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Developing the Potential of Third-level Campuses as Change Agents in Transition towards Sustainable Communities

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Rialtas na hÉireann
Government of Ireland

ENVIRONMENTAL PROTECTION AGENCY

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- Office of Communications and Corporate Services

The EPA is assisted by an Advisory Committee of twelve members who meet regularly to discuss issues of concern and provide advice to the Board.

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Developing the Potential of Third-level Campuses as Change Agents in Transition towards Sustainable Communities

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Contents

List of Figures and Tables

Figures

Tables

Executive Summary

In relation to experimentation with, and demonstration of, novel management approaches and technologies designed to enhance sustainability, higher education institution (HEI) campuses have been identified as ideal testing grounds, as they embrace a diverse population and act as a microcosm of wider society, and control space for demonstration projects. Equally important, through their functions of teaching, research and outreach to the wider community, HEIs have the potential to act as catalysts in moving society to a more sustainable future.

The objectives of this study were to:

- identify sustainability and resource efficiency opportunities for third-level campuses and develop appropriate indicator sets to track progress;
- compile and develop relevant case studies of best practice interventions and activities of campus sustainability initiatives;
- calculate the resource efficiency capacity of third-level campuses according to their classification and evaluate the potential of campuses to drive community sustainability;
- develop plans and recommendations to assist campuses, policymakers, support agencies and communities to realise the potential of third-level campuses as change agents in the transition towards sustainable communities.

An international literature review revealed many feasible options for HEIs to contribute to the transition to greater sustainability, both on campus and through community engagement activities. Sustainability indicators, national and international case studies and technological solutions were investigated from academic and grey literature and information gained from interviews and campus visits. Quantitative methods were employed to establish the current level of adoption of technological solutions in Irish and other campuses, and the future potential for additional actions to further reduce environmental impacts.

Key findings are as follows:

1. At international and national scales, HEIs have developed a range of policies and have taken subsequent actions to enhance campus and wider community sustainability.
2. Private sector and other funding for on-campus activities is available, but funding issues remain.
3. Within higher education there is a need for the adoption of a standard and recognised approach in developing its role in supporting national policies related to achieving greater sustainability.
4. There is need for a standardised and transparent approach to evaluation of the contribution of HEIs in meeting national and international environmental targets.
5. Significant gaps in relevant data collected and published by Irish HEIs exist and there is a need for an agreed common approach in the selection of indicators, assessment frameworks and reporting structures.
6. As of 2018, Irish HEIs did not have sustainability offices with a co-ordinating and pro-active role and that were accessible to the public.
7. Better on-campus co-ordination, with clear statements of staff roles and responsibilities, would provide new opportunities within HEIs and facilitate the active involvement of the wider community.
8. HEIs have shown that they have the capacity to develop relevant multidisciplinary research, but this needs to be greatly expanded.
9. HEI sustainability strategies and strategic action plans need to share national sustainability objectives and their level of ambition.
10. Many communities require support from HEIs in their sustainability transition, through a range of activities including, among others, expertise and information provision, on-campus demonstration projects and community-based joint projects.
11. In relation to on-campus sustainability, technological opportunities exist in relation to improving energy efficiencies, reducing mains

water use, improving waste management and changing transport modes.

Summarised recommendations are as follows:

1. Updated government-led policy is needed for higher education to fulfil its role, and the Higher Education Authority and relevant government departments and agencies are in a position to provide leadership and oversight.
2. All HEIs should be required to have an accessible campus sustainability policy that is linked to their community outreach policy.
3. For all HEIs, relevant data should be collected on an annual basis and published online.
4. All taught programmes should include at least one module exploring sustainability issues relevant to the discipline.
5. For all HEIs, a sustainability office should form an integral part of the management structure, providing accessibility and information and co-ordinating activities for students, staff and the wider community.
6. Outreach to wider society should be seen as a core duty for relevant academic and administrative staff and should be given equal status to industry collaborations.
7. Innovative sustainability-focused research, multidisciplinary where appropriate, should become a core focus of HEIs.
8. Implementation of policy goals should be linked to measurable targets and target dates. Audits and assessments should support continual improvement.
9. Funding sources from the private sector should be exploited. To meet national policies, further public ring-fenced investment is required for deployment of sustainable technologies at HEI campuses.
10. With regard to sustainability, HEI campuses should be developed as arenas for experimentation, testing, adaptation, demonstration and dissemination to wider society.

1 Research Context and Introduction

It has been argued that environmental challenges exist that threaten significant perturbation of global environmental functioning, including ozone depletion, climate change and plastic waste pollution (Cornell *et al*., 2018). Similarly, it has been argued that our current established organisational, institutional and political structures require a paradigm shift to facilitate a transition to a more sustainable future (Markard *et al.*, 2012). Together, these observations suggest that planning to minimise such perturbations should be both ambitious and urgent. Higher education institutions (HEIs), through their role in the research, education and training landscape, can be said to control the dissemination of any concept (Amador and Padrel Oliveira, 2013). Much has been done in this regard, and opportunities abound; however, HEIs "urgently need to strengthen their efforts to solve the pressing problems of this planet" (UNEP, 2014; ISCN, 2016). This research begins with a literature review exploring the responses of HEIs to the sustainability imperative and the efforts made thus far by academics, universities and civil society organisations to evaluate the success of these endeavours. Included in the review are published and grey literature from peer-reviewed journals and book series, as well as the websites of HEIs, national and international associations [such as the Association for the Advancement of Sustainability in Higher Education (US) and the Environmental Association for Universities and Colleges (UK)] and international networks [such as the International Sustainable Campus Network (ISCN) and Global University Leaders Forum (GULF) of the World Economic Forum]. This review of published and grey literature informed the selection of best practice case studies and indicators, which in turn informed the development of future scenarios for sustainable development in higher education (HE).

The extent of the environmental impact of the HE sector is debated in the literature. Sonetti *et al.* (2016) calculated that education accounted for 6.8% of the total European Union (EU) energy consumption while Lang and Kennedy (2016) determined that, worldwide, education accounted for 2.5% of energy use. The environmental impact of the HE sector in Ireland has not been investigated to date, but several factors indicate that it may be significant and growing. Enrolment in Irish HEIs is expected to increase by almost 50,000 students over the period 2014–2028 (DES, 2014). Ireland has one of the highest percentages of HE graduates in the EU (Eurostat, 2016a). Research activities may be the most significant in relation to emissions and Europe-wide targets aim to almost double the percentage of gross domestic product (GDP) allocated to research by 2020 (to 3%) (Eurostat, 2016b). There is an imperative therefore to ensure that the development that must occur to reach these targets can happen in a way that contributes to greater sustainability. Undeniably, however, a significant impact of HE with regard to the sustainability agenda may be through its role in transforming the societies in which it operates (Jones, 2013). In leading by example, HEIs not only can address sustainable consumption in their own operations, but also, as educators of the future, can demonstrate the most effective techniques and technologies (Amaral *et al.*, 2015).

