What are the European legal duties to conserve biodiversity in university campuses?

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Abstract Biodiversity is a key element of sustainable development in university campuses. However, integrating biodiversity in campuses requires strategic planning, beyond minimum compliance with protected species and habitats legislation. This leads to the questions: which university functions impact on biodiversity and what obligations are there under European environmental law for universities to consider biodiversity strategically? University functions and their consequent impacts were classified thematically into four and seven categories respectively. These categories were used to systematically search the Environmental Legislation Update Service and EUR-Lex for relevant legislation, which was also classified. Universities undertake capital projects, building alterations, grounds maintenance, and outdoor activities. These functions may cause loss, damage, disturbance, introductions, pollution to, and overuse of, biodiversity. Legislation applying to these impacts spans wildlife, plant health, planning, and pollution prevention disciplines. The interdisciplinary legal framework for biodiversity presents compliance and integration challenges, such as overlooking legislation or duplicating efforts. This article will help those involved in university management, teaching and research to identify and integrate in their work the relevant legal obligations on biodiversity.

Introduction: Biodiversity and sustainable development in university campuses

Biodiversity conservation is central to sustainable development. However, biodiversity is often overlooked or not considered as a priority within the environmental management systems of universities (Wright and Wilton, 2012; Dixon et al, 2007). Overlooking biodiversity may result in non-compliance with relevant legislation and in missed opportunities to promote a range of ecosystem contributions to sustainable development. This chapter systematically identifies the impacts that universities may have on biodiversity and the related European legal obligations. Moreover, this chapter outlines strategic opportunities to integrate nature conservation in universities' campus management holistically.

University and college campuses in the UK cover an area of 380km^2 and include a variety of urban, peri-urban and rural habitats and species (Dixon et al, 2007). Therefore, universities have a role to play in nature conservation and in providing urban and peri-urban ecosystem services. Conservation of urban species and habitats could be enhanced through green infrastructure planning comprising greenways and green spaces as well as green walls, facades and roofs (Sadler et al, 2011; Tzoulas et al, 2007). The concept of greenways involves linear features lined with vegetation that form networks of paths (Walmsley, 2005). Planning of university campuses could be based on creating greenways interlinking green spaces for walking and cycling between buildings (Balsas, 2003); and on the principles of green infrastructure planning (i.e. integrating publicly and privately owned green spaces and

promoting multifunctional ecosystem benefits; Tzoulas et al, 2007) and land use complementation (i.e. clustering together different green spaces to increase habitat and promote ecological processes in cities; Colding, 2007). Importantly university campuses could be integrated in ecological networks of both local and European designated and non-designated sites and species for nature conservation.

While, additional research is needed to establish the ecological performance of green roofs (Berardi et al, 2014), green infrastructure planning (Tzoulas et al, 2007) and land use complementation (Colding, 2007), as well as their socioeconomic and other environmental benefits, there is enough evidence to suggest that biodiversity on university campuses would bring about multifunctional benefits. These benefits are often referred to as ecosystem services and are grouped into four categories (i.e. supporting, provisioning, regulating and cultural; Millennium Ecosystem Assessment, 2005). In order to support biodiversity conservation on campuses in the UK the Higher Education Funding Council for England (HEFCE) and the Environmental Association for Universities and Colleges (EAUC) have developed a practical guide for university estate managers (Dixon et al, 2007). Additionally the Learning and Skills Council, UK, in its sustainable development strategy identifies biodiversity conservation as a key area of actions and principles for higher education (Learning and Skills Council, 2005).

Traditionally universities, along with businesses and corporate organisations, have seen biodiversity as a resource to be exploited and its protection as an additional legal constraint (Houdet et al, 2012). Corporate responses to biodiversity could take one of four forms or combinations: (a) securing contribution to production and / or sales; (b) avoiding costs of disservices; (c) mitigating impacts on biodiversity for other cultural reasons; and (d) assessing legal compliance (Houdet et al, 2012). Whilst the latter may be concerned with ensuring minimum compliance, the other responses indicate that organisations may consider biodiversity for strategic reasons. Do universities ensure minimum compliance? If so, can they go beyond minimum requirements and consider biodiversity in terms of wider nature conservation aims and the provision of ecosystem services?

Aim and objective

Two problems are created when universities overlook biodiversity or do not consider it as a priority in their environmental management systems. First, universities may miss opportunities to promote a range of potential socioeconomic and environmental benefits. Second, they may not be compliant with legal obligations regarding biodiversity. Thus, it is important to identify what obligations are emerging for universities to consider biodiversity strategically from European environmental law. This research aimed to identify the European legal duties that universities have to protect biodiversity. The objective comprised a thematic classification of (a) university functions and consequent impacts on biodiversity, and (b) the European legislation that applies to these impacts.

