However when done incorrectly site maintenance can cause degradation to these very same habitats.
Existing management	<p>Currently there is no written grounds maintenance/management plan, and due to this there are some key issues which need to be urgently addressed. The recent employment of a new grounds manager provides an excellent opportunity to establish new controls and develop a coordinated and comprehensive approach through the development of a Grounds Maintenance Plan. This will need to incorporate the current understanding of existing ecosystems, habitats and species on site, and the expertise available in-house should be utilized in establishing the Conservation element of the plan.</p> <p>Incidences of wild bird disturbance on site through grounds maintenance works have been recorded in the past (in breach of CROW Act, 2000, section 12 (13)i). This operation is now controlled through a procedure requiring nesting bird searches, by appropriately trained individuals, immediately prior to works commencing.</p> <p>Maintenance practices which have contributed to the general decline in biodiversity on campus include:</p> <ul style="list-style-type: none"> • Poor hedge trimming plan- and leggy hedges- rough mowing of hedges- same applies to ivy on trees • Poor grassland management- they need to decide what they want and mow accordingly- especially with respect to orchids- need to leave time to set seed etc. to improve value for biodiversity • Poor path structure- desire lines fragmenting habitat- areas of high use -paths spread during winter- degrading habitat

	<ul style="list-style-type: none"> • Poor management of pests- squirrel damage to sensitive trees • Planting ornamental trees rather than native species
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Key Recommendations: Develop a written Grounds Maintenance and Conservation Plan containing specific management plans for desired habitats. Provide training to grounds maintenance staff on general environmental/biodiversity awareness and specific maintenance techniques as appropriate.

USE OF SITE BY STAKEHOLDERS

Environmental Impact	<p>Recreational use of the site by stakeholders e.g. dog walking, jogging, walking, fishing, and general leisure use directly impacts biodiversity through general disturbance to land, trampling of grass/plants, erosion, noise and litter (including dog faeces).</p> <p>These stakeholders also have a positive role to play in making improvements to the state of current landscape and biodiversity. Directly engaging UEA students and specific societies, the general public, local schools, and naturalist groups, to contribute to conservation through collecting data or practical conservation work and reporting results and improvements can effect understanding and awareness and hence ownership. Ensuring the management of biodiversity on site is successful.</p>
Existing management	<p>There is little information on the extent of site use i.e. numbers of people using the site, what they use the site for and how they perceive the landscape and its nature conservation value. Anecdotal evidence does however suggest that there has been an increase in visitor numbers, and the impacts of this need to be addressed through appropriate signage, information and engagement.</p> <p>Poor invigilation of dog lead and faeces issues (some data is available from Iain Barr on the extent of this issue) is compounding disturbance, and other impacts caused by increased direct use.</p> <p>Some stakeholder groups are being brought on site and using this resource through actions led by Iain Barr e.g. Bluebell Primary, Earlham High, Notre Dame High, and adult education groups</p>

Key Recommendations: Undertake a survey of stakeholders to establish baselines for extent of current use and perceptions. Provide information boards around campus to raise awareness of the nature conservation value of the site. Extend the formal engagement of stakeholder groups in data collection, monitoring, etc. Publicly report performance.

6. CAMPUS DEVELOPMENT AND REFURBISHMENT

6.1 ISSUE OVERVIEW

Introduction	<p>Campus development brings physical changes on campus: construction, demolition, greening etc. The impacts may be positive e.g. energy efficiency, promotion of sustainability awareness, landscape and biodiversity improvement, improvement of sewage and drainage systems, or negative e.g. land take, noise pollution, vibration, landscape degradation, soil erosion, land and surface water continuation.</p>
Baseline environment	<p>UEA has an extensive, long term Master Plan (see also Conservation Development Strategy) for campus development and refurbishment, and has constructed world leading low energy buildings: Elizabeth Fry Building (1994) and Zuckerman Institute for Connective Environmental Research (2005) Academic Building East (currently under construction).</p> <p>There is a need to clarify and demonstrate the environmental policy commitment 'to integrate environmental expertise into the continued encouragement of high quality design and enhancement of the aesthetic well-being of the University' (Strategic operational objective).</p> <p>Although some environmental issues are considered within the planning and construction processes this tends to be ad hoc e.g. attempts have been made to incorporate rain water recycling into new buildings (currently only the E.Fry building has rain water use for irrigation of trees).</p> <p>When refurbishing and especially when building new buildings, large scale water efficiency measures need to be considered in a coherent, transparent way. Alternative options need to be compared over the lifetime of the building and not necessarily only on financial grounds. For example: grey-water recycling, or re-use.</p> <p>Six Revolving Green Fund refurbishment projects are currently in progress. (http://www.hefce.ac.uk/pubs/circlets/2008/cl20_08/). The carbon cost of construction will also need to be considered if low carbon claims are to be credible.</p> <p>Due to the cutting edge status of many of the new buildings at UEA, external stakeholder engagement has been considerable. Sector and media interest in the new biomass plant continues to grow. Active internal stakeholder engagement however is generally limited to display boards on construction hoardings and articles in Broadview. Web based material is often difficult to find, hidden away in the EST website. Opportunities exist to use these buildings to improve general awareness e.g. introducing low carbon buildings on open days, developing virtual tours.</p>
Legislation, codes of practice etc.	<p>Planning Legislation: e.g. Environmental Impact Assessment</p> <p>Building Regulations 2000 and Building (Amendment) Regulations 2001: Ensure that all new buildings and refurbishments comply with the Building Regulations, including water usage and efficiency measures.</p> <p>Site Waste Management Plan Regulations 2008 Site waste management plans (SWMP) compulsory for all construction projects in England costing over £300,000. A SWMP records the amount and type of waste produced on a construction site and</p>

	<p>how it will be reused, recycled or disposed.</p> <p>Nuisance Law:</p> <p>BREEAM http://www.breeam.org/</p> <p>See also sections 5, 8, 9, 10, 11, 12 and 13.</p>
Environmental aspects	<ul style="list-style-type: none"> • Land take • Procurement: Materials and Subcontractors • Construction waste • Construction site vehicle use • Nuisance – Dust

Key Recommendation: Develop and implement a comprehensive environmental review process for campus development and refurbishment projects

6.2 LAND TAKE

Environmental Impact	Visual impact, increased noise and pollution and the degradation/removal of natural land which in turn impacts biodiversity on site. Removing habitat will minimize the amount of carbon sequestration on site and some types of habitat, specifically marsh can cause CO ₂ release into the atmosphere.
Existing management	<p>Planning requirements.</p> <p>There is evidence that biodiversity impacts are not effectively considered e.g. the ecological consultant report on the proposed IFR car park development was informed by inadequate surveying:</p> <p>http://wam.southnorfolk.gov.uk/WAM/pas/findCaseFile.do?appNumber=2008%2F0599&style=altavista&pager.offset=20).</p>

Key Recommendations: Incorporate the assessment of impacts on the sensitive habitats and ecosystems on campus in the environmental review process. Integrate the views of stakeholders to ensure the development process is transparent.

6.3 PROCUREMENT: MATERIALS AND SUBCONTRACTORS

Environmental Impact	Significant raw material consumption, e.g. large quantities of concrete building materials with a large carbon footprint. Emissions to air from transport of goods.
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Existing management	<p>FSC wood is specified in all designs; other requirements may be stipulated on an ad hoc basis.</p> <p>A preferred supplier list is in operation for consultants, other contractors are decided upon through open tender. Environmental management during construction is not really considered any further than the assumption that major contractors will have an EMS in place; it does not form part of the consideration for the tendering process or accepting the contract.</p> <p>Large project procedure for developments, using biomass plant as an example:</p> <ul style="list-style-type: none"> • Increased need for future energy demand identified • Preliminary research carried out by Martyn Newton and others. • Possible solutions are then put to the Full Executive Team via the registry for consideration before permission is granted to go ahead with the project. • Project is put out to tender based on a list of approved contractors (consultancy register). • Contractor chosen on a variety of criteria: Cost, previous experience, reliability, feasibility of proposal, time constraints etc. but no set, prescribed procedure, though energy efficiency of buildings has always been a priority and is world class for the newer constructions. Design standards exist for this but only go so far. <p>Projects are overseen by UEA project administrators who liaise with private project managers.</p> <p>Buildings and rooms at UEA are refurbished as and when necessary.</p>
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Key Recommendations: As part of the environmental review process, establish environmental purchasing guidelines e.g. of sustainably sourced furniture and low VOC paints for redecoration, and minimum tender specifications e.g. organizations must have an EMS. Audit suppliers and subcontractors to ensure effective implementation of tender requirements and general environmental management on site e.g. chemical management.

6.4 CONSTRUCTION WASTE

Environmental Impact	Disposal of old materials to landfill and resultant emission to air and water, pollution potential etc. e.g. carpets are a major aspect of room refurbishment.
Existing management	<p>External contractors undertaking major projects are required to segregate waste and recycle where possible, and produce Site Waste Management Plans where required.</p> <p>The university does not make any considerations for environmental impact of the waste produced or the materials consumed during in house refurbishment projects.</p>

Key Recommendations: Establish waste management procedures for internal refurbishment projects

6.5 CONSTRUCTION SITE VEHICLE USE

Environmental Impact	Emissions to air, combustion of fossil fuels and related climate change impacts. Soil compaction and erosion.
Existing management	No information available

Key Recommendations: Encourage subcontractors to establish the carbon footprint of their vehicle use and implement carbon reduction strategies

6.6 CONSTRUCTION NUISANCE

Environmental Impact	Local air pollution, damage to vegetation and controlled waters Noise, vibration, odour, light pollution etc.
Existing management	No information available

Key Recommendations: Audit suppliers and subcontractors to ensure effective implementation of general environmental management on and off site.

7. EDUCATION FOR SUSTAINABLE DEVELOPMENT

7.1 ISSUE OVERVIEW

Introduction	The Rio Earth Summit (1992) brought forward the idea that education is one of the key factors in achieving effective sustainable development ²⁸ . “45% of young people intending to study education, social sciences, architecture and building and planning
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²⁸ Blewitt, J., Cullingford, C. (2004) *The sustainability curriculum: the challenge for higher education*. London. Earthscan.

	<p>said that a good track record on sustainable development was important or very important in choosing where to study”²⁹. In order to promote UEA as a sustainable campus, change in the behaviour of those involved needs to be encouraged.</p> <p>The behaviour of individuals ultimately stems from their values, which can be formed through education. Behaviour change into more sustainable ways of living, including reducing carbon emissions, can only be promoted through the availability of opportunities; these opportunities could be provided by the university in the form of education through the incorporation of sustainability issues into the curriculum.</p> <p>Education for Sustainable Development (ESD) in higher education is promoted by HEFCE and would enable students to become familiarised with the issue while at the same time becoming more scientifically literate. This would enable them to evaluate information and start thinking about sustainability analytically. “Sustainable development is not just a single subject but a way of thinking that enriches all subjects in a relevant and engaging way for learners.”³⁰</p> <p>The University of Gloucester provides a good practice example of integrating ESD (http://www.glos.ac.uk/vision/sustainability/education/Pages/default.aspx). It coordinates the Regional Centre of Expertise (RCE) in Education for Sustainable Development. The centre is endorsed by the United Nations University and is one of 55 similar centres throughout the world.</p> <p>(see http://www.glos.ac.uk/vision/sustainability/unurce/Pages/default.aspx)</p>
Baseline Environment	<p>One of UEA’s strategies, which aim to meet the objective of UEA wanting to provide a student experience that is second to none, is to develop the theme of global citizenship throughout the university³¹. “While elective courses focused specifically on sustainability are necessary and commendable...sustainability education needs to be incorporated into core curriculum and courses in many disciplines.”³² Therefore, UEA should aim to incorporate sustainability issues into the curriculum of all departments to some extent.</p> <p>Existing degree courses (e.g. MA Theatre and Development) which incorporate aspects of sustainable development are identified in appendix 3a. The MBA in Strategic Carbon Management is the first of its kind in the world. There are also issues of sustainable development built into other modules (e.g. Introduction to Environmental History in the History department).</p>
Legislation, codes of practice etc.	<p>There are no legal requirements for the way in which sustainability should be communicated in Higher Education establishments. However, there are a few organisations that provide guidance:</p>

²⁹ *People and Planet, 2009: Forum for the Future Survey*

³⁰ Sustainable Development Commission (2009) *Five Strategic Priorities for Sustainable Development and Young People*

³¹ UEA (2009) Corporate Plan 2008-2012. Available online: <http://www.uea.ac.uk/vco/corpplan> (18/03/09)

³² Shriberg, M. (2002) *Institutional assessment tools for sustainability in higher education: strengths and weaknesses, and implications for practice and theory*. Higher Education Policy. 15:153-167

	<ul style="list-style-type: none"> • Higher Education Funding Council for England • Universities that Count • People and Planet's Go Green League
Environmental Aspects	<ul style="list-style-type: none"> • Sustainability in the Curriculum

7.2 SUSTAINABILITY IN THE CURRICULUM

Environmental Impact	<p>The development of this aspect can only create the potential for positive indirect environmental impacts. ESD will encourage students to behave in a sustainable manner as their knowledge of sustainability issues increases. As they discover the consequences of their actions, this will have a role in determining their behaviour.</p> <p>It will encourage students to be more analytical about sustainability issues that are presented to them from a variety of sources (e.g. the media). This will enable them to properly analyse information and focus their attention on that which is factual and accurate, and apply this in their future careers.</p>
Existing management	<p>There have been degree courses developed at UEA that incorporate the issues of sustainable development in amongst subject areas (e.g. MA Theatre and Development, MA Cultural Heritage and International Development see appendix 3a).</p> <p>In addition to degree courses, there are also individual modules available to students in a few departments that cover topics of sustainability (e.g. 'Introduction to Environmental History' and 'Empires of Nature: Environment and Society in Britain and Germany, 1500-1945', offered in the History department). There is an opportunity to harness this experience by engaging staff involved in these programmes in meaningful debate to review best practice and establish a realistic strategy for wider implementation.</p> <p>There is a proposal to create a 'Global Citizenship Module'; a module based around the ideas of sustainable development that would be offered, either as a voluntary or mandatory class, to all throughout the university. However, this is still in the early stages of development and there are a lot of considerations that need to be made before this kind of course is offered (e.g. should it be mandatory/voluntary, what year level, how it will fit into the timetable, how it will weight in assessment of the various degree courses). In order for this course to be effective students have to be interested in taking it. Therefore, innovative approaches to teaching and learning (e.g. using 'the outdoors' as a resource) need to be adopted.</p> <p>In interviews conducted, it became evident that, in general in regards to all sustainable behaviour, if things are made difficult for people then they will not make the effort to do it. Therefore, a questionnaire should be conducted in order to assess the potential demand for such a course. Topics that should be covered in the questionnaire should be:</p>

	<ul style="list-style-type: none"> • What degree they are undertaking (current students), what they plan to study (prospective students) or what they did study (alumni). • If they would be interested in taking a course along the lines of the 'Global Citizenship Module'. Why or why not? • The questionnaire can cover areas such as the ones highlighted above to judge the students' views (e.g. whether it should be voluntary or mandatory). <p>In addition the effectiveness of existing courses requires assessment e.g. examining the views and behaviour patterns of the students before and after they have taken the module/degree course to see if it has had any effect.</p>
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Key Recommendations: Engage staff and students in debate on the most effective approaches to incorporating Education for Sustainable Development into the curriculum, with the aim of developing a strategy for implementation .e.g.