1.1 Project Objectives

The role of HEIs as change agents for sustainable communities is an underdeveloped theme, particularly within Ireland. A wealth of bottom-up sustainability initiatives exist; however, it could be argued that top-down supporting policy and top-down measures are limited in scope and ambition. Although some Irish HEIs have embraced sustainability as key to their mission, the HE sector represents a largely underexploited resource to drive societal sustainability through both on-campus actions and the wider dissemination of information and expertise. There is considerable value in exploring the role of HEIs in terms of how they can contribute to the transition to sustainable communities. Within this context, the project objectives were to:

- identify sustainability and resource efficiency opportunities for third-level campuses and develop appropriate indicator sets;

- compile and develop relevant case studies of best practice interventions and activities of campus sustainability initiatives;
- calculate the resource efficiency capacity of third-level campuses according to their classification and evaluate the potential for campuses to drive community sustainability;
- develop plans and recommendations to assist campuses, policymakers, support agencies and communities to realise the potential of third-level campuses as change agents in the transition towards sustainable communities.

Four work packages were completed to achieve these objectives.

1. identification of resource efficiency opportunities for third-level campuses and development of appropriate indicator metrics;
2. calculation of the resource efficiency potential of third-level campuses and evaluation of the potential of campuses to drive community sustainability;
3. realisation of the potential of third-level campuses as change agencies in the transition towards sustainable communities;
4. project management and dissemination of research findings.

1.2 Synthesis Report Structure

This synthesis report presents the outputs from each work package. Chapter 2 presents indicators for the HE sector; Chapter 3 identifies and evaluates best practice case studies; and Chapter 4 explores campus characterisation and the feasibility of employing available technologies on campus. Chapter 5 investigates decarbonisation pathways for the Irish HE sector and Chapter 6 presents policy recommendations arising from this research project.

2 Indicators and Assessment Tools

2.1 Introduction

A wide variety of methods to measure progress towards greater sustainability on campuses has been reported. The approach adopted here was to use a set of indicators for both on- and off-campus actions and activities. Indicators were selected to represent important aspects of enhancing sustainability that were already measurable or feasible to be measured (UNEP, 2014). The purpose was to monitor annual progress made by campuses, but not to facilitate inter-campus comparison, as HEI campuses vary greatly in their attributes and potentials.

2.2 Indicators Selected

Until recently in Ireland, the indictor adopted to estimate the scale of an HEI's support meeting national environmental sustainability objectives, as measured in the Higher Education System Performance Framework 2018–2020 (HEA, 2018), was the award of green flags, which in turn reflected the number and range of self-reported campus-based actions and activities. However, in 2018, one university commenced publishing a wide range of data relevant to sustainability issues. It was necessary to restrict the number of indicators, as for many campuses, especially perhaps the smaller ones, the collection of necessary data might have been seen as arduous. The research team worked collectively to identify all candidate indicators, based on literature review and site visits, and subsequently reduce their number to a workable number. The indicators finally selected fall into two categories: the first are seen as core indicators that all campuses should publish and the second are those that might be selected depending on campus attributes and capabilities. Distinction was made between indicators for on-campus activities and actions and indicators for the dissemination of knowledge and expertise to the wider community. The campus-related indicators embrace the environment through operations, governance and education. They include a wide range of areas and are designed to provide baseline data against which change may be assessed. Indicators relate to energy, transport, water, waste, buildings and biodiversity (Table 2.1). The core off-campus indicators embrace outreach to wider society, relevant research and community and industry links (Table 2.2). These were considered to best reflect the complexity of possible actions to enhance sustainability, while at the same time remaining feasible for adoption by HEIs.

2.3 Discussion and Conclusions

Reporting, monitoring and evaluating data from both on-campus and off-campus activities is highly important. At present, there is no standard regarding the monitoring of sustainability performance of Irish HEIs. Although many Irish HEIs are engaged in the Green-Campus Programme and Campus Engage Network, there are also many that are not engaged. Furthermore, under the Green-Campus Programme, data are not publicly available. As of 2018, the system did not allow the public to see the efforts of Irish HEIs in addressing sustainability. Unlike other EU countries, such as the UK, policy relating to sustainable development and the HE sector in Ireland is unclear. Monitoring and reporting on sustainability is not a requirement, nor is it linked to funding. Standardised data collection and public reporting aids in the recognition of work carried out by HEIs and provides evidence to support the conclusion that substantial additional funding should be forthcoming and ring-fenced for enhancing HEI sustainability, as is normal in other EU states, and that efficiency savings should be retained by the HEI for investment in further measures to enhance sustainability.

Table 2.1. Core on-campus indicators selected for Irish HEIs

Activity type	Indicator
Environment	
Energy	Scope 1 and 2 GHG emissions (tCO_{2e})
	Total energy consumption – electricity (kWh)
	Total energy consumption – thermal (kWh)
	On-site renewables – wind, solar, geothermal (kWh)
Transport	GHG emissions – commuting transport (tCO_{2e})
	GHG emissions – fleet and grounds vehicles (tCO_{2e})
Water	Potable and non-potable water consumption (m^3)
	Wastewater production (m^3)
	Proportion of pervious/impervious surfaces (m^2/m^2)
Waste	Solid waste disposal (kg)
	% of operational waste recycled
	% of operational waste composted
	WEEE (kg)
	Food waste (kg) – residential/non-residential
	Gross internal area (m^2)/roof area (m^2)/grounds area (m^2)
Buildings	% of new builds certified to green standards (BREEAM, Passivhaus)
Biodiversity	% of landscape managed according to a sustainable management programme, or organic certified or otherwise protected
Governance	
	% of university policies related to sustainability (list provided)
	Does the institution have a sustainability report? (yes/no)
	Does the institution have a sustainability action plan? (yes/no)
	Institution has at least one sustainability committee, office and/or officer (yes/no)
	% of FTE staff responsible for sustainability management
Education	
	Number of courses with an industrial placement in the field of sustainability
	% of modules related to sustainability concepts
	Number of student groups with a sustainability focus
	% of courses with applied research/learning on campus/in the community
	Number of organisations, charities, civil and civic society organisations, etc. collaborating to offer accredited community-engaged teaching, learning and research modules

BREEAM, Building Research Establishment Environmental Assessment Method; FTE, full-time equivalent; GHG, greenhouse gas; tCO_{2e}, tonnes of CO_2 equivalent; WEEE, waste electrical and electronic equipment.