Methods

This research comprised a critical review and thematic classification. The former provides a systematic way for interrogating (Hart, 1998), and the latter for identifying patterns or themes in, written texts (Robson, 1993). In combination these methods have the potential to reveal patterns, conflicts and synergies within and between policies and are thus often used in analysing legal documents. Critical reviews and thematic classifications of European legislation and policy have previously been applied to identify gaps in current academic research (O'Connell and Yallop, 2002), adaptive capacity to climate change (Pettersson and Keskitalo, 2011), and the compliance of protected areas with international legislation (Mauerhofer, 2011).

University services that may impact on biodiversity were identified by a systematic review of the website of Manchester Metropolitan University (UK). This institution was chosen because it came first in the People and Planet Green League Table (2013), which is a UK ranking system for environmental management in universities. The contents of the University's website were searched and details of the services provided by different parts of the institution were noted. The search identified sixty two different services which were then classified in five broad themes - teaching, research, administrative, outreach and campus management - drawn from the institutional mission statement. The subsequent research focussed on campus management services because they could have direct and significant impacts on local biodiversity. The campus management services were then further classified using grounded theory (Lincoln and Guba, 1985) until four functions emerged: capital projects, building alterations, grounds management, and outdoor activities.

Potential direct impacts on biodiversity were identified by establishing possible pathways between actions on the ground associated with each campus management function, and effects on species or habitats. For example, a new campus development (capital project), would change the land use, which in turn could impact on species and habitats (Tzoulas et al, 2007). Based on grounded theory (Lincoln and Guba, 1985) such possible pathways were thematically classified in seven emergent categories of impacts: loss, damage, disturbance, introductions, pollution, use, and disease associated with species or habitats.

In the UK a not-for-profit organisation called newground provides an Environmental Legislation Update Service (ELUS; www.legislationupdateservice.co.uk), which is a database of up to date law. ELUS was searched using the key word for each impact category (loss, damage, disturbance, introductions, pollution, use, and disease associated with species or habitats) and campus management function (capital projects, building alterations, grounds management, and outdoor activities). This ensured that legislation covering both functions and impacts were retrieved and collated. The second step focused on identifying the UK legislation that had a European origin by reviewing the preambles of UK legislation that was collated in the first stage. This way, all European Union legislation that had been translated in UK law was identified.

The final stage involved finding and reviewing the originating European legislation using the European Commission's service EUR-Lex (www.eur-lex.europa.eu), which provides access to legal documents including most recent updates and proposals for forthcoming legislation. All relevant European Union legislation that is legally binding across its member states was collected (i.e. Regulations and Directives). Decisions, Recommendations, Opinions, policy documents and international conventions were excluded because they may not apply to all member states or are not legally binding.

The collated Regulations and Directives were critically reviewed to collect legal obligations. Using grounded theory (Lincoln and Guba, 1985) these obligations were then classified into eleven emergent categories relating to protected species; protected sites; controlled species (invasive, alien, traded and pests); managed species (wild, ornamental, exceptions); management methods; prohibitions (species, methods, substances, uses or actions); need for authorisation; controlled substances; waste disposal; environment (plants and animals generally); and planning considerations. These categories of obligations are the same for all European Union member states to which the relevant legislation has been translated into national law (Regulations are transposed as they are; but Directives can vary in the form and means of implementation amongst member states).

The body of European legislation relating to biodiversity

The European legal framework for biodiversity conservation comprises thirty four legally binding Regulations (six original, nine amending) and Directives (fifteen original, four

amending); and proposals for two forthcoming Regulations and one Directive (Table 1). Thirty four legally binding documents, many of which have long and technically complicated sections and annexes, create a complex legal framework to comply with.

The European legislation for biodiversity can be grouped into four discipline areas: wildlife, spatial planning, plant health, and pollution (Table 1). The Birds ((COM) 2009/147/EC) and Habitats ((COM) 92/43/EEC) Directives are often quoted as the landmark legislation for European nature conservation, perhaps because they are the only two to have obligatory monitoring requirements (Henle et al, 2013), or because they inform much of the other environmental legislation. However, the obligations arising from these two Directives are only part of the legal duties that universities have towards biodiversity.