- Conduct questionnaires and establish forums for students and staff to determine the potential for the theme of sustainability to be incorporated into the curriculum in all departments.
- Evaluate the effectiveness in behaviour change and awareness of current degree courses and individual modules that incorporate sustainability.
- Research best practice to determine if and how other universities incorporate sustainability into the curriculum and what affect this has had.

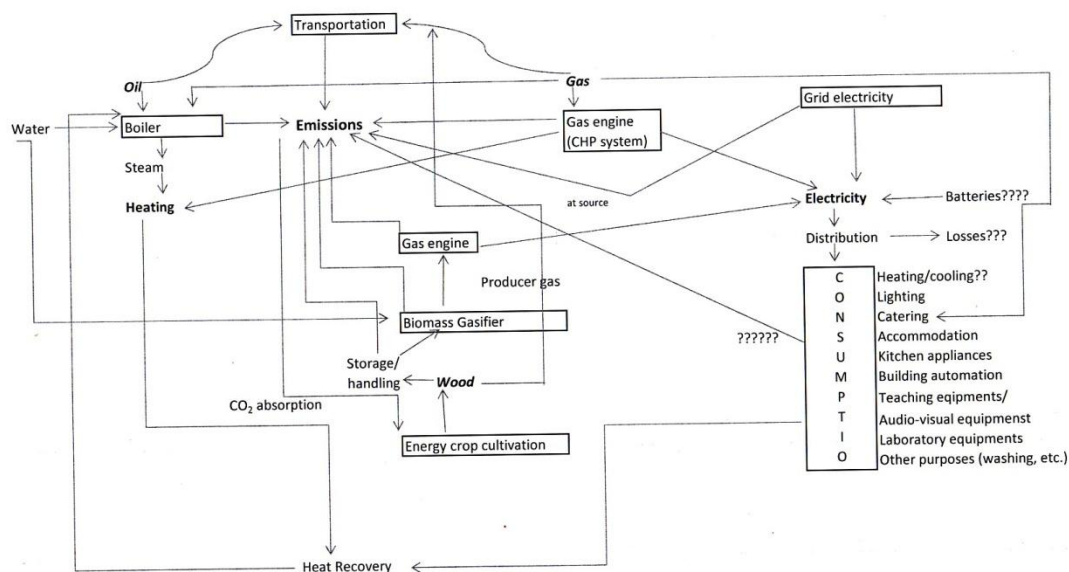
8. EMISSIONS TO AIR (STATIONARY SOURCES)

8.1 ISSUE OVERVIEW

Introduction	<p>Emissions to air from stationary sources include: energy generation and consumption, construction, laboratory emissions, refrigeration, the handling and storage of chemicals, swimming pool chlorination, and catering. Figure E1 illustrates the relevant processes and resultant environmental impacts.</p> <p>Energy generation and consumption are vast areas of resource depletion in any business sector, therefore, the capability and viability to reduce the energy generated and consumed at the UEA would greatly benefit the whole organisation. With respect to business risk the introduction of more renewable energy generation technology methods could reduce the environmental liabilities of the institution e.g. reductions in carbon emissions.</p> <p>HEFCE are in the process of producing a sector wide carbon reduction strategy and setting related targets. In the next round of capital funding HEFCE will link funding to performance against carbon management plans and institutions will be required to report on progress in implementing the plans, and on the results achieved³³:</p> <p>The Carbon Trust Standard (http://www.carbontruststandard.com/) establishes a systematic framework for HEIs to develop and formally adopt carbon reduction strategies, and is recommended by HEFCE and looked on favourably by the Carbon Reduction Commitment.</p>
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³³ HEFCE (2009/03) Sustainable Development in Higher Education: 2008 Update to Strategic Statement and Action Plan

Figure E1. Emissions to Air Process Flow Diagram



Baseline Environment

Although the UEA environmental policy (<http://www.uea.ac.uk/Estates/energy>) clearly focuses on energy and the related direct carbon emissions, issues such as expansion of the strategy to cover additional sources of CO₂ and CO₂e. A structured carbon reduction strategy beyond the Biomass implementation is needed.

The Energy Manager, Mel Pascoe (EST) and new Assistant Energy Manager are responsible for energy management at UEA. The Assistant Energy Manager's role is primarily focused on the implementation of energy efficiency campaigns, with resourcing for the post coming from related energy savings.

UEA generates approximately 60% of its own electrical power on site³⁴. Currently the main sources of energy are from the Combined Heat and Power (CHP) gas engines system (installed in 1998) and electricity imported from the National Grid. However, installation of the Biomass CHP system (currently in construction) will greatly reduce or eliminate any import of electricity from the National Grid and therefore reduce the sole reliance of electricity generation upon the existing CHP system. In addition to reducing the import of electricity the overall carbon emissions of the UEA will be greatly reduced and therefore, contribute vastly to achieving the carbon reduction targets and sustainability vision targets of the UEA. However, research studies have shown that the increase in renewable energy sources does not necessarily correlate with reductions in carbon emissions and can therefore, be contrary to the national plan and its expectations³⁵

UEA measures and reports on its CO₂ emissions (through Estate Management Statistics) from direct energy use (see table E1) against a baseline year of 1990. These calculations use the DEFRA (2007) emissions factors. Additional historical data is available to establish emissions for 1996-2003. Reduction targets are currently being agreed by the Sustainability Group.

³⁴ Broadview, Nov 2008
³⁵ Ward 2008

	<p>Table E1. Annual Carbon Emissions from Energy Use (Jan-Dec)</p> <table><tr><th>Year</th><th>Total UEA KgCO₂</th><th>KgCO₂ Per Student</th></tr><tr><td>1990</td><td>19,420,141</td><td>3,308</td></tr><tr><td>2004</td><td>17,586,900*</td><td>1,321</td></tr><tr><td>2005</td><td>20,324,170**</td><td>1,484</td></tr><tr><td>2006</td><td>21,702,346**</td><td>1,544</td></tr><tr><td>2007</td><td>21,564,024</td><td>1,439</td></tr></table> <p>* Site gas meter change over, some assumptions in total site use ** Dev Farm Gas use is not completely calculated due to incorrect meter readings and Kwh calculations. Note: Baseline consumption data for University Plain, UEA Village, NAM, Earlham Hall, Dev Farm and Colney Lane Pavillion. Net gas emissions factor used.</p> <p>UEA has been at the forefront of low energy building procurement and operation for about 15 years starting with the Elizabeth Fry building which completed in 1994 (saving 80 tonnes of CO₂ per annum against the benchmarking levels for a naturally ventilated 3000 square meter building³⁶). After winning the first ever Low Energy Building of the Year Award in 2005 for the Zuckerman Institute, UEA still continues its low energy strategy.</p>	Year	Total UEA KgCO ₂	KgCO ₂ Per Student	1990	19,420,141	3,308	2004	17,586,900*	1,321	2005	20,324,170**	1,484	2006	21,702,346**	1,544	2007	21,564,024	1,439
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2007	21,564,024	1,439																	
Legislation, codes of practice etc.	<p>EU Waste Incineration Directive 2007 – This directive may be applicable to the biomass CHP plant, however, depends upon the fuel purchased and interpretation of the implementation of the directive for England.</p> <p>EC GHG emission trading scheme – Mel Pascoe responsible person at UEA</p> <p>Regulation on compost and bio-waste – possible implications with bio-char, a by-product from biomass CHP energy generation plant.</p> <p>Buildings Regulations 2000, SI 2531 – Calculate the energy rating for UEA dwellings built after 2006.</p> <p>Energy Performance of Buildings (Certificates and Inspections) (England and Wales) Regulations 2007 SI 991 – Includes all other buildings excluded from above building regulation.</p> <p>Climate Change Levy is applicable to the import of electricity from the National Grid and the CHP is exempt if CHP quality is certificated.</p> <p>Energy and heat generation (NetRegs) Good Practice Guidance – for the generation of energy and heat for the existing CHP plant and future biomass CHP plant.</p>																		

³⁶ ECON 19 DETR 1998b

	<p>Carbon Reduction Commitment</p> <p>Hazardous Waste (England and Wales) Regulations 2005; Clean Air Act 1993; Solvent Emissions (England and Wales) Regulations 2004; Environmental Protection Act 1990; Control of Substances Hazardous to Health Regulations 2002.</p> <p>Carbon Trust Standard http://www.carbontruststandard.com/</p> <p>HEFCE Feb 2009/03, Sustainable Development in Higher Education: 2008 update to strategic statement and action plan: requirements for carbon management plans</p>
Environmental Aspects	<ul style="list-style-type: none"> • National Grid supply • CHP Operation • Boiler Operation • Solar Energy • Biomass (under construction-not operational) • Electricity Consumption • Gas Consumption • Heating Ventilation and Air Conditioning • Laboratory Emissions • Refrigerants • Swimming pool Chlorination • Catering

Key Recommendations: Extend carbon reduction targets to incorporate other direct and indirect sources of emissions e.g. refrigerants, transport, waste, (establish baseline data and monitoring systems)

8.2 ENERGY GENERATION

8.2.1 GRID ELECTRICITY

Environmental Impact	The actual source of energy from the grid (it may be from thermal, hydro, nuclear, renewable etc.) is not known. Energy generation requires legislation, codes of practice and use of hazardous material (such as radioactive material) at large capacity sources. It uses natural non-renewable resources such as fossil fuels and creates resultant emissions to air e.g. CO ₂ .
Existing management	<p>Metering system linked to BMS in place for recording import and export of electrical energy. The energy import from grid is currently regular and quantifiable.</p> <p>Installation of the Biomass CHP system (currently in construction) will greatly reduce or eliminate any import of electricity from the National Grid and related carbon emissions.</p>

	UEA's current electricity supplier is N Power who have a number of green business tariffs (http://www.npower.com/web/At_home/index.htm). Electricity supply contracts are arranged by Mel Pascoe, Energy Manager (EST). Importing grid electricity from a power generator that uses renewable sources can provide an opportunity for carbon reductions.
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Key Recommendations: Aim to eliminate the use of grid electricity on campus through reduction in demand and the further development of renewable sources of generation on site. Minimize any residual need by sourcing grid electricity from a renewables supplier.

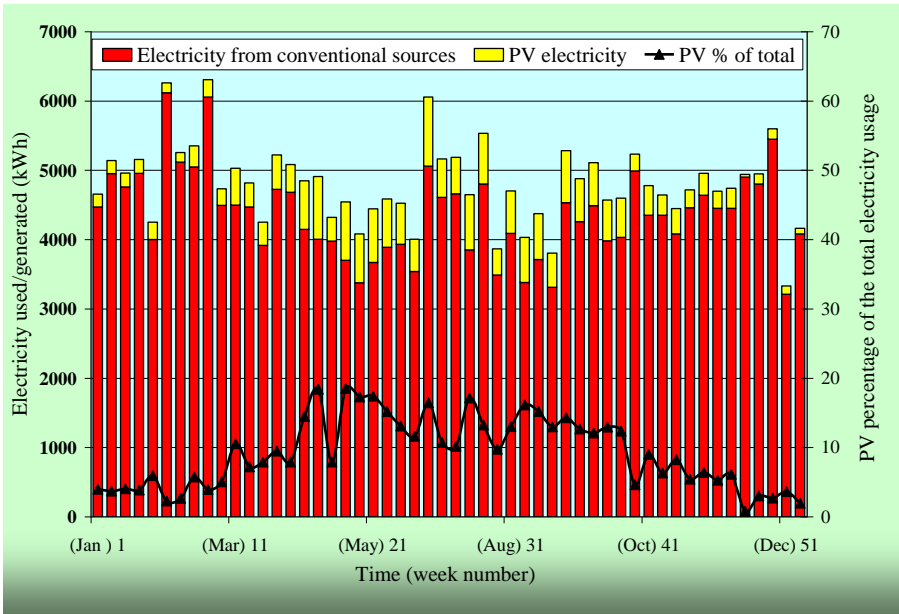
8.2.2 CHP PLANT OPERATION

Environmental Impact	Non-renewable resource depletion (gas use), emissions to air contributing to global warming e.g. CO ₂ , noise
Existing management	<p>Department of Estates and Building (EST) are responsible for managing CHP operation, overseen by the Energy Manager, Mel Pascoe (EST). Overall system efficiency is 86% (electricity-36% and heat- 50%) which means that it is a "good quality" CHP system leading to exemption from CCL. The system consists of three gas engines (each 1MW electrical capacity) powered by natural gas, and has been operational since February 1999. Detailed performance data is available from the Buildings Management System (BMS), and Stark monitoring and targeting system:</p> <ul style="list-style-type: none"> • Energy output metering in place for each engine. • Fuel consumption metering • Performance monitoring (in terms of fuel consumption per unit of energy and waste heat recovery) • Monthly data management on generation and consumption of energy, however, data are complex. • Efficient maintenance and back-up system to ensure uninterrupted energy supply. Records for engine servicing are available. • Emissions from gas engines are not monitored. Hence, no record of emissions is available. However, CO₂ emissions are calculated according to DEFRA (2007) emission factors. <p>There are no codes of practice or legislation for smaller capacity CHP plant (<50MW).</p> <p>The system, so far has been very effective in carbon reductions and reducing dependency on grid for energy needs simultaneously diverting a proportion of generated energy to the grid. However, use of renewable source of energy and reducing energy consumption through further monitoring and energy management will provide additional opportunity in the areas of carbon reductions, demand reduction and purchasing efficiency e.g.</p> <ul style="list-style-type: none"> • Emission monitoring at certain intervals, if not continuous (although it might be assumed that emission magnitudes may not be large owing to the fact that the

	<p>system operates with high efficiency on natural gas which is relatively 'clean'. Monitoring will help gather primary data in turn providing a sound basis for comparison with targeted reductions in emissions.</p> <ul style="list-style-type: none"> • Data on consumption pattern of energy from CHP needs to be recorded more comprehensively i.e. it can be done by facility (within campus and off-campus). This will help identify areas of concern in terms of electrical load. Following this, the plans and measures for reducing energy consumption can be devised ultimately leading to carbon reduction. • Data management requires simple formats for data capture and analysis as current format is technical and complex.
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Key Recommendations: Review the current BMS and Stark Datalogger performance data and establish appropriate monitoring systems where possible.