Table 2.2. Core off-campus indicators selected for Irish HEIs

Activity type	Indicator
Outreach	
	Number of partnerships for sustainable development with community groups at local level
	Number of student groups focusing on one aspect of sustainable development
	Presence of collaborations with other HEIs to advance sustainable development on campus (yes/no)
	Outreach materials that foster sustainable development knowledge produced (yes/no)
	Institution holds at least one sustainability-related outreach campaign directed at students (yes/no)
	Percentage of new employees offered orientation/guidance materials covering sustainable development
	% of continuing education courses that address sustainability
	Institution's affiliated hospital is a member of a sustainable hospital programme (yes/no)
	% of hosting organisations that report positive experiences working with student volunteers on sustainability projects
Research	
	% of multi-/interdisciplinary sustainability research projects
	% of graduate students carrying out research into sustainability
	% of faculty members carrying out research into sustainability
	Number of committees, advisory boards and working groups that advance engaged research practices and cross-sectoral collaborations
	Number of publications with a focus on sustainability
	Number of centres on campus providing sustainability-related research
	% of departments that conduct sustainability research
	Number of research collaborations with non-profit organisations
	Number of endowed professorships or chairs on sustainable development
Industry	
	% of GDP spent on sustainability research
	Number of industry and HEI sustainability collaborations
	Number of industry partners in course development and sustainability research activity
	Number of courses with an industrial placement in the field of sustainability
	Research and development budget for sustainability in collaboration with industry and HEIs

3 Key Findings of Case Studies

3.1 Introduction

This chapter summarises the findings of 19 case studies that examined the implementation of sustainability-related measures, as of 2018, within HEIs in Ireland, the UK, Germany, Austria, Denmark, Norway, Portugal and the USA. Key attributes of HEIs that supported the implementation of sustainability are identified.

3.2 Case Study Selection

The case studies were selected on the basis of information gained through online data published by HEIs, HEI websites, literature that assessed the success of actions undertaken, colleagues in other HEIs, and campus visits. The purpose was to identify best practice and the attributes of HEIs that facilitated progress.

3.3 Results

Higher education institutions differed markedly in key attributes, such as campus form and area, date established, setting, number of students and staff and building area per full-time student equivalent. Clearly, it is not feasible that every HEI could replicate the actions reported in case studies. Rather, the analysis was designed to identify attributes of HEIs that correlated with novel action on enhancing sustainability.

3.3.1 Organisational structures linked to successful implementation of actions

At an international level, HEIs adopted a range of structures to support innovative practices. Of note, innovative HEIs frequently established sustainability offices with permanent members of staff, which had close contact with relevant departments, committees, teams, councils and working groups, including students. Sustainability office personnel maintained regular contact with senior management, to exchange information and ensure institutional support for initiatives. Some Irish HEIs had employed sustainability officers, but, on the basis of available information, as of 2018, none had established a sustainability office. Top-down leadership, or the appointment of senior management members with explicit roles in promoting sustainability, was seen as crucial.

3.3.2 Publication of policy

For many of the international HEIs studied, policy in relation to sustainability was precise and ambitious. For most Irish HEIs, policy statements were not as precise and related to projects undertaken on campus by academic staff and students, which were relatively small scale and, of necessity, had limited ambition. However, there were exceptions to this generalisation: on some Irish campuses much more was achieved than was evident from websites and institutional policy statements appeared not to reflect the level of activity on the ground. For Irish HEIs, off-campus dissemination of knowledge and expertise to surrounding communities attracted less attention. International case studies indicated clearly that HEIs see themselves as having a clear role in extending knowledge, expertise and other aids to surrounding communities, and they have policies that reflect this role. Many Irish HEIs have a policy on links with industry, as have international HEIs.

3.3.3 Monitoring of success in achieving targets

For HEIs in Ireland and elsewhere, there was no agreement on a single standard approach to monitoring the success of institutions in enhancing sustainability (Bullock and Wilder, 2016). Within Ireland, for some HEIs, the green flag awarded by An Taisce provided a means of reporting progress made. Three Irish and four international HEIs had adopted the Universitas Indonesia (UI) GreenMetric method to monitor progress (UIGreenMetric, 2018) and one Irish HEI received a STARS (Sustainability Teaching Assessment and Rating System) award (STARS, 2019). An aim of this project was to facilitate supporting progress towards greater sustainability by developing a monitoring method that was applicable to all Irish HEIs and was not linked to a ranking process.

3.3.4 Networks for sustainability

Many Irish HEIs were members of the Campus Engage Network or the Green-Campus Programme. At the international scale a majority of HEIs studied were linked to multiple networks supporting sustainable actions, which might be expected to generate greater opportunities for dissemination of best practice.

3.4 Discussion and Conclusions

The case studies showed that there was no agreed standard approach taken to incorporate sustainability within HEIs, both nationally and internationally. The case studies were selected because of their pro-environmental policies and actions. However, it is unlikely that they are representative of all HEIs in these countries as previous work has found that, at the international scale, for a majority of HEIs, taking a leading role in promoting sustainability is not a policy priority (Bilodeau *et al.*, 2014; Lozano *et al.*, 2015). Rather, the implementation of sustainable development was attempted within departmental structures rather than within interdisciplinary teams, and with a focus on on-campus actions.

3.4.1 Policy, strategies, initiatives and outreach to communities

Not all Irish HEIs had published detailed policy statements and this raised the possibility that HEIs had developed such policies, and were in practice engaged in relevant actions, but had not publicised them. It should be noted that, by the conclusion of this research project, two Irish HEIs had started to report on their policies and actions and it became clear to the research team that more activity was taking place than had been previously been made public. Best practice would suggest that policies and plans should be structured around targets and dates for completion, with a range of indicators adopted to measure progress made in achieving objectives, to allow verification of outcomes. In comparison, Irish HEIs in the past have not published such information (Horan *et al*., 2019a). The focus has been on operational and technological strategies aiming to enhance resource efficiencies, with much less attention paid to global challenges, for example decarbonisation (Adams *et al.*, 2018).

As a generalisation, both in Ireland and elsewhere, historically the criteria adopted in judging academic quality did not reward engagement with communities, nor did they allow sufficient time for researchers to collaborate with off-campus partners (other than industrial partners) to help find solutions to their problems (Stephens *et al.*, 2008). In Ireland, action by staff and students has often been undertaken on a voluntary basis, without the expectation of reward, with an attendant lack of continuity in maintaining longer term activities. Until recently, compared with campus-based initiatives, off-campus collaboration was less frequently reported by HEIs. For outreach to become a core duty for academic and administrative staff, and fully recognised as part of the HEI mission, the review of case studies suggested that supporting structures are needed, examples of which are described in Table 3.1. This in turn may be expected to enhance the capacity of HEIs to engage successfully with off-campus partners. Supporting structures and new initiatives require funding, and in the current context this represents a challenge for Irish HEIs. It is noteworthy that, at the international scale, major strides towards greater sustainability have followed when campus expenditure was reduced through efficiency gains in, for example, energy and water consumption, with the money saved being made available for additional actions to further enhance sustainability, supporting a cycle of continual improvement.