Table 1: EU biodiversity legislation

Wildlife legislation	**Pollution legislation**
R. 338/97: Wildlife trade (Basic) R. 865/2006: Wildlife trade (Implement) - R. 100/2008: Amending R. 865/2006 - R. 791/2012: Amending R. 865/2006 R. 792/2012: Wildlife trade (Permit) R. 587/2013: Wildlife trade (Suspensions) D. 92/43/EEC: Habitats D. 2009/147/EC: Birds COM (2013) 620: Alien and invasive species*	R. 850/2004: POPs - R.1195/2006: Amending R. 850/2004 - R.172/2007: Amending R. 850/2004 - R.323/2007: Amending R. 850/2004 - R.304/2009: Amending R. 850/2004 - R.756/2010: Amending R. 850/2004 - R.757/2010: Amending R. 850/2004 - R.519/2012: Amending R. 850/2004 R. 528/2012: Biocides D. 2000/60/EC: Water Framework D. 2003/4/EC: Access to information D. 2003/35/EC: Public participation D. 2004/35/EC: Environmental liability D. 2008/98/EC: Waste Framework D. 2008/56/EC: Marine Framework D. 2009/128/EC: Pesticides
Plant health legislation	**Planning legislation**
D. 77/93/EEC: Plant pests (first) - D. 86/546/EEC: Amending D. 77/93/EEC - D. 92/103/EEC: Amending D. 77/93/EEC D. 91/682/EEC: Ornamental plants D. 93/49/EEC: Ornamental plants (pests) D. 2000/29/EC: Plant pests (second) - D. 2004/102/EC: Amending D. 2000/29/EC - D. 2009/118/EC Amending D. 2000/29/EC COM (2013) 141: Pests*	D. 2001/42/EC: SEA D. 2011/92/EU: EIA COM (2012) 0297: Amend EIA**

Abbreviations: R: Regulation; **D:** Directive; **POPs:** Persistent organic pollutants; **SEA:** strategic environmental assessment; **EIA:** environmental impact assessment; **Notes:** (*) These are proposals for regulations; (**) this is a proposal for a Directive; all documents can be accessed on www.eur-lex.europa.eu using year and number of legislation

Pollution legislation that applies to biodiversity is the most fragmented and spread out. The Environmental Liability Directive ((COM) 2004/35/EC) and the Water ((COM) 2000/60/EC), Marine ((COM) 2008/56/EC) and Waste ((COM) 2008/98/EC) Framework Directives are most likely to be overlooked; because they are mainly associated with pollution compliance rather than biodiversity conservation. These findings indicate that the majority of legal obligations relating to biodiversity may be about preventing and mitigating risks and damage to it from pollution, disease or development; rather than incentivising proactive conservation.

The legal obligations for biodiversity conservation

The legal obligations arising from European legislation to protect and conserve biodiversity that apply to universities can be grouped into eleven categories (Table 2; top row). The

majority of legal obligations relate to gaining authorisation for interfering with specific species, habitats or processes; to protecting the natural environment including non-protected plants and animals; to following specific permitted management methods; and to prohibitions (Table 2). The Habitats ((COM) 92/43/EEC) and Birds ((COM) 2009/147/EC) Directives introduce the most legal obligations. This explains why these are often cited and at the top of the legal compliance list. However, it would be short sighted to assume that protected species and habitats are the centre of biodiversity legislation. This is because eight pieces of legislation refer to protected species and sites, but fourteen refer to environment including non-protected plants and animals (Table2).

Table 2: Obligations arising from European biodiversity legislation

European Legislation	EN	SP	CS	MS	ST	M	BN	SB	AU	W	PL
Wildlife trade [1, 3]		•		•			•		•		
Habitats [2]		•	•	•	•		•		•		•
Birds [2]		•		•	•		•		•		•
Alien species [1*]	•		•			•	•		•		
First plant pests [2, 4]	•		•			•	•		•		
Ornamental plants [2]				•		•			•		
Ornamental plant pests [2]	•		•	•		•	•		•		
Second plant pests [2, 5]	•		•			•	•		•		
Pests [1*]			•	•		•	•		•		
POPs [1, 6, 7]	•					•	•	•	•	•	
Biocides [1]	•					•		•	•		
Water Framework [2]	•	•			•	•					
Access to information [2]	•						•				•
Public participation [2]	•						•				•
Environmental liability [2]		•			•	•			•		
Waste Framework [2]	•					•				•	
Marine Framework [2]					•	•		•			•
Pesticides [2]	•					•		•	•		
SEA [2, 9]	•	•			•				•	•	•
EIA [2, 10]	•	•			•				•	•	•
Amend EIA [2*]	•	•			•				•	•	•