8.2.3 SPV (SOLAR PHOTOVOLTAIC) SYSTEM OPERATION

Environmental Impact	A renewable source of electricity generation, reducing the dependency and depletion of natural resources.
Existing management	<p>The generation of 34kW electricity (installed capacity) from photovoltaic cells on the side and roof of the ZICER building, used primarily to power computers inside the building. Management of the solar energy generation is undertaken using the UEA's Building Management System (BMS) software. Examples of the energy generated are shown in Figure E2 below.</p> <p>Table E2 SPV operation (created by N.K. Tovey, ENV).</p>  <p>However, access and collection of the data can be tricky due to the large quantity</p>

	<p>input in real time into the BMS system. Keith Tovey (ENV) notes that analysis of this data can be very time consuming and therefore, needs further improvements in all data analysis aspects.</p> <p>The system was expensive to install and the panels are difficult to repair once damaged.</p>
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8.2.4 BIOMASS GASIFICATION PLANT_(CURRENTLY IN CONSTRUCTION)

Environmental Impact	<p>Emissions to air from combustion and transport of woodchips</p> <p>Production of bio-char (can be used as fertilizer on the very forests which produce the timber)</p>
Existing management	<p>The UEA will benefit from the generation of approximately 1.4MW electrical power and 2MW thermal energy generated from a forestry fuel sourced within a radius 50km from the UEA. The new biomass plant, aims to reduce carbon emissions by 34% after two years of operation.</p> <p>The biomass CHP (expected to be operational within 2009), shares some of its operational aspects with the existing natural gas operated CHP. However, the two systems differ in the raw material used for energy generation i.e. biomass is a renewable source of energy. In terms of emissions to air, it provides significant opportunities for carbon reductions and for reducing reliance for energy on the existing CHP and grid, thereby increasing purchasing efficiency as a result of demand reduction in generation.</p> <p>The project is high profile within the sector and more generally, and whilst impressive, it is important to ensure the credibility of claims made with regard to carbon reductions.</p> <p>No formal procedures have been provided with regard to the management of the future biomass CHP plant. For example the contractors of the wood fuel have not yet been agreed and the (re)use of the bio-char waste from the production of energy has not been confirmed due to unknown benefits of bio-char market.</p> <p>The existing/primary management of the plant is being handled via the Estates and Buildings Division (EST).</p>

Key Recommendations: The collection and recording of data and how it will be monitored is essential to auditing the success of the plant. Plant management regarding energy generation and fuel consumption should be clearly identified to assess performance.

8.2.5 BOILER OPERATION

Environmental Impact	Resource depletion (fossil fuels, water), emission to air e.g. CO ₂ , visual impact (chimney). Potential for contamination of land and controlled waters through oil storage. Transport costs (carbon and other environmental as well as financial) of oil delivery (and disposal).
Existing management	<p>A number of boilers are used on site; back-up boilers in EST and heating in Earlham Hall and Blackdale Annex. EST is responsible for managing all boiler operation.</p> <p>Fuel (oil) consumption metering in place, but data is sporadic: Collected via deliveries. Thermal efficiency is relatively low in comparison to other forms of energy generation on site.</p> <p>Primary emissions data from the boilers is not monitored. However, direct CO₂ emissions are calculated according to DEFRA (2007) emission factors (emissions of between 60-130 tonnes of carbon per annum have been calculated for the Earlham Hall and Blackdale Annex boilers). The thermal energy input-output of the back-up boilers is quantifiable and significant but the regularity of operation is infrequent as it acts as a back-up system for the CHP.</p> <p>The opportunity to replace the boilers in Earlham Hall and Blackdale Annex is limited due to the age and nature of the buildings. Engaging staff in these buildings in energy efficiency will reduce reliance on the boilers and would establish e.g. monitoring and control of space heating.</p> <p>See also oil storage (section 12)</p>

Key Recommendations: Monitor, record and manage oil consumption for boilers. Review renewable alternatives to boiler use and focus energy efficiency campaigns in Earlham Hall and Blackdale Annex.

8.3 ENERGY CONSUMPTION

8.3.1 ELECTRICITY

Environmental Impact	Non-renewable resource depletion (fossil fuels), emissions to air contributing to global warming e.g. CO ₂ , noise. Impacts as for grid electricity.
Existing management	The Estates and Buildings Division (EST) are responsible for monitoring and managing electricity consumption. Consumption of energy for heating/cooling and electricity at the UEA could be substantially reduced if the consumption patterns are carefully monitored, recorded, analyzed and managed accordingly. Electricity consumption data according to the type of application need to be managed in order to determine the scope for potential energy savings. Current data includes:

	<ul style="list-style-type: none"> • Energy meters are installed in all major buildings. Sub-meters are being installed in energy intensive areas. All data is currently being input into the BMS and STARK monitoring and targeting system, to ensure compliance with Display Energy Certificates (DECs). • Data available for consumption of electricity (in kWh) for campus and off-campus use on monthly basis. • No data for consumption pattern i.e. lighting, heating, audio-visual and other applications such as lift operation, automated systems such as doors etc. • Energy efficiency measures are taken for example installation of energy efficient electrical appliances. • Heating and cooling guidance available on EST website but not user friendly or promoted (http://www.uea.ac.uk/Estates/energy/heating%26cooling) • 2121 jobdone@uea.ac.uk established to encourage staff to report faults, heating/cooling problems etc. The effectiveness of this requires assessment. <p>Energy awareness programs amongst staff and students have been implemented (see appendix 3A). However, the impacts of such programs need to be measured and quantified in terms of energy savings. Schemes such as Energy Action Day and Student Switch off are well established.</p> <p>A proposal developed in conjunction with the Low Carbon Innovation Centre³⁷ to provide 'Carbon Coaches' training to 10% of staff with the aim of promoting, implementing and evaluating UEA's corporate commitments to carbon reduction, and more broadly sustainability, is currently being considered by the Sustainability Group.</p> <p>The Sustainable ICT Service Provision (SISP) project (http://www.uea.ac.uk/is/sustainable-ict). Funded by JISC as part of the Institutional Innovation Programme, aims to determine the sustainability of current UEA ICT services in terms of the energy consumption and CO₂ emissions, and to investigate and implement strategies by which the sustainability can be significantly improved in a cost effective manner without unduly compromising services and allowing planned ICT service enhancement programmes to continue. SISP has the deliverables listed below as intended products:</p> <ol style="list-style-type: none"> 1. Guidelines for sustainable ICT Services in higher education. 2. A business case for a UEA hosted regional HE/FE data centre to further benefit from location and low carbon power generation 3. Reviewed ICT policies for sustainable practices at UEA. <p>SISP updates are available at: http://www.uea.ac.uk/is/sustainable-ict/newsevents</p>
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Key Recommendations: Develop and implement a coordinated, long term strategy for reduction in electricity consumption (in conjunction with or as part of, the stakeholder engagement strategy)

³⁷ www.cred-uk.org, www.carbon-connections.org.uk

8.3.2 GAS

Environmental Impact	Non-renewable resource depletion (gas use), emissions to air contributing to global warming e.g. CO ₂																																																								
Existing management	<p>Responsibility of EST. No separate monitoring is undertaken for gas use beyond metering at DEV farm, NAM and the UEA Village. Table E2 identifies a range of gas consumers on campus. Gas is also used for catering in the Sainsbury Centre and ZEST. A small amount is also used in Labs.</p> <p>Table E2. Consumers of Gas for Hot Water, Heating and Drying on Campus</p> <table><tr><th>Location</th><th>Heating</th><th>Hot Water</th><th>Drying</th></tr><tr><td>Queens Building</td><td>X</td><td>X</td><td></td></tr><tr><td>Elizabeth Fry</td><td>X</td><td>X</td><td></td></tr><tr><td>OPT (Queens Building)</td><td>X</td><td>X</td><td></td></tr><tr><td>MED ED 1</td><td>X</td><td>X</td><td></td></tr><tr><td>MED ED 2</td><td>X</td><td>X</td><td></td></tr><tr><td>Security Lodge</td><td>X</td><td>X</td><td></td></tr><tr><td>DEV Farm/BIO greenhouse</td><td>X</td><td>X</td><td></td></tr><tr><td>Constable Terrace</td><td></td><td>X</td><td></td></tr><tr><td>NAM</td><td>X</td><td>X</td><td></td></tr><tr><td>UEA Village</td><td>X</td><td>X</td><td></td></tr><tr><td>Village laundrette</td><td></td><td></td><td>X</td></tr><tr><td>The Street laundrette</td><td></td><td></td><td>X</td></tr><tr><td>Health and Community Centre laundrette</td><td></td><td></td><td>X</td></tr></table>	Location	Heating	Hot Water	Drying	Queens Building	X	X		Elizabeth Fry	X	X		OPT (Queens Building)	X	X		MED ED 1	X	X		MED ED 2	X	X		Security Lodge	X	X		DEV Farm/BIO greenhouse	X	X		Constable Terrace		X		NAM	X	X		UEA Village	X	X		Village laundrette			X	The Street laundrette			X	Health and Community Centre laundrette			X
Location	Heating	Hot Water	Drying																																																						
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Security Lodge	X	X																																																							
DEV Farm/BIO greenhouse	X	X																																																							
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UEA Village	X	X																																																							
Village laundrette			X																																																						
The Street laundrette			X																																																						
Health and Community Centre laundrette			X																																																						

8.4 OTHER EMISSIONS TO AIR

8.4.1 LABORATORY EMISSIONS

Environmental Impact	Laboratory emissions and the storage of chemicals could represent hazards e.g. improper disposal of chemicals harmful to surrounding environmental receptors.
Existing management	<p>COSHH and RA forms are filled in for 'hazardous' chemicals (see appendix 5). These are reviewed in the annual Health and Safety Audit undertaken by the safety committee of each school. Chemical purchasing procedures are discussed in section 9.2.2.</p> <p>Technical staff undergo basic Health and Safety training on top of initial competence to undertake their jobs. Laboratory managers ensure that the safety of lab users by ensuring that safety regulations are read. They state that once chemicals are within the fume cupboards it becomes the responsibility of the Estates department (EST).</p>

	<p>Lab managers were unsure whether any equipment was in place to clean up the emissions. EST explained that fans diluted the emissions before they were vented. EST would expect to be notified if new hazardous activities were undertaken so as to install further measures (e.g. Biomedical Research Centre have HEPA filters to clean emissions).</p> <p>Use of 'best practicable means' to prevent emission of noxious or offensive substances. Depending on age, fume cupboards are built and fitted in compliance with BS 7258:1994 or BS EN 14175:2003. Equipment is examined at least every 14 months and records kept for 5 years. If fume cupboards deal with radioactive substances they must have a filter and labelled as such. If work involves reactive materials which can damage pipework and the cupboard itself, then cascading water over the airflow outlet should be fitted; and the fume cupboard labelled 'Scrubbed Fume Cupboard'.</p> <p>No monitoring of emissions is undertaken. EST and laboratory managers assume that they would be notified by the Environment Agency if emissions breach regulatory limits. There is also currently no system in place to record spills unless they are potentially damaging to health.</p> <p>Carol Boags gave details of an uncontrolled release over the summer: a bottle of thiol was placed in a fume cupboard following a spillage resulting in a smell of gas across Norwich. Although in this case not harmful to health in such concentrations, there is a possibility that chemical emissions can reduce air quality and remain within legal limits.</p>
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Key Recommendations: Routine audits of safety regulations, risk assessment and COSHH procedures to determine whether they are adequate and being adhered to. HAZOP study to determine possible pollution scenarios.

8.4.2 HEATING, VENTILLATION, AIR CONDITIONING

Environmental Impact	Ozone depletion and global warming potential
Existing management	<p>The heating for the main UEA plain is via the district heating system which is running at a high efficiency (see section 8.2.2). Sites off the main campus have their own heating systems mainly gas boilers (see section 8.2.5) and some with electric storage heaters.</p> <p>The efficiency of space heating and air-conditioning can be improved by following good practice approach. Consumption varies seasonally from low to high in summers and winters respectively. Carbon reduction opportunities can be identified through adjusting the heating temperatures, automatic control and avoiding heat wastage by adequate monitoring system.</p> <p>Several ozone-depleting chemicals with significant global warming potential are used on site for the refrigeration system. These are topped up periodically by</p>

Estates staff and subcontractors and are part of PPM system. Data on releases and carbon emissions are illustrated in table E3. These figures (collated from purchase orders from EST Finance Office) suggest that refrigerants could contribute an additional 0.5% of direct carbon emissions.

Consultants undertake audits of refrigerant equipment on site, and are currently developing an asset register (to meet requirements of the Energy Performance in Buildings Directive). Keeping appropriate records on e.g. how much was used, which apparatus was refilled and the date it was refilled, will assist in maintaining equipment and reporting on carbon emissions.