3.4.2 Monitoring and performance

At the international scale, reporting on the success or failure of actions designed to promote sustainability was found to be exceptional (Lozano *et al.*, 2015). Until recently, Irish HEIs have published little relevant information and that which was published was not collated in an easily accessible location on websites. Locating it was therefore difficult and time-consuming. In relation to international case studies, information was much more readily available, either through the HEIs' own websites or in publications by national government agencies. For Irish HEIs, these data gaps have resulted in underestimation of the initiates being undertaken, with an attendant lack of widespread acknowledgement of progress made by some HEIs and, perhaps, curtailing of opportunities for HEIs to learn from each other.

Table 3.1. Attributes of successful HEIs in supporting action for greater sustainability

Best practices identified	HEI international examples	Published sources
• Sectoral- and institutional-level commitment: strong, engaged and supportive leadership	British Columbia, Ball State, UC Davis	Bilodeau *et al.* (2014); Trencher *et al.* (2014)
• Championed by an informed person in a sufficiently senior position to make decisions and access a budget		
• Deans or their appointees in all faculties act to ensure that modules on sustainability are included in all taught programmes		
• Formal organisation for sustainability with permanently staffed sustainability office as part of HEI management structure and linked to faculties and academic departments, providing a point of contact for staff, students and members of the community	Brighton, Ball State, UC Davis	Hart *et al.* (2009); Trencher *et al.* (2014)
• Mission, vision and values explicitly supporting sustainability	British Columbia, Brighton, Manchester	Bilodeau *et al.* (2014)
• Policies that incorporate and support sustainability, such as green procurement, renewable energy, rainwater harvesting and enhancing biodiversity	Edinburgh, LSE, UC Davis, Nottingham	Hart *et al.* (2009); Bilodeau *et al.* (2014); Holm *et al.* (2015); Higgins and Thomas (2016)
• HEI strategic action plan and sustainability strategy with measurable targets, dates for completion, roles and responsibilities and long-term focus	NUIG, Ball State, BOKU, Nottingham, UC Davis, Copenhagen	Hart *et al.* (2009); Holm *et al.* (2015); Stough *et al.* (2018)
• Assessment framework with appropriate indicators, monitoring, evaluation of outcomes and public reporting procedures	LSE, BOKU, Ball State	Chalker-Scott and Tinnemore (2009); Hart *et al.* (2009); Disterheft *et al.* (2015); Holm *et al.* (2015); Stough *et al.* (2018)
• Money saved through environmental efficiency all available to invest in further actions, including revolving green funds	Harvard, Nottingham, Ball State	Northmore and Hart (2011); Trencher *et al.* (2014)
• Data on enhancing sustainability made publicly available online as a requirement to receive full government funding		
• Stakeholder involvement in decision-making processes with active involvement of students at all levels, with academic staff expected to contribute when they can	UC Berkeley, Ball State, UC Davis	Northmore and Hart (2011); Trencher *et al.* (2014); Holm *et al.* (2015); Higgins and Thomas (2016); Thomas and Deakin (2017)
• Awards and other recognition for both staff and students actively involved in sustainability and outreach	LSE, Edinburgh	Northmore and Hart (2011)
• Active encouragement of multidisciplinary research and teaching		
• Outreach viewed and funded as a core HEI function with a focus on solving “real world” problems that benefit the HEI and community		
• Living lab initiatives, with active collaborations with industry, business, consultancies, communities, local authorities and government agencies, seen as intrinsic to the function of HEIs	Umwelt-Campus Birkenfeld, Lisbon (Faculty of Sciences)	van Geenhuizen (2013); Bilodeau *et al.* (2014); Evans *et al.* (2015)
• Sustainability closely linked to research activity as a core function. Technological expertise available in house made available to the wider community		

BOKU, University of Natural Resources and Life Sciences, Vienna; LSE, London School of Economics; NUIG, National University of Ireland, Galway; UC, University of California.

3.4.3 Sustainability staff, including technology transfer offices and the living lab concept

As mentioned, sustainability offices may play a key role in capacity building (both within HEIs and between HEIs and the community), building trust, providing resources and maintaining relationships (Hart *et al*., 2009). Such offices also may play a role in gaining the support of, for example, municipalities, communities and industry, thus increasing the scope and ambition of HEI-led projects and actions. Data reported here for the numbers of staff employed in UK sustainability offices were located on HEI websites and may not accurately reflect current levels. Of the 160 UK HEIs for which environmental data were available online, 83 provided data on the total number of staff and the number of staff employed to develop HEI sustainability. Of these, the University of Edinburgh employed the largest number of staff to develop HEI sustainability ($n = 28$), resulting in a sustainability employee being in post for every 987 students and staff members. In Ireland, the Central Statistics Office publishes annually the total number of full-time student equivalents for HEIs. In 2017, a total of 172,687 students was recorded. If it is assumed that the University of Edinburgh sustainability staff number ($n = 28$) represents best practice in terms of scope of actions and level of ambition, then to reach the same ratio the Irish HE sector would require the employment of 173 sustainability staff.

The comparison between the University of Edinburgh and Irish HEIs was complicated as the exact number of sustainability staff employed within Irish HEIs in 2018 was unclear, as data were difficult or impossible to locate. Staff who were involved at least some of the time in enhancing sustainability were typically linked to the Green-Campus Programme or held positions within the Building and Estates Departments.

At the international scale, in addition to HEI collaboration with government, industry and business, many outreach activities partnered with communities were mentioned on websites. These aimed to test new ideas to help improve social, environmental and economic conditions. For Irish HEIs, it was difficult to estimate the extent of outreach activities related to sustainability, and very few collaborations were publicised. Clearly, such collaborations existed, for example in the University of Limerick academics in one department worked closely with Cloughjordan Ecovillage and those in other departments worked with the wider community on the re-use and recycling of waste electrical and electronic equipment. Other projects were identified that were designed to enhance community socioeconomic resilience but which were not explicitly linked to sustainability. The creation of sustainability offices within HEIs would facilitate not only on-campus sustainability but also outreach with the wider community so that all such collaborations and dissemination could be publicised. These offices could act to bring together representatives from many departments with, for example, technology transfer offices, Campus Engage and Knowledge Transfer Ireland, facilitating collaboration within and among HEIs. Campuses might develop living labs, where new technologies could be tested and students and staff made aware of their existence and significance. For example, Enterprise Ireland might aid in attracting companies to avail of campuses as living labs to demonstrate the effectiveness of new products, which might help to disseminate them within wider society.