Abbreviations: EN: environment, flora and fauna generally; **SP**: protected species; **CS**: controlled species (invasive, alien and pests); **MS**: managed species (wild, ornamental, trade); **ST**: protected sites; **M**: permitted management methods; **BN**: banned methods, uses or action and substances; **SB**: controlled, restricted substances; **AU**: authorisation, notification to/ from regulator needed; **W**: waste disposal; **PL**: must be considered at planning stage; **POPs:** Persistent organic pollutants; **SEA:** strategic environmental assessment; **EIA:** environmental impact assessment; **Notes: (1):** Regulations; **(2):** Directives; **(*)** Proposal; **(3):** includes six Regulations; **(4):** includes three Directives; **(5):** includes three Directives; **(6):** includes eight Regulations; **(7):** persistent organic pollutants; **(8):** strategic environmental assessment; **(9):** applies to universities as major consultees and with regards to protected sites; (**10):** environmental impact assessment

University functions, impacts on biodiversity and legal obligations

Capital projects in university campuses often involve master planning and large-scale land development and building work. Consequently, the whole range of legal obligations for biodiversity applies to capital projects (Table 3). To ensure legal compliance it is common to

undertake ecological impact assessments, and if necessary mitigation, during the master planning and development of new university campuses.

However, university estate managers may overlook that day-to-day grounds maintenance functions have to comply with almost as many legal obligations as capital projects (Table 3). The use of biocides, heavy machinery and intensive maintenance methods; and dealing with ornamental plants, pests and invasive species make grounds maintenance liable to a number of legal obligations, related to both protected and non-protected species. While the former may be taken into account during maintenance, the latter most often will not.

Table 3: University functions and corresponding potential legal obligations

Functions	EN	SP	CS	MS	ST	M	BN	SB	AU	W	PL
Capital projects	•	•	•	•	•	•	•	•	•	•	•
Building alterations			•			•	•				
Grounds maintenance	•	•	•	•	•	•	•	•	•	•	
Outdoor activities	•	•	•					•			

For abbreviations of obligations see Table 2 footnote

Universities are prohibited (BN column; Table 4) to impact in any way on protected species or habitats (SP and ST columns, Table 4). If any university functions are likely to cause a significant impact on protected species or habitats the relevant authority must be notified and authorisation gained (AU column; Table 4). Additionally, universities must ensure that day-to-day grounds maintenance follows permitted methods for dealing with introduced species, pollution discharges, handling biodiversity and pests (M column, Table 4). Also, it is important to be aware of the legal obligations relating to dealing with controlled substances and species (SB and CS column respectively, Table 4) as well as managed species (MS column, Table 4).

Table 4: University biodiversity impacts and corresponding potential legal obligations

Impacts	EN	SP	CS	MS	ST	M	BN	SB	AU	W	PL
Loss		•			•		•		•		•
Damage		•			•		•		•		•
Disturbance		•			•		•		•		•
Introductions	•	•	•	•	•	•	•		•		
Pollution	•	•		•	•	•	•	•	•	•	
Use		•	•	•	•	•	•	•	•		
Disease	•	•	•	•	•	•	•		•		

For abbreviations of obligations see Table 2 footnote

Discussion: Interdisciplinary legal framework

Wildlife legislation has been the main focus of European nature conservation law reviews (Henle et al, 2013; Mauerhofer, 2011; Pettersson and Keskitalo, 2011; O'Connell and Yallop, 2002). Some limited aspects of pollution legislation (e.g. Water ((COM) 2000/60/EC) and Marine ((COM) 2008/56/EC) Framework Directives) and spatial planning policy (e.g. Strategic Environmental Assessment Directive; (COM) 2001/42/EC) appear in reviews (Henle et al, 2013; Pettersson and Keskitalo, 2011). However, this research revealed a wider range of wildlife, planning and pollution legislation than previous studies. Also, it revealed that European legislation from the area of plant health has not been covered before. Organisations may assume that enforcement of biodiversity legislation depends on avoiding damage to the species and habitats covered in the Habitats ((COM) 92/43/EEC) and Birds

((COM) 2009/147/EC) Directives (Henle et al, 2013). However, requirements to protect non-listed as well as listed flora, fauna and landscapes exist throughout the plant health, planning and pollution related legislation.