A replacement regime has been established: a main aim/strategy to put equipment on the district system where possible (pers comm. M Newton, April 2009), but implementation is restricted by availability of resources.

Table E3. Carbon Emissions from Refrigerants

Date	Refrigerant	Amount Kg	Conversion factor CO ₂ (eq)	Kg CO ₂
10.01.08	R134a	6	1300	7800
14.02.08	R407c	9	1526	13734
31.03.08	R404a	9	3260	29340
6.05.08	R22	28	n/a	see note
18.07.08	R404a	9	3260	29340
31.07.08	R407c	27	1526	41202
TOTAL (kg)				121416
TOTAL (tonnes)				121.416

Note: HCFC therefore omitted from calculations

Key Recommendations: Improve resourcing for phase-out of ozone-depleting refrigerants. Consideration of GWP when procuring new refrigeration equipment. Maintain a record of refrigerants linked to asset register

8.4.3 SWIMMING POOL CHLORINATION

Environmental Impact	Chlorine gas: toxic to humans and animals by inhalation; irritating to eyes, respiratory system and skin; toxic to aquatic organisms; acid rain; ozone layer depletion.
Existing management	<p>The Sportspark's 50 metre pool operates with a physical ultra violet water treatment system and a minimal chemical chlorine gas system to give some residual bacterial kill in the water. This is done to give the best water quality for professional swimmers who may be in the water for considerable periods.</p> <p>Chlorine gas used to chlorinate the water continuously. Two K-sized bottles stored at the Sportspark within a sealed room containing an alarm to detect leaks. These tend to last 2-3 weeks. The system operates under a vacuum to draw the gas direct from the bottles so reducing pipework under pressure with chlorine gas. The room has been specifically designed in that it is sealed; has a gas detection system with alarm</p>

	<p>to reception and automatic water sprays to neutralise any gas release.</p> <p>Bottle changing has a procedure involving two members of staff both with breathing apparatus to reduce any potential risk and the trained delivery personnel. Appropriate PPE worn during bottle change. Alarm tested twice annually by the supplier.</p> <p>A review is currently under way of the safety procedures including the risk from terrorist action.</p>
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9. PROCUREMENT

9.1 ISSUE OVERVIEW

Introduction	<p>The total non-pay spend in the English higher education sector is £4 billion per annum. Procurement decisions about works, goods and services affect the rate of consumption of resources, and the productivity of resources, as well as influencing the social and environmental impact of institutions and companies in the supply chain. (HEFCE 2005/28)</p> <p>The procurement of goods and services are directly linked to the production of waste and therefore need to be considered in an integrated way to ensure purchasing can contribute effectively to waste minimisation and legal compliance in relation to waste management. Transport impacts can also be joined up.</p> <p>Other impacts from purchasing are external to the campus but often have implications around the globe. Taking a life cycle approach this may include deforestation/river pollution/ gaseous emissions (e.g. carbon), all of which may also indirectly affect landscapes and biodiversity. As such, applying sustainable purchasing practices presents an opportunity to achieve significant environmental performance improvement, and related cost savings through improved efficiencies.</p> <p>The assessment of carbon emissions from procurement activities is complex and any assessment should reflect the uncertainties associated with carbon analysis in a realistic way: These are quite variable and practical solutions for improving data quality are needed (see also section 12 on water footprinting).</p> <p>The Environmental Association for Universities and Colleges (EAUC) Initiated a Sustainable procurement project supported by the Environmental Action Fund (EAF) in 2005, and from this provides guidance and best practice for HEIs implementing sustainable procurement (http://www.eauc.org.uk/sustainable_procurement1).</p> <p>The guidance provided includes a list of example policies (see http://www.eauc.org.uk/example_policies_strategies)</p>
Baseline Environment	<p>Although commitments to implement sustainable purchasing are made within the UEA environmental Policy, UEA does not engage with its suppliers on sustainability in any systematic way. There are however, individual examples where environmental issues have been key to the appointment of suppliers:</p>

- Waste Disposal – recycling criteria are key
- PC Purchase - recycling of old kit and re-use of packaging
<https://intranet.uea.ac.uk/is/pc-dispose>
- Achieved Fairtrade status (Feb 2009)

The Procurement Policy (<https://intranet.uea.ac.uk/fin/purchasing/procpolicy>) is however, currently being reviewed to include sustainability as one of its core objectives. This will be used as the basis of a number of guidelines relating to individual products and services. Future action is likely to be focused on products supplied by preferred suppliers or following a tender exercise for major purchases (over £20,000). Once the policy is in place “the practice will follow, depending on available resources and support from senior management and budget-holders” (pers. comm. Steve Boardman, April 2009). Purchasing policies also exist within individual Schools and there needs to be definite leadership and coordination of this if effective change management is to be achieved in purchasing practice.

The Southern University purchasing Consortium (of which UEA is a member) has a sustainable procurement policy which it uses to influence its purchases and those it purchases from (<http://supc.procureweb.ac.uk/aboutsupc/aboutus>) influencing the development of this should be a priority.

The Union of UEA Students has its own sustainable purchasing policy and procedures, and performed well in this category in the NUS Sound Environmental Impact Awards (2008/9). Other tenants should be made aware of UEA’s own policy.

Steve Boardman is UEA’s Procurement Manager, Finance Division (FIN) with overall responsibility for expenditure at UEA. Every faculty holds a budget and they oversee procurement expenditure for each one of their schools. The schools order goods from UEA preferred suppliers, either from a recommended list issued by the Southern Universities Purchasing Consortium (SUPC) or from individual suppliers that have negotiated with UEA. For specialist items or services, schools may source these themselves. Purchases over £5000 require 3 quotes, whilst purchases over £ 20,000 are required to be put out to tender by consulting the Purchasing Office.

The authority to commit expenditure is delegated to an extensive number of Heads of Spending Units who may then nominate Authorised Signatories to sign Purchase Orders on behalf of the University.

Most buyers use Preferred Suppliers (<https://intranet.uea.ac.uk/fin/purchasing/useprefsupps>) wherever practical ensuring not only that they are getting value for money, but also comply with the EU Procurement Directive. See also buyers guide:

<https://intranet.uea.ac.uk/fin/purchasing#BuyersGuide>

Preferred suppliers are monitored for use, compliance with tendering procedures, and quality of product and service (from user feedback).

In the financial year to 31st July 2008, the University and subsidiaries’ non-pay spend was £50.8m, with a further £7.3m on capital expenditure. During 2007/08, 28,700 purchase orders were raised with almost 3000 different suppliers. The areas in which expenditure are greatest are:

- Buildings and maintenance (see section 6)

- Electricity (see section 8)
- Computer equipment and software (see section 8.3)
- Laptop equipment and consumables
- Consultancy (other than buildings)
- Books and journals

The main spending departments are:

- Estates
 - new buildings and refurbishments
 - facilities management and maintenance
- Catering
- Accommodation
- SCI Faculty

Tables P1 and P2 list the key suppliers identified by FIN as a focus for action for assessing supplier environmental credentials. Specific products also identified by FIN as having significant environmental impacts and potential for significant improvement are; refrigerators/freezers, paper, water coolers, desktop printers.

Table P1. Top 10 Suppliers by Spend (2008/9)

Supplier	Category
Dell Computer Corporation	Desktop computers
EBSCO Information Services	Journals
Total Gas and Power Ltd.	Electricity
Tectrade Computers Ltd.	Network equipment
ICM Computer Systems	Computer components
Coutts Information Services (UK) Ltd.	Books
Fisher Scientific UK Ltd.	Laboratory consumables
Brake Bros. Foodservice Ltd.	Groceries
Computaform	Computer components
Snelling Business Systems Ltd.	Audio Visual equipment

Table P2. Top 10 Suppliers by Number of Orders (2008/9)

Supplier	Category
Fisher Scientific UK Ltd.	Laboratory chemicals
Sigma-Aldrich Co. Ltd.	Laboratory consumables
Students Union Services (E Anglia) Ltd.	Travel Agents
Office Depot UK Ltd.	Stationery
Brake Bros. Foodservice Ltd.	Groceries
Coutts Information Services (UK) Ltd.	Books
BOC Ltd.	Laboratory gases
Edmundson Electrical	Electrical components
Accent fresh Ltd.	Green grocers
Vodafone Ltd. (Corporate)	Mobile phone calls

The data available on suppliers by spend and by deliveries, could provide proxy measurements for a carbon emissions assessment, however estimates will be required and the accuracy of these is likely to be poor.

Legislation, codes of practice etc.	<p>EU Procurement Directive: https://intranet.uea.ac.uk/fin/purchasing/euprocdirects</p> <p>The Utilities Contracts Regulations 2006 (SI 2006 No 6): stems from the EU directive that compels organisations to put out to tender major contracts (over £140,000) within the EU.</p> <p>COSHH (Control of Substances Hazardous to Health)</p> <p>The Dangerous Substances and Explosive Atmospheres Regulations 2002.</p> <p>See also section 10</p>
Environmental Aspects	<ul style="list-style-type: none"> • General Procurement: Materials and Subcontractors e.g. <ul style="list-style-type: none"> • EEE Purchasing • Chemical Purchasing • Paper Purchasing • Development & Refurbishments Purchasing (see section 6)

Key Recommendations: Review procurement policy and procedures to embed environmental criteria into procurement processes, specifically establishing ways of monitoring and reducing the carbon and water footprints, and biodiversity impact of purchasing decisions. Develop and implement staff training and auditing to ensure procedures are complied with.

9.2 GENERAL PROCUREMENT: MATERIALS AND SUBCONTRACTORS

9.2.1 EEE PURCHASING

Environmental Impact	<p>Global warming</p> <p>Ozone Depletion</p> <p>Use of non-renewable resources</p> <p>Land and water contamination</p>
Existing management	<p>Purchasing of Computer equipment in UEA is undertaken centrally by UEA Finance Division, Procurement Unit. Purchasing guidance is available on the UEA website and intranet e.g:</p> <ul style="list-style-type: none"> • Buyer guides https://intranet.uea.ac.uk/fin/buyersguide/desktopcomputers: provides information relevant to purchase of IT equipment/software, including details of preferred suppliers name and contact points etc. • Recommendations for IT hardware https://intranet.uea.ac.uk/is/itpurchase/ithwrecs : provides detailed specifications and purchasing routes for IT equipment. • Students (https://intranet.uea.ac.uk/is/itpurchase/stupurchase) <p>This guidance does not include specific considerations for environmental impacts beyond basic energy saving features. SISP will inform the development of purchasing practice in this area.</p>

Key Recommendation: Integrate environmental considerations into EEE buyers guides and related information/training, informed by the findings of SISP

9.2.2 CHEMICAL PURCHASING

Environmental Impact	<p>Production of leachate, contamination to ground and/or surface water</p> <p>Global warming, Ozone Depletion, Eutrophication</p> <p>Loss of biodiversity, Non-renewable resource use</p>
Existing management	<p>There are no central rules on procurement, but the UEA Safety Services intranet site has a numbers of relevant documents (https://intranet.uea.ac.uk/uss/intranet).</p> <p>All the chemical procurement activity in UEA is handled by Ian P. Twaite (the BIO laboratory and SCI store manager), and is based on Risk Assessment complying with HSE regulations, such as: COSHH (Control of Substances Hazardous to Health), and The Dangerous Substances and Explosive Atmospheres Regulations 2002.</p> <p>All researchers, students or labs in UEA who want to purchase chemical substances are required to complete a COSHH form (see appendix 5). Questions asked include: how will the chemicals be disposed of after use, and what emergency procedures are required. If they cannot provide satisfactory answers, the lecturer or lab technician will interview them first and provide the appropriate information. Furthermore, if a school thinks they cannot handle the chemical waste disposal properly e.g. because it is too dangerous or hazardous, the school will not proceed with the purchase and ask the researchers/students/labs to find alternatives. The COSHH forms are assessed by Ian and the UEA safety inspector (two assessors).</p> <p>The researchers, students or labs give their internal requisition order to Ian, if they want to buy common chemicals, such as: salt, trace or buffer that is generally available in the SCI Store (SCI Store only has and sells the common chemicals that are often used in labs). Ian will collect all the orders, usually 10-20 orders per day, and then compile it as one main order to the company(s). The company will send the chemicals directly to the SCI store and the invoice will be charged to the financial office of the appropriate SCI School. If they want to buy chemicals that are not available in SCI store, they send their external requisition order directly to the finance office of the relevant SCI School. The SCI store will also send external requisition orders if they want to buy a particular chemical substance in a small amount.</p> <p>Data on chemical purchasing is vast and complex and is not regularly monitored. It is however used when tender or contract with companies/suppliers is required. This data has the potential to link with hazardous waste disposal controls (see section 10.3)</p>

Key Recommendation: Establish effective monitoring of chemical procurement

9.2.3 PAPER PURCHASING

Environmental Impact	Global warming, Ozone Depletion, Eutrophication, Deforestation, Loss of biodiversity
Existing management	<p>The University has a contract with Premier Paper for Bulk Copier Paper (such as the library, print room etc.) which will order from these by the pallet load (approx 64 boxes of paper). They will sometimes sell these on to the schools. If a faculty only requires a few boxes. The preferred supplier is Office Depot using the Office Depot on-line facility as per the UEA Purchasing policy:</p> <p>https://intranet.uea.ac.uk/fin/buyersguide/stationery</p> <p>An attempt to introduce recycled paper across campus several years ago ended in failure as staff objected, saying the new paper jammed in the photocopiers (pers. comm. Steve Boardman, April 2009).</p> <p>Bournemouth University successfully introduced recycled paper in 2006, achieved on a cost neutral basis:</p> <p>http://www.wrap.org.uk/businesses/using_recycled_paper/case_studies/bournemouth.html</p>

Key Recommendation: Integrate environmental considerations into stationary buyers guide and related information/training, informed by stakeholder consultation.