Sustainability offices may function to consolidate and avoid the duplication of resources, and improve efficiencies, allowing multidisciplinary areas to work cohesively together. Crucially, they may act as an access point for information for both campus-based students, staff and individuals and also citizens and communities in the wider society. It might be expected that such offices would also co-ordinate data collection and storage and help fill the major data gaps that currently hamper examination of the potential of Irish HEIs to offer significant support to meeting government environmental targets. Currently, the Irish HEI sector remains a largely underutilised resource in meeting these targets. Clearly, HEIs have demonstrated their potential to showcase significant and continual improvements on campus. They may act as testbeds for new ideas, with the ability to lead by example and to share research findings and expertise on technologies and management with wider society, and engage as active partners with off-campus communities, industry and business to boost efforts to, for example, reduce greenhouse gas emissions.

4 Higher Education Campus Characterisation and Potential to Reduce Greenhouse Gas Emissions

4.1 Introduction

Again, major data gaps were identified in relation to the environmental impacts of the Irish HE sector, with disaggregated resource use data for the sector either not currently collected or not publicly available, and it was therefore necessary to develop methods for the estimation of impacts. To establish appropriate approaches to estimating Irish HEIs' resource use, a literature review was undertaken, which identified correlations between various HEI campus attributes and the level of energy use. This information was used to facilitate estimation of the environmental impacts of the Irish HE sector.

4.2 Baseline Carbon Emissions

For the year 2017, carbon emissions were estimated to be 891 tCO_{2e} for the Irish HE sector. This estimation was arrived at using both bottom-up and top-down approaches, with data sources being the Sustainable Energy Authority of Ireland (SEAI) and site visits. Top-down approaches were found to be useful in identifying carbon emission hotspots but needed to be supplemented by robust bottom-up data to allow for meaningful quantification of impacts and improvement over time (Horan *et al.*, 2019b). Although Scope 3 emissions, those arising from off-campus activities, were estimated to account for the largest share of the sector's emissions (330 tCO_{2e}), this research focused on the reduction in Scope 1 and 2 emissions as reliable bottom-up data were available to monitor impact reduction and HEIs had the greatest degree of control of carbon emissions on campus (Table 4.1).

4.3 Economic Feasibility of Technologies

The economic viability of carbon reduction measures was assessed in relation to building integrated and carport generating systems, as these were found to be cost positive at 2015 prices. Micro-wind installations and electricity-generating biomass boilers were found to be cost negative without government supports or subsidies. In 2018 there was little technical literature on capital and operating expenditure relating to rainwater-harvesting systems, both in Ireland and internationally. For this reason, calculations here of the potential financial savings arising from rainwater harvesting accounted only for the avoided cost associated with substituting demand for utility water supplies with harvested rainwater for greywater applications. The financial savings gained by replacing internal combustion engine campus vehicles with electric vehicles was not assessed here because of the large capital investment needed to replace all the current stock, although it is accepted savings would be made if such replacement was undertaken as fossil-fueled vehicles reached end of life.

Table 4.1. Total baseline annual CO_2 emissions for the Irish HE sector

Scope	Aspect	As measured by tCO_2 or tCO_{2e}
Scope 1	Stationary combustion	59,125
	Mobile combustion	613
Scope 2	Purchased electricity	107,979
Scope 3	Student commute	71,320
	Staff commute	21,983
	Waste	2191
	Water supply	739
	Waste water	1383
	Supply chain	232,558

4.4 Results

For the first time in an Irish HEI context, an assessment was undertaken of the potential for reduction in carbon emissions arising from building-integrated and carport photovoltaic (PV) electricity (Horan *et al*., 2019c), erection of micro-wind turbines, campus fleet electrification, and conversion from oil to biomass boilers for space heating. This study identified that there is potential for the HE sector to deploy and experiment with sustainable technologies on campus, with the national potential to install up to 42 MW of building-integrated PV electricity, 2.5 MW capacity micro-wind turbines and 37 MW of carport PV electricity systems, replace 12 GWh of heating oil demand with biomass boilers, replace 2.5 GWh of energy requirements from campus fleet internal combustion engine vehicles with electric vehicles, and harvest up to 850,000 m^3 per annum of rainwater, saving energy by reducing the consumption of potable water. The combined impacts of these technologies have the potential to reduce annual carbon emissions for the sector by 25% (Figure 4.1). This equates to a carbon saving of 45,517 tCO_2.

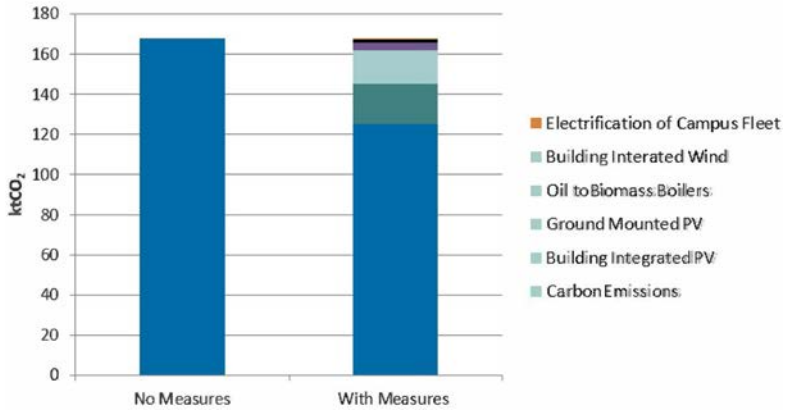

Figure 4.1. Carbon reduction potential of the HE sector (2016 data).

5 Decarbonisation Pathways for the Irish Higher Education Sector and a Higher Education Institution Role in National Sustainability Transitions

5.1 HE Sector Decarbonisation: Projections to 2030 (Scopes 1 and 2)

By extrapolating from historical trends relating to growth in building areas, full-time student equivalent numbers and energy efficiency gains at HEIs, coupled with national grid decarbonisation, absolute carbon emission projections for the Irish HE sector were estimated for three scenarios. These were (1) no improvement in energy efficiency post 2016; (2) extrapolating current progress of the National Energy Efficiency Action Plan (DCCAE, 2017); and (3) the National Energy Efficiency Action Plan trajectory plus additional measures of on-campus PV installation, on-campus wind energy generation, electrification of campus vehicle fleets and switching from heating oil to biomass for space heating.

Based on the evidence of what was technically possible in 2018, Figure 5.1 displays estimates for these scenarios relative to a 2009 baseline. By 2030, for the first scenario there would be an 8% increase in emissions (13,067 tCO_2); for the second scenario a 17% decrease in emissions (28,959 tCO_2); and for the third scenario a 36% decrease in emissions (59,027 tCO_2). Measured using the efficiency metric of carbon emissions per full-time student equivalent, the improvement relative to 2009 for the third scenario was projected to be 57% by 2030. These projections highlight what is technologically feasible in terms of carbon reductions for Irish HEI campuses.