Compliance challenges

More legislation refers to managing impacts on non-listed flora and fauna and of the environment in general than to protected species and sites (Table 2). This suggests that organisations ought to consider both protected and non-protected elements of the natural environment. In the UK, several universities have established campus biodiversity audits and action plans (e.g. University of Brighton, Brunel University, and University of Chester). These plans often audit protected and non-protected species and/or sites, even though the focus tends to be on the former. Information and vertical integration gaps make it difficult to comply with European biodiversity legislation (Henle et al, 2013; Mauerhofer, 2011; O'Connell and Yallop, 2002). So, complying with duties to protect non-listed species and sites may be unlikely.

Although legislative measures to protect species and sites are necessary they tend to be reactive, static and fragmented (Pettersson and Keskitalo, 2011; Kundis Craig, 2010). This increases the complexity of biodiversity legislation and reduces its flexibility. The former present challenges to identifying and complying with all relevant obligations and the latter tends to concentrate efforts only on listed species or sites. Consequently, legislative measures alone may not be effective in addressing biodiversity conservation holistically (Pettersson and Keskitalo, 2011; Kundis Craig, 2010). Additional voluntary, financial and other instruments are needed to complement legislative measures (Pettersson and Keskitalo, 2011; Kundis Craig, 2010).

Integration challenges

There are opportunities to integrate biodiversity considerations into existing mechanisms rather than duplicating policies (e.g. potential damage to plants, animals or sites integrated in health and safety, risk assessment and control of substances hazardous to health mechanisms). The main challenge in integration is the lack of clear communication between legal, research and operations departments (O'Connell and Yallop, 2002).

Biodiversity related issues are mentioned passively but not discussed in detail in existing literature regarding environmental management of universities (Wright and Wilton, 2012; Alshuwaikhat and Abubakar, 2008). Poorly maintained, unmanaged or wild looking green spaces tend to be perceived negatively by people in urban areas and may be associated with ecosystem disservices (Sadler et al, 2011; Tzoulas and James, 2010). However, there could also be strategic reasons for maintaining high quality green spaces on campus.

For example, the Green League Table ranks UK universities according to their environmental performance against eight impact areas: waste, transport, procurement, water, construction, emissions, community, and biodiversity (People and Planet, 2013). Green League requires universities to have a policy on biodiversity with time bound targets to improve species and/or habitat diversity, which must be reported annually (People and Planet, 2013). These requirements create an incentive for UK universities to integrate biodiversity at a strategic as well as operational level in order to gain a high ranking.

It has been possible to map university functions and impacts and their relevance to different legal obligations for biodiversity protection. The matrices developed can be used for quick referencing relevant duties to consider when different operations are undertaken. Mapping functions and impacts against obligations allows for easy navigation though a complex legal framework. The research presented here could be used in universities across

Europe by decision-makers, environmental managers ensuring compliance with, and educators teaching and students studying biodiversity legislation.

Conclusion

There is a complex European legal framework for conserving biodiversity that applies to the higher education sector. Legal obligations cover protected habitats and species; non-protected plants, animals and landscapes; controlled plants, animals and substances; and pollution. By covering nature conservation, spatial planning, pollution and plant health legislation this research facilitates a holistic approach to auditing and ensuring compliance with European biodiversity legislation. Moreover, throughout this chapter opportunities for integrating strategically and operationally biodiversity conservation in campus management have been outlined.

Whilst impacts on biodiversity during capital projects are usually considered, and when necessary mitigated, this may not be the case with day-to-day grounds maintenance. Non-compliance with biodiversity legislation is more likely to come from the latter than the former. However, since there is no reporting mechanism for harming un-protected plants or animals such impacts may be overlooked or even knowingly ignored. Further research is needed to establish how biodiversity conservation is integrated in the management of university campuses and the reasons why it may or may not be seen as a priority.

Developing green infrastructure and land use complementation on campus present opportunities to integrate biodiversity conservation at a strategic and operational level across universities. For example, applying land use complementation principles from the planning stage and throughout the life time of a new university campus (Colding, 2007). However, this would require the integration of biodiversity issues throughout key university policies. Additional research is needed to establish the role of universities have to play in local, regional and international biodiversity conservation though the management of their campuses.

The research presented here offers a starting point for ensuring compliance with European biodiversity legislation. However, like all publications this chapter can only provide a snapshot in time. Thus, continuous updating of legislation necessitates ongoing reviews of the legal obligations reported in this chapter. Even if universities were fully compliant with legislation relating to protected sites and species it is likely that they could overlook impacts to other non-listed plants and animals. University policies need to explicitly identify whether the aim is compliance with biodiversity legislation or contributing to nature conservation. Whilst the latter could ensure the former, the opposite may not be the case.

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