10. SOLID WASTE

10.1 ISSUE OVERVIEW

Introduction	<p>Waste management issues are being prioritized by HEIs according to three significant factors:</p> <ul style="list-style-type: none"> • Environmental best practice • Economic efficiency • Compliance with legislation <p>The contribution that waste disposal makes towards a university's overall environmental impact is becoming more widely recognised³⁸. Coupled with an ever increasing cocktail of regulations and increasing costs for waste disposal, efficient waste management is an essential function of a HEI.</p>
Baseline Environment	Waste management is currently the responsibility of Janice Bone (Deputy Director of Waste and Recycling, Residences and Services Division). Janice is leaving UEA in July when responsibility will pass to Martyn Newton in EST.

³⁸ EUAC <http://www.eauc.org.uk/home>

	<p>Waste management policy statements have been developed in line with overall UEA commitments, see https://intranet.uea.ac.uk/cleaning/environmental</p> <p>Work is undertaken with procurement to ensure minimum waste is brought in, resulting in minimum waste being disposed of. This tends to be done with specific, larger scale purchases e.g. computers. Janice stated that she does consider carbon footprint where possible and turned down a contractor on the basis that waste would be transported to Scotland, rather than to be dealt with locally, but there is no formal mechanism for this type of decision making.</p> <p>Table S1. Waste Disposal at UEA</p> <table><tr><th>Waste Mass (tonnes)</th><th>2004 – 05</th><th>2005 – 06</th><th>2006 – 07</th><th>2007 - 08 (Dec - Nov)</th></tr><tr><td>Recycled</td><td>790</td><td>5253</td><td>5877</td><td>3539.2</td></tr><tr><td>Incineration</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>Other Methods (landfill)</td><td>1388</td><td>3897</td><td>3974</td><td>1786.4</td></tr><tr><td>Total</td><td>2178</td><td>9851</td><td>9851</td><td>5325.6</td></tr></table> <p>The waste disposal figures shown in table S1 have been provided by the waste management contractor (NEWS). The way in which these figures have been collected has changed over time and this data cannot be used to identify trends. If waste management is to be effectively incorporated into the carbon reduction strategy, robust data needs to be made available. Further investigation is required on data on waste such as hazardous (from each school) and WEEE (from individual projects dealt with by contractors).</p> <p>Students leave behind a large quantity of waste, including items in good order at the end of semester.</p> <p>General waste collection is contracted on a 5 year basis and is currently up for renewal with the aim of introducing a composting scheme. This has however been deferred for approximately 6 months due to the lack of capability at present (pers. comm. J Bone, April 2009).</p> <p>Legal obligations are dealt with by the waste contractor. Duty of Care Documentation is also dealt with by them. UEA holds a hazardous waste number as required by The Hazardous Waste Regs 2005. All documentation is kept together in a standard filing system for a period of 7 years (as required by law) before disposal.</p> <p>Waste contractor audits are undertaken (e.g. Laura Spawls 29/8/2008) but the training of personnel undertaking this task is not known. UEA's Duty of Care documentation should be checked during these audits.</p>	Waste Mass (tonnes)	2004 – 05	2005 – 06	2006 – 07	2007 - 08 (Dec - Nov)	Recycled	790	5253	5877	3539.2	Incineration	0	0	0	0	Other Methods (landfill)	1388	3897	3974	1786.4	Total	2178	9851	9851	5325.6
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Total	2178	9851	9851	5325.6																						
Legislation, codes of practice etc.	<ul style="list-style-type: none">• Duty of Care: review compliance documentation held with contractor• The EU Landfill Directive 1999/31/EC sets demanding targets to reduce the amount of biodegradable municipal landfilled. For meeting these targets, the UK government has implemented the Landfill Tax (Amendment) Regulations 2008 and the Landfill Allowances and Trading Scheme 2007/08.• Packaging and Packaging Waste Directive 94/62/EC sets targets for reductions in the amount of packaging used, recovery and recycling of the packaging waste. Thus, all sections of society, including the HEI sector, will																									

	<p>have to look very carefully at the amounts of waste they produce and the ways in which they deal with it. UEA should find a suitable waste management system which can prevent the generation of waste based on the “waste hierarchy” through 3Rs: reduce, reuse and recycle.</p> <ul style="list-style-type: none"> • The hazardous waste is subject to the EU Council Directive 91/689/EEC on hazardous waste and SI 2005 No. 894 the Hazardous Waste (England and Wales) Regulations 2005. • WEEE is subject to the Waste Electronic and Electrical Equipment (WEEE) Directive 2002/96/EC and 2003/108/EC, and The Restriction of the use of certain Hazardous Substances in electrical and electronic equipment (RoHS) Directive. • Industry Council for Electronic Equipment Recycling (ICER) knowledge and expertise on WEEE and industry forum http://www.icer.org.uk/ • Guidance from EUAC and HEEPI
Environmental Aspects	<ul style="list-style-type: none"> • General Waste (non-recyclable and recyclable) • Hazardous Waste • WEEE • Recyclable Waste • Biodegradable Waste

Key Recommendation: Establish appropriate data collection, monitoring and auditing. Establish guidelines or tender specification in order to ensure the waste management objectives of UEA are fully addressed

10.2 GENERAL WASTE

Environmental Impact	Emissions to air, land and water due to land filling and other waste disposal practices like incineration. Improper segregation of recyclable waste leads to increased land filling.
Existing management	<p>The UEA campus has two types of bin, blue for landfill, food and glass and green for recycling. On The Street there are no recycling bins, just grey general waste bins. There are three glass recycling bins on campus, in the walkway between storage place and library, one for green and brown glass, one for clear glass, and one for mixed glass. Additionally, there is one more glass recycling bin for mixed glass in front of the pub.</p> <p>In the accommodation, every building has the same bin schemes in the kitchen (a black plastic bag is used for landfill waste and the red plastic bag is used for recyclable waste), apart from the paired room accommodation which only has one grey bin for every kitchen.</p> <p>The Blue bins (Non recyclables) are collected thrice a week while the green bins (recyclable) are collected twice a week. The food waste is also currently collected</p>

	<p>under general waste category.</p> <p>Cleaning staff collect and move all waste</p>
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Key Recommendation: Improve waste segregation facilities in paired unit accommodation and outside areas.

10.3 HAZARDOUS WASTE

Environmental Impact	<p>If accidents happen during hazardous waste deliveries, such as: collision, or in maintaining hazardous, flammable and radioactive chemical waste storage, they can cause leachate, fires or radioactive contamination that can be harmful to the surrounding ecosystems. Leachate can contaminate the ground and surface water which is normally used as the source of water needs for humans, animals and plants.</p>
Existing management	<p>At the moment, all the hazardous waste is handled by VEOLIA. UEA store hazardous waste in several places (see map in appendix 6) in different containers, usually plastics bottles or bags, which are then placed in the secondary containers to avoid any leachates. Veolia collect liquid waste every 6 weeks other types of waste 2-3 times per year e.g. batteries. All of these wastes should be labeled properly and a list is sent to the company. If the company does not recognize the waste characteristics, and therefore how to dispose of it, they will return the list and ask for further information from the school.</p> <p>All hazardous waste is sent to the holding area and then for incineration. Laura Spawls (the Chief Technician of CAP Lab) has undertaken a Duty of Care visit to the incinerator and will undertake a further visit to the holding area in the summer.</p> <p>All hazardous chemicals in UEA are managed centrally by CAP school. Carol Boags is the person responsible. Hazardous waste must not be discharged to drains and it is assumed that until now the students or researchers have complied with this. They are required to know the characteristics of the chemicals that they use by filling out the COSHH form, prior to lab work. Furthermore, chemicals should also be appropriately labeled.</p> <p>Anglia Water monitors the drainage and sewage system on a quarterly basis to check for contamination. There has been no incidence of this to date.</p> <p>Data on hazardous waste arisings and storage on site has not been made available for this study. Data on chemical purchases however may be available (see section 9.2.2)</p>

Key Recommendation: Collate and monitor data on hazardous wastes produced and undertake periodic inspections/audit of storage areas on site.

10.4 WEEE

Environmental Impact	Waste Electronic and Electrical Equipment (WEEE): Batteries, computers, refrigerators. Depletion of non-renewable resources, use of hazardous substances in manufacture. Possible Land and water pollution due to leaching from improper disposal of WEEE
Existing management	<p>Dell provides a managed service for PC procurement which includes a take-back scheme for PCs and monitors. Full PC equipment recycling guidance is provided at: http://www.uea.ac.uk/is/pc-dispose. No data has been made available on the effectiveness of these schemes.</p> <p>Other sources of WEEE are collected by EST and sent for recycling. During semesters WEEE produced in residences is handed over to the housekeeper. Fridges and freezers are recycled but are stored on site (behind EST) until around 16 units can be disposed of. The current contractor is Wincanton (see http://www.wincanton.co.uk/default.asp?Section=SS&Cat2=VES&Cat3=WEE).</p> <p>Tubes and lamps are recycled through a local recycling facility run by Recyclite (http://www.recyclite.co.uk/).</p> <p>Batteries are collected separately in white bins, available mainly in the library and schools' buildings, but these are commonly misused. There is a specific person dealing with used batteries from labs. These are collected by EST and sent for recycling. Improved availability of battery recycling facilities is required specifically in student accommodation, for example the majority of students do not receive sufficient information about how to deal with battery waste and there is no separate bin for students to dispose of them.</p> <p>WEEE guidance is not readily available on the UEA website. General information on waste and waste management provided is confusing with two main web sites containing poorly presented and out of date information: :</p> <ul style="list-style-type: none"> • http://www.uea.ac.uk/Estates/energy/Waste+Management+%26+recycling+ • http://www.uea.ac.uk/cleaning/environmental <p>A significant amount of WEEE is produced from student residences at the end of term, disposal practices for these arisings are not known.</p> <p>Data on WEEE arisings has not been made available. It may be possible to use data from the electrical testing procedure to inform management of WEEE.</p>

Key Recommendations: Improve awareness of WEEE disposal routes/requirements to both staff and students. Monitor and audit WEEE arisings

10.5 RECYCLABLE WASTE

Environmental Impact	<p>Transport and energy use related emissions to air etc. from recycling process</p> <p>Improper segregation of waste leads to increased land filling and resultant emissions</p>
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	of leachate etc. to air, land and water.												
Existing management	<p>Recyclable arisings are predominately cardboard, cans, plastic bottles and paper³⁹.</p> <p>General guidelines are provided on waste disposal practices e.g:</p> <ul style="list-style-type: none"> • http://www.uea.ac.uk/~k297/Recycling.htm • http://www.uea.ac.uk/~k297/RecyclableMaterialsGuide.pdf • http://www.uea.ac.uk/~k297/A%20Quick%20Guide%20to%20Plastics%20and%20their%20Recycling.htm <p>But the website has not been updated since 2004.</p> <p>At present glass is disposed of in the blue bin for landfill (see section 10.2) unless deliberately taken to one of the bottle banks on site. Can and bottles banks are positioned in various locations around the campus (see appendix 6). These are however sparse and should be incorporated into residences, communal areas and The Street.</p> <p>Recycling champions (http://www.uea.ac.uk/~k297/recyclingchampions.htm) located throughout the schools, departments etc on campus were established in 2004. The scheme has however lapsed as can be seen from comments received during this review (see table S2).</p> <p>Table S2. Key Quotes from Participants of the Recycling Champion Scheme (April 2009)</p> <table border="1"> <thead> <tr> <th>School</th><th>Key Quote</th></tr> </thead> <tbody> <tr> <td>BIO</td><td>We were so busy setting up the new office it all just lapsed. Also it wasn't practical to continue</td></tr> <tr> <td>COMM</td><td>I remember one meeting with someone from EST, but that was all</td></tr> <tr> <td>EDU</td><td>I think the only time I met other RCs was when we were all gathered together for a group publicity photo!</td></tr> <tr> <td>ENV</td><td>I don't think it was taken seriously by anyone else and, after an initial burst of enthusiasm and activity it just petered out and wasn't revisited after restructuring which mixed up so many things. The early days of restructuring were so busy and stressful that I'm sure many people, like me, had little appetite for this sort of voluntary add-on job, even if it didn't take up much time.</td></tr> <tr> <td>MTH</td><td>Nobody ever contacted me about anything to do with recycling</td></tr> </tbody> </table> <p>At the schemes height RSD employed a waste supervisor on a part time basis to promote and support the activities related to the waste collection, working closely with recycling champions. Promotion of the scheme was also undertaken e.g. mouse mats with all the details of the scheme were printed for each study bedroom (3500) and posters with the same info positioned in all schools, departments and student accommodation. (undated information from web site: http://www.uea.ac.uk/Estates/energy/Waste+Management+%26+recycling+)</p> <p>Resident tutors advise students in residences on waste management practices when they first arrive.</p> <p>Catering (CAT) produces significant amounts of bottles, packaging and waste cooking oil which have the potential to be recycled. Current practice is not known.</p>	School	Key Quote	BIO	We were so busy setting up the new office it all just lapsed. Also it wasn't practical to continue	COMM	I remember one meeting with someone from EST, but that was all	EDU	I think the only time I met other RCs was when we were all gathered together for a group publicity photo!	ENV	I don't think it was taken seriously by anyone else and, after an initial burst of enthusiasm and activity it just petered out and wasn't revisited after restructuring which mixed up so many things. The early days of restructuring were so busy and stressful that I'm sure many people, like me, had little appetite for this sort of voluntary add-on job, even if it didn't take up much time.	MTH	Nobody ever contacted me about anything to do with recycling
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³⁹ <http://www.uea.ac.uk/Estates/energy/Waste+Management+%26+recycling+>

Key Recommendations: Develop and implement a long term strategy for waste management awareness: Re-instigating and over-hauling the recycling champions scheme. Provide additional glass recycling facilities.

10.6 BIODEGRADABLE WASTE

Environmental Impact	Impacts due to land filling, Emissions from landfill, Impacts due to other waste disposal practices like incineration, Improper segregation of waste leads to increased land filling which is not a sustainable way of waste disposal.
Existing management	<p>The food waste is currently collected under general waste category and sent to landfill.</p> <p>The general waste collection is contracted on a 5 year basis and is currently up for renewal with the aim of introducing a composting scheme. This has however been deferred for approximately 6 months due to the lack of capability at present (pers. comm. J Bone, April 2009).</p>

Key Recommendations: Establish guidelines or tender specification in order to ensure the effective segregation of biodegradable waste for composting.