5.2 Integrated Approach to Evaluate the HE Role in National Sustainability Transitions

To inform the potential role of HEIs in national sustainability transitions, a novel integrated approach was developed. This is titled Higher Education Advancing Development for Sustainability (HEADS) and utilises quantitative systems analysis, sociotechnical analysis and initiative-based learning (living lab) perspectives. Based on a literature review of each perspective, a configuration of the approach was developed.

It was decided that the quantitative systems analysis perspective was to be applied to national-level sustainability transition projections to identify arenas where HEIs may take actions to best serve wider societal sustainability transitions. The sociotechnical analysis perspective entailed using a multiphase concept of transitions (the ideal pattern that represents a transition process following an S-shaped curve

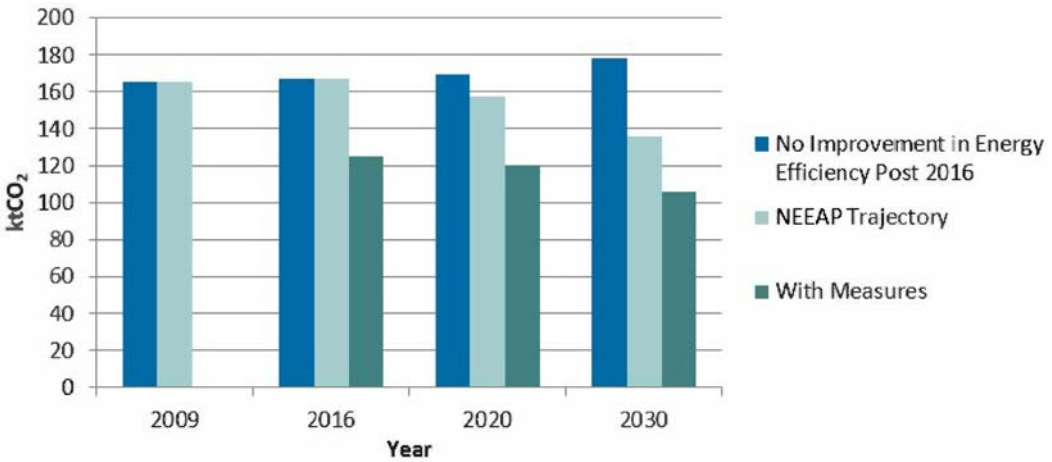

Figure 5.1. Dynamic scenarios of carbon reduction (DCCAE, 2017).

through the phases of pre-development, take-off, acceleration and stabilisation) and a novel framing of HEIs as niche actors using the multilevel perspective of society (niche, regime and landscape levels of structuration). The initiative-based learning aspect entailed utilising a living lab perspective to identify experimentation and demonstration of sustainability solutions currently taking place at some HEIs and how lessons learned may be replicated by other HEIs and up-scaled to wider society. Each of these perspectives was integrated into an approach that was specifically adapted to guide HEI actions in facilitating national sustainability transitions. The linkages between the perspectives are shown in Figure 5.2.

The HEADS approach links projections of sustainability transitions at the national level to experimentation and demonstration of sustainability solutions at the local level by HEIs. The multilevel nature of the sociotechnical analysis perspective serves as a link along the spatial dimension between national level-focused projections and on-the-ground experimentation and demonstration. This link is achieved by conceptualising HEIs as niche actors interacting with national sociotechnical systems and regimes. Along the temporal dimension, the quantitative systems analysis and living lab perspectives both focus on informing future trends while the sociotechnical perspective looks to the past to identify the role that HEIs have played in previous national transitions, utilising the multiphase concept and the multilevel perspective (niche, sociotechnical systems and landscape actors), which is then used to guide future HEI actions in sustainability transitions.

By applying this approach to national electric vehicle transitions, it is evident that the role of Irish HEI campuses in niche development is being exploited to a very limited extent, with 196 extra charging points needing to be installed at Irish HEIs to match the 2018 Norwegian ambition. Mechanisms of operation from international best practice to aid niche development relate to initiatives linking renewable energy generation to campus EV charging points, smart charging research and normalisation activities on campus. The approach was also applied to national electricity generation transitions, with an additional 690 kW of on-site PV electricity required at Irish HEIs to match the 2018 UK HEI sector ambition levels. Mechanisms of operation from the international literature relate to various actions, for example testing PV performance on campus and funding mechanisms such as revolving green funds, power purchaser agreements and university-funded installations. By positioning HEIs as niche actors within national sustainability transitions, the approach identified the potential of Irish HEIs in facilitating national sustainable technology niche development.

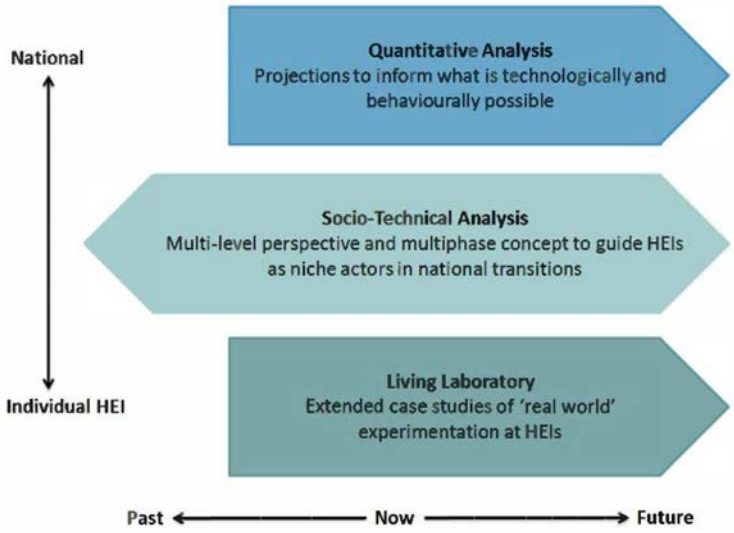

Figure 5.2. The HEADS approach. Source: Horan *et al.* (2019c). This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY 4.0) license (http://creativecommons.org/licenses/by/4.0/).

5.3 Discussion and Conclusions

The combined decarbonisation potential of the carbon reduction measures identified in Chapter 4 was projected to reduce absolute carbon emissions for the Irish HE sector by 36% (59,027 tCO_2) by 2030 relative to 2009 baseline figures. Measured using the efficiency metric of carbon emissions per full-time student equivalent, the improvement relative to 2009 was projected to be 57% by 2030. These projections highlight what is technologically feasible in terms of carbon reductions for Irish HEI campuses.

6 Integrating On-campus and Outreach Activities to Maximise the Higher Education Institution Role in Enhancing Sustainability

Literature searches revealed that a majority of authors agree that a whole-systems approach is required in addressing the need for HEIs to play a full role in enhancing national-scale sustainability. A mechanism for this, developed in this study, is presented in Figure 6.1, in which examples of policies, technologies, actions and events are included, together with the policy and management linkages.

6.1 Recommendations

The following recommendations are proposed.

Recommendation 1: Updated government-led policy is needed for the Irish HE sector to reach its potential to support society-scale sustainable development and the Higher Education Authority (HEA) and Department of Education and Skills should be given more authority and resources to provide leadership and oversight.

As of 2018, the most recent strategy released by the Irish government concerning HE and sustainability was the National Strategy on Education for Sustainable Development in Ireland, 2014–2020 (DES, 2014). Within the National Mitigation Plan (Government of Ireland, 2017), the government proposed an initial €7.6 billion of public funds to be invested in low-carbon projects between 2018 and 2027, as part of plans within the Project Ireland 2040: National Planning Framework (Government of Ireland, 2018a). It forecasted that this will unlock an additional €14.2 billion of private financing from commercial semi-state bodies. However, these documents do not explicitly acknowledge the role of HEIs in the planned process of decarbonisation. This points to a need for an updated policy for HE and its role in promoting sustainable development. Appropriate departments or state bodies should be given the authority and resources to aid the HE sector in enhancing leadership

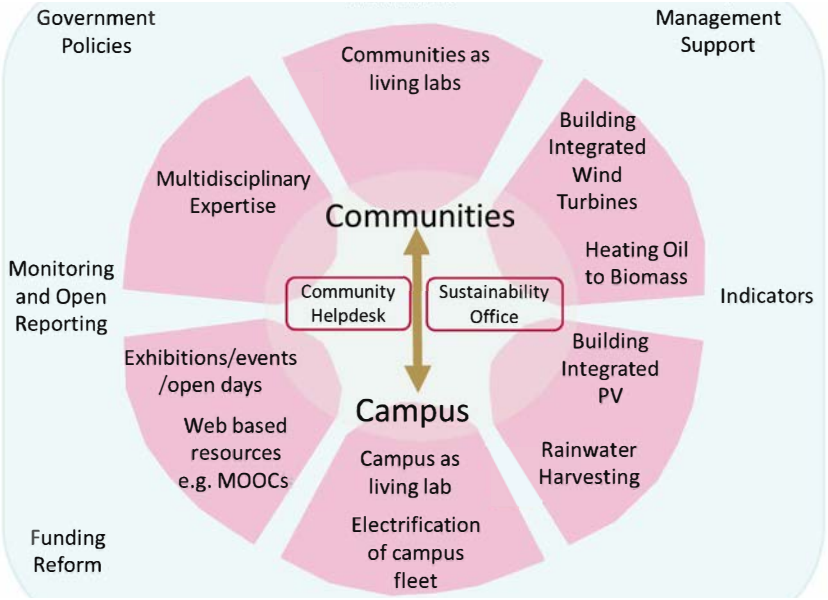

Figure 6.1. Whole institution approach: government policies, HEI policies, management support, monitoring and open reporting, use of indicators and funding reform all influence and impact on HEI campus policies and actions and their outreach capabilities. The sustainability office may facilitate communication within the campus and with the wider community (after Disterheft *et al.*, 2015 and Leal Filho *et al.*, 2015). MOOC, massive open online course.

and guidance in the context of a difficult transition period to societal-scale sustainability.

Recommendation 2: All HEIs should be required to have a published and accessible campus sustainability policy linked to their community outreach policy.

There is no current requirement for HEIs to have a sustainability policy. Evidence from the literature suggests that HEIs that have a sustainability policy, supported by the mission, vision and values of the HEI, are more successful in policy implementation. One model that Irish HEIs could adopt is the approach taken by the University of Edinburgh. The university has published social responsibility- and sustainability-integrated policies, which cover areas including accommodation services, biodiversity, climate strategy, recycling and waste management, drinking water, and estates development sustainability strategy. As public sector bodies, HEIs must comply with relevant energy efficiency and sustainability targets.

Recommendation 3: For all HEIs, relevant data should be collected on an annual basis and made publicly available, including on HEI operations, research, outreach to communities, governance, and education indicators.

Reporting mechanisms and the generation of baseline data are priorities in the National Strategy on Education for Sustainable Development in Ireland, 2014–2020 (DES, 2014), with the HEA identified as the reporting body. The Higher Education System Performance Framework 2018–2020 (HEA, 2018) considers some bottom-up indicators, namely the number of green flags awarded and environmental policies and practices. It includes no top-down indicators, nor does it consider off-campus work related to sustainability. The UK Higher Education Statistics Agency annual data collection framework (HESA, 2019) may serve as a useful model but should be expanded in scope to include all of the five core areas of operations, research, outreach, governance and education. To ensure compliance in the UK, HEI funding is linked to the collection and publication of these data. For the Irish HE sector it is recommended that:

- a standardised core set of indicators for the sector, where relevant, is adopted and accepted;
- mandatory collection and publication of sustainability data takes place;
- an assessment framework for monitoring, reporting and evaluation is established;
- a central online location for the storage and publication of each HEI's sustainability data be created and maintained.

Recommendation 4: All taught programmes should include at least one module exploring sustainability issues appropriate to individual disciplines.

Deans, or their appointees, in all faculties should act to ensure that modules on sustainability are included in all undergraduate programmes. For example, as of 2018, the National University of Ireland Maynooth was in the process of implementing a plan to have such a module in all primary degree programmes. Students are key actors within HEIs and many students consider pro-environmental behaviour important. This presents an immense opportunity for HEIs to exploit.

Recommendation 5: For all HEIs, a sustainability office should form an integral part of the management structure, providing accessibility and information and co-ordinating activities for students, staff and the wider community.

As of 2018, no clear HEI policy addresses the provision of sustainability offices. Based on website information and information provided by colleagues, within Ireland three HEIs employ a single sustainability officer, which is a very welcome development, but it is not clear if they also have other duties. To emulate the level of ambition of the University of Edinburgh, the Irish HE sector would need to employ 172 dedicated sustainability staff; although this target is unlikely to be met, it does demonstrate the scope of work that may be undertaken by staff. A sustainability office should form an integral part of the HEI management structure, linked to all academic and administrative structures, including, for example, industrial liaison, technology transfer officers and the Campus Engage network. A sustainability office, working with relevant representatives from across HEIs, would consolidate and avoid the duplication of resources, improving efficiencies, encouraging the formation of interdisciplinary groups and providing a portal for two-way communication between the HEI

and wider society. This would create an effective and accessible interface as a point of contact and provider of further information for students, staff and the wider community.