11. TRANSPORT

11.1 ISSUE OVERVIEW

Introduction	The negative environmental impacts of transport have been realized and paid much attention by government and the general public. Organizations such as universities are challenged by the balance between transport expansion caused by university development and concerns over the environmental impacts of this from stakeholders, legislation and other government strategies. Therefore transport is an important issue related to universities' environmental management and business development.
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	<table><tr><th>Input</th><th></th><th>Output</th></tr><tr><td rowspan="4">Fossil fuel</td><td>Private cars</td><td>CO₂</td></tr><tr><td>Motorcycles</td><td>Hydrocarbon</td></tr><tr><td>Buses</td><td>NOx</td></tr><tr><td>Delivery vehicles</td><td>Particulate matter</td></tr></table>	Input		Output	Fossil fuel	Private cars	CO ₂	Motorcycles	Hydrocarbon	Buses	NOx	Delivery vehicles	Particulate matter																		
Input		Output																													
Fossil fuel	Private cars	CO ₂																													
	Motorcycles	Hydrocarbon																													
	Buses	NOx																													
	Delivery vehicles	Particulate matter																													
Baseline Environment	<p>The UEA campus is situated approximately 3 miles from Norwich city centre, in a edge of town location. Its main entrance 'University Drive' is located on the Watton Road (B1108). A second entrance can be found on Bluebell Road. Both entrances provide access for pedestrians, cyclists, buses and motor vehicles. By 2009 there are around 1700 parking spaces on campus. A map of campus location and parking spaces can be found in Appendix 7.</p> <p>UEA has made commitments to reducing the impacts of transport in its environmental policy (http://www.uea.ac.uk/Estates/energy/Strategic+Operational+Objectives). Dawn Dewar, (EST) is the UEA Transport Coordinator, responsible for implementation of the Green Travel Plan (2002 and updated in 2006) (http://www.uea.ac.uk/polopoly_fs/1.102653!travelplan%20april06.pdf), which aims to “Ease the car parking problems at the University and reduce the University’s environmental impact through a reduction in non-essential car use, achieved by creating opportunities for staff, students and visitors to travel by alternative means of transport to the private car or to travel in ways which reduce the number of one person, one-car commuter journeys”. The Travel Plan (TP) is therefore specifically focused on commuting. A 5 year target of modal shift is also given (see figure T1) based on 1998, 2003 and 2005 travel survey data (see appendix 8) but this is not SMART. The TP makes a commitment to annual audit and reporting e.g. travel surveys, but these have been consistently postponed due to construction or other issues on campus.</p> <p>Figure T1. UEA Commuting Modal Share 5 Year Target from UEA Travel Plan</p> <div><p>Modal Shift 5 Year Targets</p><table><thead><tr><th>Year</th><th>Walk</th><th>Cycle</th><th>Bus</th><th>Other</th><th>Car</th></tr></thead><tbody><tr><td>2002</td><td>30</td><td>15</td><td>14</td><td>3</td><td>38</td></tr><tr><td>2007</td><td>31</td><td>16</td><td>16</td><td>4</td><td>33</td></tr><tr><td>2012</td><td>32</td><td>18</td><td>17</td><td>5</td><td>28</td></tr><tr><td>2017</td><td>34</td><td>19</td><td>18</td><td>6</td><td>23</td></tr></tbody></table></div>	Year	Walk	Cycle	Bus	Other	Car	2002	30	15	14	3	38	2007	31	16	16	4	33	2012	32	18	17	5	28	2017	34	19	18	6	23
Year	Walk	Cycle	Bus	Other	Car																										
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2007	31	16	16	4	33																										
2012	32	18	17	5	28																										
2017	34	19	18	6	23																										

	<p>In order to continually improve performance, additional transport aspects need to be addressed within the TP e.g. fleet vehicles, student travel to and from home.</p> <p>Funding for implementing the TP comes mainly from car parking revenue. This not only constrains the implementation of the objectives of the TP, but also fails to make it a cost saving activity, thus reducing the motivation to implement.</p> <p>Car parking card swipe data is held by ITCS, and visitor parking ticket sales are the responsibility of FIN. There is a need to coordinate information to establish robust monitoring data and performance indicators, if transport is to be effectively included in the Carbon Management Plan.</p> <p>The growing number of students, staff and visitors are challenging the limited number of parking spaces and the quality of life/well being of UEA's stakeholders. UEA needs to balance its wish to reduce its transport impact and its need to carry out its business by organizing its environmental performance effectively. To achieve this increased awareness of the TP and UEAs performance against it is required (see appendix 3a).</p> <p>The UEA transport website (http://www.uea.ac.uk/Estates/transport) has useful content but the design is 'unattractive, uninspiring and outdated'</p>
Legislation, codes of practice etc.	<p>EU: Common Transport Policy (2001, reviewed in 2006) This sets out the priorities for action on transport issues, including environmental aspects.</p> <p>UK: Climate Change Programme 2006 The programme pointed out that In 2004, the transport sector was responsible for around 27 per cent of total UK carbon dioxide emissions. It also addressed the commitment from UK Government to promoting sustainable transport and cutting transport emissions in the medium to longer term, especially business use of transport within organizations.</p> <p>(http://www.defra.gov.uk/environment/climatechange/uk/ukccp/pdf/ukccp06-all.pdf)</p> <p>UK: A New Deal for Transport: Better for Everyone – White Paper This motivates sustainable transport with concern of climate change and air quality, especially “promoting green transport plans for journeys to work, school and other places” at local level.</p> <p>UK: The Future of Transport - White Paper CM 6234 This paper addresses the negative impact of transport on air quality and climate change, as well as the prospect of smart workplace and school travel plan.</p> <p>UK: PPG13 makes a clear regulation on parking spaces (Maximum Parking Standards) in communities, which seeks to balance local development and requirement for car parking, and promotion of alternative transport means. It also gives clear responsibilities and recommendations to local authorities and organizations on promoting public transport, walking, cycling. PPG 13 also makes it clear that car parking charges should be used to encourage the use of alternative modes.</p> <p>UK Department of Transport: Guidance on Reducing Carbon Emission from Business Related Transport of Organizations This guidance addresses the importance of and detailed recommendations on how to manage commuter and business travel, how to manage fleet and how to manage logistics.</p> <p>http://www.dft.gov.uk/pgr/sustainable/businessrelatedtransport</p> <p>Higher Education Funding Council for England: 'All institutions in receipt of capital funding should have plans to reduce carbon emissions, and performance against</p>

	<p>these plans should be a factor in future capital allocations’.</p> <p>Higher Education Carbon Management Programme: Although UEA is not a partner of the Programme yet, ‘given the intellectual leadership role of the sector, the Government, students and academics will expect Universities to lead the drive to cut UK carbon emissions by 80% by 2050. Managing carbon emissions will also enable Universities to successfully navigate forthcoming regulation, including the Carbon Reduction Commitment and the new carbon and sustainability strategy being developed by HEFCE.’ (http://www.carbontrust.co.uk/carbon/publicsector/he/)</p> <p>Norwich Area Transportation Strategy 2006</p> <p>Policy 57: The strategy will seek to address the adverse environmental impacts of traffic (primarily air and noise pollution, and greenhouse gas emissions) in the Norwich area.</p> <p>Policy 59: Cleaner vehicles The Council will work with local authorities to raise awareness of and promote energy efficiency in transport, including the use of sustainable vehicles and fuels, and best practice in relation to fuel efficiency and pollution.</p> <p>HEEPI and EUAC Guidance</p>
Environmental Aspects	<ul style="list-style-type: none"> • Staff and students commuting to their place of work or study • Staff and students travelling off campus for work or study reasons • Visitors travelling to and from campus • Students travelling to and from home • Use of UEA fleet vehicles • Supplier deliveries and collections • Construction vehicles (see section 6)

Key Recommendation: Monitor, evaluate and report on progress of the UEA Travel Plan. Extend the Plan to adequately reflect UEA’s transport impacts

11.2 STAFF AND STUDENTS COMMUTING TO THEIR PLACE OF WORK OR STUDY

Environmental Impact	Private vehicle commuting e.g. car, motorbike emissions to air including CO ₂ . Using public transport vehicles reduces emissions to air etc. per person.
Existing management	<p>The latest commuter survey carried out in 2005 shows the modal share of students and staff in 2005, a comparison with that of 1998 and 2003 is shown in Appendix 8.</p> <p>Through the implementation of the TP a wide range of awareness schemes and incentives have been established e.g.</p> <ul style="list-style-type: none"> • Personal Travel Advisor • Car Share • City Car Club

	<ul style="list-style-type: none"> • Public transport tickets at 70% discount • The Try-Before-You-Buy cycle scheme • Cycle lease back scheme • Cycle health checks • Walking map giving routes and average times <p>(http://www.uea.ac.uk/Estates/transport/Alternatives+to+bringing+your+car+to+UEA)</p> <p>An assessment of the effectiveness of some of these schemes is made in appendix 3a, but no formal review against TP objectives and targets has been undertaken.</p> <p>A recent study (Tovey, 2009) on commuting to campus on weekdays using card swipe information shows that annually, the number of commuting journeys to UEA is round 319896 while the distance travelled is over 13 million km (13050980) and the associated emitted carbon dioxide is 2349 tonnes. (see Appendix 9)</p> <p>The data used in the report is incomplete as there is a lack of data on the use of the inner car park during vacations and at weekends. It has been estimated that this might add a maximum of 10 per cent to the figure (K Tovey).</p>
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Key Recommendation: Agree baseline data and establish monitoring systems allowing carbon reduction targets to be set for commuting

11.3 STAFF AND STUDENTS TRAVELLING OFF CAMPUS FOR WORK OR STUDY

Environmental Impact	Non-renewable resource use, emissions from all transport options e.g. emissions from air travel including CO ₂ .
Existing management	No information available

Key Recommendations: Investigate baseline data availability and monitoring requirements

11.4 VISITORS TRAVELLING TO CAMPUS

Environmental Impact	Private vehicle use e.g. car, motorbike emissions to air including CO ₂ . Using public transport vehicles reduces emissions to air etc. per person.
Existing management	Visiting cars include visitors on school open days, graduations, visiting lectures and speakers and visitors attending meetings or conferences, visits to students by parents

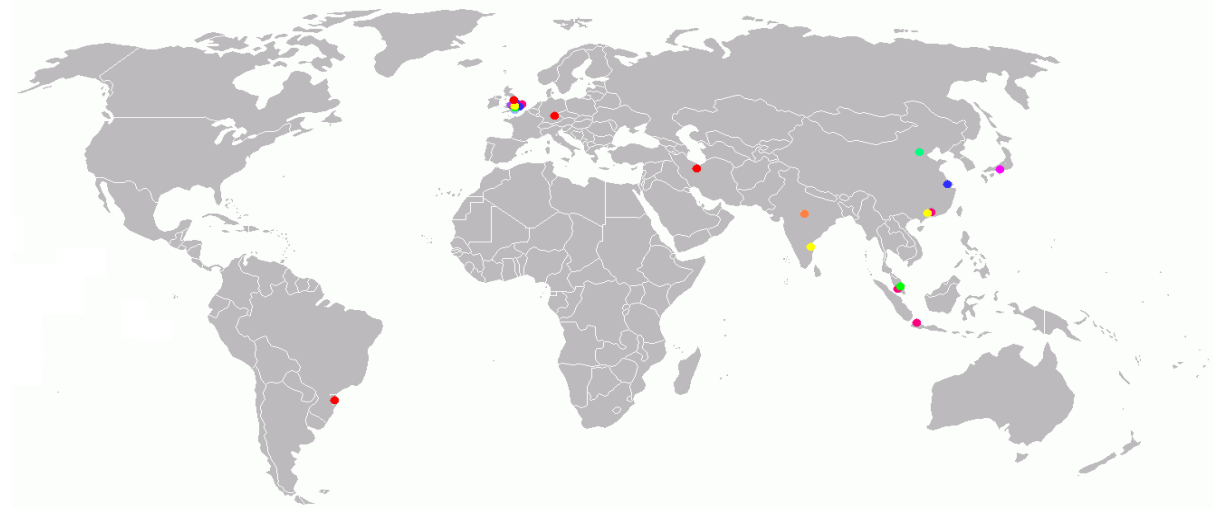
	<p>and friends, visitors to Sainsbury Centre etc.</p> <p>Guidance on visitor parking is provided at:</p> <ul style="list-style-type: none"> • http://www.uea.ac.uk/Estates/transport/Visitor+Parking • http://www.uea.ac.uk/about/gettinghere <p>Travel options are not specifically promoted for specific events e.g. on the open days web site. Management of visitor travel is complex, and there are no known data.</p>
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Key Recommendations: Investigate baseline data availability and monitoring requirements.

11.5 STUDENTS TRAVELLING TO AND FROM HOME

Environmental Impact	Private vehicle use e.g. car, motorbike emissions to air including CO ₂ . Using public transport vehicles reduces emissions to air etc. per person. Emissions to air from air travel, a significant proportion of which will be long haul flights.
Existing management	<p>Approximately 15% of UEA students (2,500) are non-UK residents which indicates the significant contribution to carbon emissions from this aspect.</p> <p>A 'snap shot' survey (see fig E1) undertaken of the 29 students of the ENV-M542 module (2009) illustrates the potential magnitude of the emissions. An estimated total of 27.5tCO₂ from air travel has been estimated: Equating to ~ 0.1% of UEA's annual direct energy CO₂ emissions.</p> <p>https://sustainabletravelinternational.org/documents/op_carboncalcs.html</p>

Figure E1. ENV-M542 2009 Students Home Residencies



Key Recommendation: Investigate baseline data availability and monitoring requirements

11.6 USE OF UEA FLEET VEHICLES

Environmental Impact	Emissions to air including CO ₂ Impacts from refueling and vehicle washing (see section 12)
Existing management	The UEA has 31 fleet vehicles (see appendix 10). Several are electric vehicles including a new pick-up truck used by EST (details awaited). There is however no formal plan to reduce the environmental impact of fleet vehicles overall.

Key Recommendations: Establish baseline data and monitoring procedure setting targets for carbon reduction.

11.7 SUPPLIER DELIVERIES AND COLLECTIONS

Environmental Impact	Emissions to air including CO ₂ . The main vehicles used for delivery may be trucks, van and so on. Emission from these vehicles are generally low efficiency and the frequency of vehicles is high (i.e. many deliveries/collections daily)
Existing management	Data on delivery vehicles is limited. Waste is collected 5 times a week (recyclable and non-recyclable). Hazardous waste production is quite low and is collected separately by contractors when necessary. Each school orders goods for delivery independently, so it is down to each school how it gets hold of its stationery, chemicals etc. and details of specific deliveries are not recorded.

Key Recommendations: Effectively consider transport impact of deliveries in the procurement policy and related procedures

12. WATER

12.1 ISSUE OVERVIEW

Introduction	<p>Water is a key issue for the UEA primarily because it has one of the highest water consumptions per head of students in the country. In the People and Planet survey the UEA came in the bottom quarter, for water conservation, of the universities surveyed. The UEA is situated in one of the driest area of the UK which is predicted to get drier in the future due to global warming and, consequently, the current water consumption is unsustainable.</p> <p>The UEA has two major water sensitive receptors on campus e.g. the River Yare and the Broad and consequently, the management of potential water pollutants is important to prevent potential damage to these receptors and the potential costs of</p>
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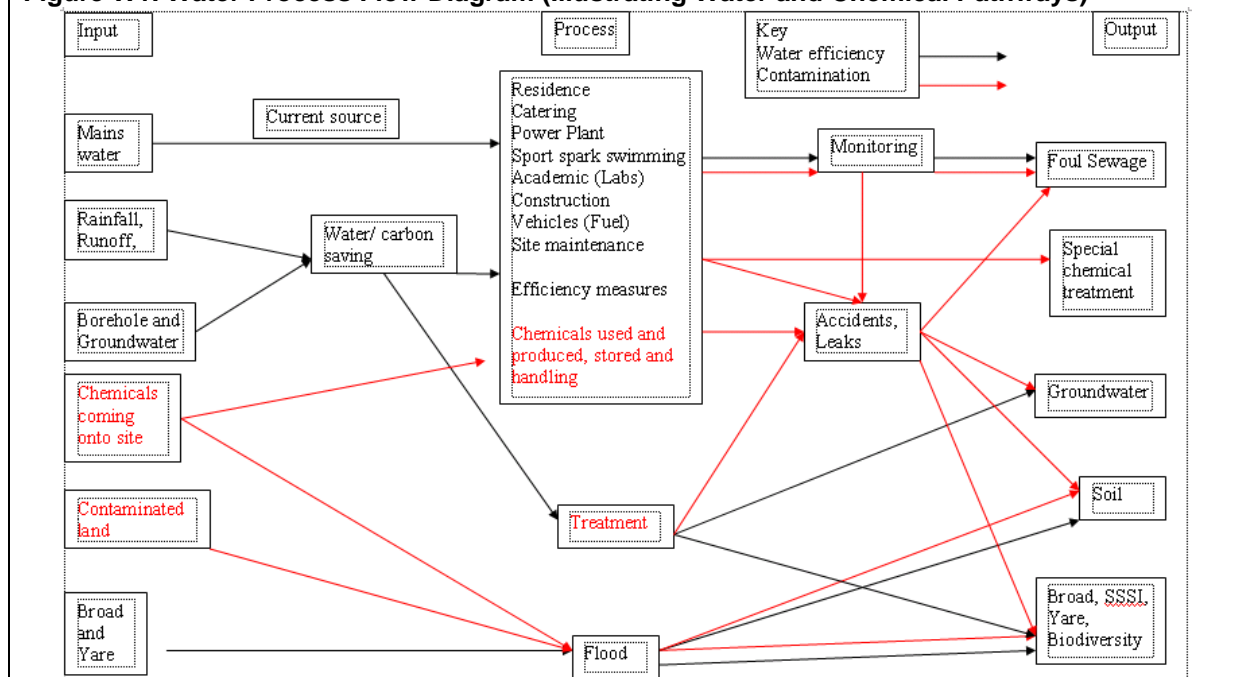
clean-up of contamination. (Figure W1). Pollution incidents could also contaminate the sewage works and the surface water it discharges into.

Water footprinting is a new approach that aims to counter global water scarcity by measuring the amount of water that goes into a product, with the aim of setting reduction targets and identifying products that have a high impact on water resources. Developing water footprints is a relatively new exercise that has followed on from the success of carbon footprints in enabling businesses and corporations to determine the carbon cost of their products. With increasing water scarcity worldwide, water footprints have the potential to become as important as carbon footprints to organisations with a strong sense of corporate responsibility. The World Business Council for Sustainable Development (WBCSD) stated in 2006 that 'water footprint reporting will become common practice and even obligatory for businesses in various countries already by the year 2010'.

Reducing water footprints will inevitably drive down costs as less resource is used in manufacturing, growing and/or transporting goods. Today many companies recognize that failure to manage the freshwater issue raises risks, including damage to the corporate image, threat of increased regulatory control, financial risks caused by pollution, or insufficient freshwater availability for operations (Gerbens-Leenes and Hoekstra, 2007)

Business water accounting is increasingly regarded as an integral part of sustainable corporate performance accounting. Consultancy companies are now emerging that carry out water footprint measurements in much the same way as carbon footprinting consultancies do (e.g. WSP launched on March 9th 2009). Water footprinting is at the cutting edge of environmental management and best practices are being determined in the US through conferences which are involving most major international companies and environmental institutions (Coca-Cola, Walmart, Defra etc.). By implementing a provisional water footprint study now, the UEA will be a leader amongst the sector in managing its water.

Figure W1. Water Process Flow Diagram (Illustrating Water and Chemical Pathways)



Baseline environment	<p>The River Yare has the only existing water quality data as the Environmental Agency has a duty to collect such data (see appendix 10).</p> <p>All surface drains on campus drain into the Broad, which is connected to the River Yare via a pipe at the east end of the Broad. The Broad does not currently have water monitoring records (see drainage plan available from EST).</p> <p>In addition the quality of the groundwater and foul sewage water are unknown as data is not collected. Anglian Water Trade Effluent Discharge Consents are held for the Village and Campus Laundrettes and BIO labs (copies available from EST).</p> <p>Baseline water consumption and related carbon emissions can be found in section 12.2.</p> <p>There are no existing water footprinting measures in place at UEA. Carrying out a water footprint for water will supplement the other more pressing matters of improving water efficiency and decreasing carbon cost of water, though gaining a basis now will put the university in a good position for the future, when implementation of water footprint studies is expected to be widespread. Standards for ISO accreditation with regards to water sustainability have been developed, and water footprinting serves as a useful metric that can be used to help in improving usage of freshwater. It is therefore recommended that a supply-chain water footprint for paper is determined in the short-term, followed by a water footprint for the university as a whole within 3 years. Much of the research and work into developing water footprinting as a tool is being done so by A.Y. Hoekstra at the Institute for Water Education.</p>
Legislation and codes of practice etc.	

Subject Area	Legislation	How does this apply to the UEA?
Water Quality	Control of Pollution (Oil Storage) (England) Regulations 2001	<p>Applies where storage of oil occurs in containers with a capacity of at least 200 litres (3,500 litres for domestic storage). Do not apply to a container situated within a building or wholly underground.</p> <p>The oil container must be of sufficient strength and structural integrity to ensure that it is unlikely to burst or leak in its ordinary use.</p> <p>The container must be situated within a secondary containment system (SCS) which will prevent the release of oil that has escaped from its container.</p> <p>Prescribed controls must be present on tanks to prevent leakage.</p>
Water Quality	Water Industry Act 1991 – Part IV Trade Effluents (Prescribed Processes and Substances) Regulations 1989 (SI 1989/1156) as amended	<p>Trade effluent may only be discharged into a public sewer with the consent and agreement of the relevant sewerage undertaker.</p> <p>Need to abide to the quantity, rate, nature and composition, and prescribed substances contained in the consent notice.</p> <p>Prescribe the substances and processes which are</p>

	by Sis 1990/1629 and 1992/339	treated as 'special category effluent' under WIA91. Require referral to Environment Agency.
Water Quality	Water Resources Act 1991 PPG13	Never allow or cause any poisonous, noxious or polluting substances to enter controlled waters without having obtained first discharge consent to do so from the environmental Regulator.
Groundwater Quality	<u>Groundwater Regulations 1998 SI 2746</u>	Empowers the Environment Agency in England to prevent direct or indirect discharge of certain dangerous substances to groundwater and control pollution resulting from the discharge of those and other substances.
Pollution prevention and control	<u>The Environmental Permitting (England and Wales) Regulations 2007 SI 3538</u> Pollution Prevention and Control (England and Wales) Regulations 2000. Environmental Protection Act 1990	Prescribed processes must be authorised to operate. Discharges to sewer from IPPC/IPC process are subject to both authorisation from the Environment Agency and Sewerage Undertaker.
Contaminated Land	<u>Contaminated Land (England) Regulations 2006 SI 1380</u> Environmental Protection Act 1990 – Part II as amended by the Environment Act 1995 (EA95) – Part II Contaminated Land [England] Regulations 2000 [SI 2000/227]	Sets out the measures for dealing with contaminated land. If land is contaminated to the extent that it meets the definition of contaminated land set out in the legislation, then the Local Authority is required to identify who is responsible, what needs to be done by way of remediation, and serve notices on those persons to carry out the work. This legislation could affect the University as a result of both past and current activities on the land in question.
Use of Pesticides	<u>Control of Pesticides (Amendment) Regulations 1997 SI 188</u> Control of Pesticides Regulations 1986 SI 1510	Sets out restrictions on selling, supplying or storing pesticides and precautions to protect the health of humans, the environment, and particularly water, when using pesticides.
Water Abstraction and use	Water Act 2003	Ensure that the installation of all water meet specified criteria, e.g. are BS approved, and the requirements of these regulations. Ensure that all water fittings are installed, connected, altered, repaired and disconnected in accordance with the regulations. Lead pipes and fittings are prohibited. Sets out the framework for abstraction licensing, regulates impoundments, increases competition in water supply and includes measures for drought management and flood defence work in England and Wales.
Hazardous Substances	Control of Substances Hazardous to Health Regulations 1999 –	Required to control exposure to hazardous substances to protect employees and others who may be exposed from work activities.

	COSHH (SI1999/437)	
Waste	Environmental Protection Act 1990 – Part II s34 imposes a duty of care on anyone that imports, produces carries, keeps treats or disposes of controlled waste. Environmental Protection (Duty of Care) Regulations 1991 (SI 1991/2839) as amended by SI 1996/972	Signed Waste Transfer Notes (WTN) for each load of waste that leaves the site is stored for two years. Ensure that all waste is stored securely, kept in suitable labelled containers at all times in order to prevent any escape, and ensure the correct segregation of waste types. Store liquid wastes on impervious surfaces that are preferably bunded or drained to a sealed pit capable of containing the contents of the storage containers. Ensure that the transfer is only to an authorised person for authorised transport purposes.
Environmental Damage	Environmental Damage (Prevention and Remediation) Regulations 2009	If activities threaten to cause, or have caused, environmental damage the university must: Take steps to prevent the damage (or further damage) occurring. Inform the Environment Agency or other authorities who will tell the university what it must do to repair the damage. If the Environment Agency has to repair the damage for the university, it will have to pay the costs.
Environmental Information	Environmental Information Regulations 2004 (Came into force on 1 January 2005)	Allows people to request environmental information from public authorities and those bodies carrying out a public function, including universities. Any request for information held by/on behalf of the University is technically an FOI request in the first instance. Section 39 of the Freedom of Information Act 2000 (FOI) then exempts environmental information from being dealt with under the FOI Act and provides it should be dealt with under the Environmental Information Regulations 2004.

Environmental Aspects	<ul style="list-style-type: none"> • Water Consumption • Chemical management (including cleaning) • Oil storage • Vehicle washing • Vehicle refueling • Effluent release • Procurement (e.g. embodied water impacts of products) (see section 8) • Use of herbicides and pesticides (see section 5)
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Key Recommendations: Establish ways of monitoring and reducing the water footprint of purchasing decisions

12.2 WATER CONSUMPTION

Environmental Impact	Water consumption, principally: residencies, catering, CHP plant, Sportspark swimming pool, academic (labs), construction and site maintenance. Resource depletion, this is of particular importance as East Anglia is particularly dry and therefore water is a scarce resource, perhaps becoming increasingly so, as a result of climate change. Also CO ₂ emissions (see separate template).																																													
Existing management	<p>Currently there is no consistent approach to water management, with no one with specific overall responsibility. The general attitude is that the university has negotiated a very good tariff on water, and therefore represents a small expenditure compared to the other utilities (<i>pers. corres.</i> Mel Pascoe). Very little commitment or emphasis has been put on reducing water consumption because of the perceived lack of potential for significant financial savings and moreover the cost effectiveness of measures (current water consumption costs are in the region of £125,000 per annum, <i>pers. Comm.</i> Martyn Newton 04/09). The overriding carbon agenda and target of an “exemplary low carbon campus” have focused attention and investment, perhaps at the expense of water and other environmental objectives.</p> <p>Mel Pascoe (EST) has overall responsibility for utilities as energy manager and compiles annual reports on water usage and cost. His main focus remains on energy and large projects like new buildings, the CHP and biomass plants. No one therefore is specifically responsible for water consumption and efficiency monitoring and management.</p> <p>The table below shows Mel's figures, combined by student numbers from Garrick Fincham (REG). This data is not fully comprehensive as historical data were not available for ENV Greenhouses, Observatory and the Waterfront. Carbon has been calculated based on Anglian Water's figure for treatment and distribution of drinking water (2009)⁴⁰.</p> <p>Table W1. Annual Water Consumption and Related Carbon Emissions (Aug – Jul)</p> <table><tr><th>Year</th><th>Students (FTE) (Total)</th><th>Total consumption (cub.metres)</th><th>Consumption per/student(FTE) (cub.metres)</th><th>Carbon/student(FTE) (tCO₂e)</th></tr><tr><td>2000/01</td><td>13180</td><td>268222</td><td>26.15</td><td>91.195</td></tr><tr><td>2001/02</td><td>13274</td><td>282061</td><td>27.79</td><td>95.901</td></tr><tr><td>2002/03</td><td>12966</td><td>272555</td><td>26.92</td><td>92.669</td></tr><tr><td>2003/04</td><td>13310</td><td>283401</td><td>26.71</td><td>96.356</td></tr><tr><td>2004/05</td><td>13692</td><td>297215</td><td>27.09</td><td>101.053</td></tr><tr><td>2005/06</td><td>14047</td><td>297983</td><td>25.78</td><td>101.314</td></tr><tr><td>2006/07</td><td>14981</td><td>318405</td><td>26.74</td><td>108.258</td></tr><tr><td>2007/08</td><td>13654</td><td>342951</td><td>28.53</td><td>116.603</td></tr></table> <p>Water fixtures and fittings in new buildings and refurbishments adhere to building regulations, but fail to exploit the opportunity to install more efficient systems. A number of large scale measures have been considered, including grey-water recycling, when the Elizabeth Fry building was built, however they were rejected on cost grounds. It is unclear to what extent they were considered and whether pay-</p>	Year	Students (FTE) (Total)	Total consumption (cub.metres)	Consumption per/student(FTE) (cub.metres)	Carbon/student(FTE) (tCO ₂ e)	2000/01	13180	268222	26.15	91.195	2001/02	13274	282061	27.79	95.901	2002/03	12966	272555	26.92	92.669	2003/04	13310	283401	26.71	96.356	2004/05	13692	297215	27.09	101.053	2005/06	14047	297983	25.78	101.314	2006/07	14981	318405	26.74	108.258	2007/08	13654	342951	28.53	116.603
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⁴⁰ 0.34kgCO₂/m³

	<p>back periods etc, were considered or if judgments were based solely on initial costs. The practical reasons for rejection have also not really been established.</p> <p>In the past small scale efficiency measures have been installed (e.g. at an individual cistern or tap scale), however these have not been monitored nor maintained. The viability of low cost, small scale water saving devices in existing buildings, labs and washrooms requires objective assessment. For example automatic urinals, push taps, dams or water displacement devices in cisterns and In-line restrictors to reduce flow to taps or cooling systems (Case study: Bristol University (Hefce, 2009)). The commitment to these measures needs to be ongoing with regular maintenance and monitoring to maximize efficiency gains, with someone with overall responsibility for this.</p> <p>Although an external leaks survey was conducted by EST (2006) which resulted in the repair of leaking hydrants, no other testing to find leaks has been undertaken. They are identified and fixed when pipes are replaced or flooding occurs. It is therefore sensible to suggest that many smaller leaks go undetected.</p> <p>No water usage awareness programme, for staff or students has been initiated or considered. Water awareness for staff and students: raising awareness of the importance of reducing water consumption, advising on ways to do this and encouraging the reporting of dripping taps etc. is essential if efficiencies are to be made (Case studies: Oxford University (Hefce, 2009) and Bristol University Energy and Environmental Management Unit website).</p> <p>Monitoring and auditing of water consumption is not been undertaken. Metering is in place for some buildings (residencies, teaching wall and newer buildings), it is by no means comprehensive enough to identify areas/ buildings that use particularly high quantities of water (and therefore where to focus initial attention to reduce this) or where significant leakage may be occurring. Moreover no one currently monitors those meters in place, apart from when charging the residency subsidiary companies. It is however proposed that metering will be increased to cover individual buildings and schools, eventually monitored as part of the BMS. Monitoring and auditing can lead to huge reductions in consumption, cost and carbon footprint (case study: Liverpool John Moores University (HEEPI, 2009)). The number of meters needs to be considerably increased to allow this to be comprehensive.</p>
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Key Recommendations: Develop and implement a long term strategy for reduction in water consumption

12.3 CHEMICAL MANAGEMENT

Environmental Impact	Potential for land, groundwater and surface water contamination. Reduction in air quality.
Existing	The existing chemical management procedure within the labs is to fill in the risk

management	<p>assessment forms in conjunction with COSHH forms (see appendix 5). The risk assessment informs the person using the chemicals of the safety issues and the appropriate method of disposal. A safety auditing programme is in place but this does not currently cover specific environmental risks. This should be extended to:</p> <ul style="list-style-type: none"> • Assess the accuracy of completed risk assessments • Audit staff and student awareness and competency in waste management practices (Note : Technical staff undergo basic Health and Safety training on top of initial competence to undertake their jobs). • Spot check audit to ensure compliance with the risk assessments <p>Analysis is required to confirm that substances prohibited under the discharge license provided by Anglian Water (see section 12.8) are also prohibited by the COSHH forms. A system to record and assess any environmental spillages/incidents that occur outside of the buildings is also needed.</p> <p>Teaching labs keep a list of chemicals held but there is no overall inventory of chemicals held in departments. Small quantities of chemicals are ordered to minimise quantities stored. Estates do not hold an inventory of chemicals stored on site, as there is an assumption that Stores do. Keeping an up-to-date inventory that may be accessed by Stores and schools that require chemicals and those responsible for relaying information to emergency services will be important for effective chemical management.</p> <p>UEA Cleaning (Residences and Services Division) is responsible for both academic and residences. COSHH training is provided to staff but no information on chemicals used has been provided for this review. http://www.uea.ac.uk/cleaning</p> <p>Note: There are 13 substations on campus each with transformers that are PCB free</p>
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Key Recommendations: Extend Health and Safety audit programme to include environmental aspects and establish an environmental incident reporting and risk management procedure

12.5 OIL STORAGE

Environmental Impact	The oil tanks around campus represent a significant and potentially costly pollution event to land and water if they were to leak or a spill occur whilst refueling.
Existing management	<p>There are a number of oil tanks on campus which require refuelling and maintenance:</p> <ul style="list-style-type: none"> ▪ 10 oil tanks feeding emergency generators located in Arts, BMRC, BIO, CHE, ENV, MED, ITCS, Congregation Hall, LIB and EST. ▪ 2 80,000 gallon capacity underground tanks containing light diesel oil are buried under the roadside before visitor's car par (P4) entrance. These feed a 4,000 gallon daily service tank in EST for the back-up boilers. One of the tanks is currently scheduled for repair, identified from observation. Bores taken on one

	<p>side of the tank found no soil contamination.</p> <ul style="list-style-type: none"> ▪ Earlham Hall School ▪ Blackdale Building ▪ Lubrication oil storage tanks for CHP engines in Boiler House ▪ Other 2 oil tanks out of UEA campus but under UEA supervision <p>A full audit needs to be undertaken by appropriately trained personnel to confirm these storage facilities meet the requirements of the Control of Pollution (Oil Storage) (England) Regulations 2001.</p> <p>There is currently no specific procedure or timing of refueling (upon need but usually at least once every 6 months). Tanks are always filled above the minimum limit and contain enough to run the power generator. Although the emergency generators are included in the PPM system, tank inspection currently is not. The Environment Agency recommends that all tanks are refueled in a standard manner, are checked regularly to ensure there are no leaks in the tanks and pipes work and are audited by a professional tank auditor once every 6 months.</p> <p>Oil separators that have been installed in surface water drains to The Broad. There are scheduled activities e.g. monitoring the condition of the oil separators, cleaning out trapped oil.</p> <p>There have been no recorded leakages or major spillage on site (other than the back-up boiler oil storage tank). An oil spill kit is available in the Boiler House but operative awareness is uncertain.</p>
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Key Recommendations: Undertake a compliance audit to confirm oil storage facilities meet the requirements of the Control of Pollution (Oil Storage) (England) Regulations 2001.

Incorporate oil storage tanks into the PPM system as recommended by the Environment Agency (see <http://www.environment-agency.gov.uk/business/topics/pollution/32252.aspx>)

12.6 VEHICLE WASHING

Environmental Impact	<p>Washing vehicles produces effluent which may contain potential contaminants e.g. detergents, herbicides. Detergents will also emulsify oils resulting in oil interceptors becoming ineffective. On a business site vehicle washing requires a license or an exemption from the Environment Agency for discharges to controlled waters such as The Broad or Anglian Water where discharges are to foul drains (see PPG13 http://publications.environment-agency.gov.uk/pdf/PMHO0307BMDX-e-e.pdf?lang=e)</p>
Existing management	<p>The majority of UEA vehicles are washed off site. A small number of grounds maintenance vehicles (e.g. tractors) were being washed down in the EST compound (behind the Estates building). The drains in this area go into The Broad which is controlled water, via an oil separator. As a license or exemption is required for this activity under the Water Resources Act 1991, this activity</p>

	<p>has ceased and a dedicated vehicle washing area is being established under license to discharge from Anglian Water.</p> <p>The Environment Agency Pollution Prevention Guidance PPG13 outlines the management practices being applied in the design and implementation of these works.</p>
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Key Recommendations: Establish dedicated vehicle washing area in line with PPG13

12.7 VEHICLE REFUELING

Environmental Impact	Pollution event to land and water if a leak or spill were to occur whilst refueling.
Existing management	<p>EST vehicles e.g. tractors are refueled with red diesel, behind the EST building. The drains in this area go into The Broad which is controlled water, via an oil separator. A new red diesel oil storage tank has recently been installed which meets the requirements of the Oil Storage Regulations.</p> <p>No evidence of actual practice was gathered for this review.</p>

Key Recommendations: Audit refueling practice to ensure appropriate operational controls are in place to implement pollution prevention

12.8 EFFLUENT RELEASE

Environmental Impact	Degradation of water quality which will alter habitat and also impact species diversity. Effluent will not only impact the water quality but could also leach into surrounding soils, slowly changing the state of the soil and impacting vegetation growth. Changes in vegetation, water and soil quality impact the biodiversity, an impact dependent upon the size of the area affected. Any change like this will also cause visual degradation.
Existing management	Anglian Water Trade Effluent Discharge Consents are held for the Village and Campus Laundrettes, BMRC, BIO, CHE and Science labs (copies available from EST). In the schools compliance is managed through the risk assessment process (see section 12.3). Although the discharge licenses stipulate that there has to be monitoring of discharges to foul sewers (section 13), Anglian Water do not at present require this to be undertaken.

	<p>During episodes of intense rainfall a sewerage drain along Bluebell Road overflows into the main drain; which in turn empties into The Broad (at the Bluebell Road outfall). The overtopping of the sewer into the main drain occurs due to a high rate of overland flow down Bluebell Road into the drain. There are no records that monitor the frequency of this activity, but it is speculated as occurring roughly 10 times a year.</p> <p>There is no existing management of this issue, though it is known about by all interested parties (Anglian Water, Norwich City Council, UEA and Environment Agency). The connection of the sewer with the drain will need to be modified to stop the overtopping occurring and is the responsibility of Anglian Water. The flow of sewerage water into the Broad is a breach of the Water Resources Act 1991.</p> <p>Establishing a monitoring system for the effluent release would allow the issue to be managed effectively. Monitoring may be linked to relevant schools/courses who could undertake such work to gain valuable experience. Localized surveying to compare the effects on biodiversity of effluent released could also be part of this programme.</p>
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Key Recommendations: Establish monitoring of the Bluebell Road outfall gathering evidence of impact to present to interested parties.

13. EMERGENCY PREPAREDNESS AND RESPONSE

13.1 ISSUE OVERVIEW

Introduction	<p>Emergency scenarios often present the largest environmental business risk to an organization. Ensuring that procedures are in place to minimize the environmental impact from e.g. chemical spills provides reassurance to regulators that all reasonable steps have been taken and any resulting liability for damage will take this into consideration. The potential range of emergency situations and therefore impacts are great e.g. release of hazardous substances, fire water runoff, vehicle crash, will cause loss of biodiversity, emissions to air, water and soil pollution; eutrophication; acid rain and acidification, ozone depletion.</p>
Baseline Environment	<p>The UEA has implemented a Major Incident Plan, and has a training exercise scheduled for July 2009. This does not however specifically consider environmental impacts and their management.</p> <p>A risk assessment procedure covers every campus activity perceived as potentially harmful to health, but the environmental elements of this are limited e.g. waste disposal (see section 12.2).</p> <p>There is currently no method of recording environmental incidents, or implementing</p>

	<p>corrective actions on these.</p> <p>An oil spill kit is located in the Boiler House in EST, but operative awareness of this is unknown.</p>
Legislation, codes of practice etc	<p>Environmental Damage (Prevention and Remediation) Regulations 2009: If activities threaten to cause, or have caused, environmental damage the university must:</p> <ul style="list-style-type: none"> • Take steps to prevent the damage (or further damage) occurring. • Inform the Environment Agency or other authorities who will tell the university what it must do to repair the damage. • If the Environment Agency has to repair the damage for the university, it will have to pay the costs.
Environmental aspects	<p>e.g. Hazardous solid waste release</p> <p>Discharge of fire water</p> <p>Vehicle crash</p> <p>Sewage into Broad from Blue Bell road</p> <p>Accidental refrigerant release</p> <p>Swimming pool chlorine release</p> <p>Laboratory emissions release</p>

Key Recommendation: Undertake an emergency planning exercise to establish the operational controls required to effectively safeguard the environment in the event of e.g. fire, vehicle crash

With Thanks to the ENV542 2009 Cohort:

AIR	Jay Shiv Eva Wan Olivier Tang Mingming Wang Zhenxing Chen Zhenjiang Li
BIODIVERSITY	Kimberley Parsons Rebecca Hart Lin Liu Wenshi Lin
WATER	Sheng Yang John Bevan Christopher Harris Sebastian Blake Qamarul Arifin Mohamad Shu Zhu
ESD	Adam Williams Aline Lazzarotto Yuko Minegaki Robin Van Wonderen Corinna Luther
RESOURCES	George Knights Jie Mao Jinglu Wang Haqiki Aplesiasfika Fateme Farrashkhiabani Norni Lina Mohamed Shakthi Sritharan Simon Hughes



Pro-Vision Environmental

2, The Croft

Old Costessey

Norwich

NR8 5DT

07832383074

elaine@provisionenvironmental.co.uk