Recommendation 6: Outreach should be seen as a core duty for academic and administrative staff, fully recognised and valued as part of an HEI mission. Information should be made available to communities on resources available within the HEI in relation to aiding their transition to greater sustainability.

The Higher Education System Performance Framework 2018–2020 recognises societal engagement as a measure of institutional performance, with bridging enterprise and community being one of the key objectives. However, within this framework, HEIs have the freedom to choose their mission priorities, allowing for the omission of sustainability as an objective. The Irish government White Paper *Ireland's Transition to a Low Carbon Energy Future 2015–2030* (Government of Ireland, 2015) stressed the need for community-level action in the reduction of greenhouse gas emissions; HEIs are in a key position to promote and support this objective. As of 2018, the Higher Education System Performance Framework 2018–2020 does not consider in-depth outreach as core to the HEI mission, nor the potential contribution of academic and administrative staff in initiating and supporting outreach. *Ireland's Future Talent: A Charter for Irish Universities* (IUA, 2018) recommends increasing student access to, and engagement with, communities and industry. For outreach to become central to HEIs, staff engagement needs to be adequately valued and sufficient time allocated for interaction with off-campus stakeholders. Sustainability champions will need to be in sufficiently senior positions to be able to make decisions and access budgets. For example, the University of Brighton Community University Partnership Programme (University of Brighton, 2003) was established in 2003 and in 2018 formed part of the university's core strategy. Its helpdesk acts as a point of entry to the university for local community, voluntary and statutory organisations, as well as staff and students for research and collaborative opportunities. It appears to represent a feasible model for Irish HEIs.

Recommendation 7: Sustainability research, development and innovation should become a core focus of HEIs, fully recognised, funded and valued.

The National Strategy on Education for Sustainable Development in Ireland 2014–2020 (DES, 2014) recommends that the HEA and Department of Education and Skills work together to ensure that sustainable development is a priority area for future research programmes. Sustainability research is integral to addressing the challenges of how to build sustainable communities and transition to a low-carbon future, which is emphasised in *Innovation 2020* (DBEI, 2015) and supported by the *EPA Research Strategy 2014–2020* (EPA, 2014). With clear support from senior management, HEIs should actively pursue research collaborations related to sustainability with communities, the private sector and governmental and non-governmental bodies.

Recommendation 8: Implementation of policy goals should be linked to measurable targets and dates for completion. Roles and responsibilities over the short, medium and long term within sustainability strategies should be transparent. Audits and assessments should support continual improvement.

There is a need for HEIs to formulate, publish and implement a sustainability strategy that is reflective of national and international policy goals. Twenty-four Irish HEIs have joined the An Taisce-managed Green-Campus Programme (An Taisce, 2018) and through this have implemented many on-campus actions, and this bottom-up interest should be reflected in HEI missions. The creation of a sustainability strategy would help in the development and implementation of a whole institution approach, as described in the National Strategy on Education for Sustainable Development in Ireland 2014–2020 (DES, 2014). The sustainability strategy should contain measurable targets over the short, medium and long term, as well as target dates. In addition, audits of verifiable achievements should be undertaken to identify continual improvement, with the objective of gaining national and international recognition of achievements. The National Strategy on Education for Sustainable Development in Ireland 2014–2020 (DES, 2014) provides little guidance on the value of ramped and goal-orientated interaction among agencies and departments. If this was formulated with adequate ambition, and acted on, this strategy would enhance

the likelihood of meeting national targets in relation to, for example, greenhouse gas emissions.

Recommendation 9: For HEIs to play a major role in helping to meet national policy objectives, major investment would be required in sustainable technologies at HEI campuses.

As of 2018, the deployment of sustainable technologies at Irish HEIs is at a low level compared with international best practice. This study has identified that as a starting point there is the potential to:

- install 42 MW of building-integrated PV systems;
- install 2.5 MW of micro-wind turbine systems;
- install 37 MW of carport mounted PV systems;
- replace 12 GWh of heating oil demand with biomass boilers;
- replace 2.5 GWh of energy requirements from campus fleet internal combustion engine vehicles with electric vehicles;
- harvest up to 850,00 m^3 of roof rainwater across the Irish HE sector.

Private sector funding should be accessed where possible, and with additional government support all of these actions would become economically viable in the short to medium term.

Recommendation 10: HEI campuses should be developed as arenas for experimentation, testing, adaptation, evaluation, demonstration and deployment to expedite development of national involvement in the sustainable technology niche. This will provide a range of employment opportunities, open up additional national and international research funding for campuses and allow industry to test new technologies and business models in a "real world" context.

Ireland's National Development Plan 2018–2027 (Government of Ireland, 2018b) allocated €22 billion for mitigation and adaption to climate change, with ambitious targets relating to electric vehicle uptake and renewable energy deployment at the national scale. However, the plan does not indicate how local-scale actions can help in meeting national targets. The plan allocated €2.2 billion of Exchequer funding to the HE sector for campus infrastructure construction and upgrades. However, it does not stipulate that HEIs should incorporate sustainability into existing and planned developments, beyond enhancing energy efficiency. HEIs are to be eligible to collaborate with enterprises on projects funded by the Disruptive Technologies Innovation Fund (DTIF) (DBEI, 2019), with decarbonising the energy system and sustainable living considered priority areas. At the international scale, HEI campuses have been identified as ideal testbeds (often termed "living labs") for pilot demonstration projects to evaluate and adapt technologies and methods as an aid to mainstreaming into wider society. HEIs offering their campuses as living labs for DTIF-funded projects would position campuses as sites for testing or demonstration of disruptive technologies and business models in a "real world" context. Capitalising on synergies between government policy, private sector commercialisation and HEI living lab resources might be expected to stimulate economic growth and job creation and expedite renewable technology deployment to meet national decarbonisation targets.

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Abbreviations

DTIF	Disruptive Technologies Innovation Fund
EU	European Union
GDP	Gross domestic product
HE	Higher education
HEA	Higher Education Authority
HEADS	Higher Education Advancing Development for Sustainability
HEI	Higher education institution
PV	Photovoltaic

AN GHNÍOMHAIREACHT UM CHAOMHNÚ COMHSHAOIL
Tá an Ghníomhaireacht um Chaomhnú Comhshaoil (GCC) freagrach as an gcomhshaol a chaomhnú agus a fheabhsú mar shócmhainn luachmhar do mhuintir na hÉireann. Táimid tiomanta do dhaoine agus don chomhshaol a chosaint ó éifeachtaí díobhálacha na radaíochta agus an truaillithe.

Is féidir obair na Gníomhaireachta a roinnt ina trí phríomhréimse:

Rialú: *Déanaimid córais éifeachtacha rialaithe agus comhlíonta comhshaoil a chur i bhfeidhm chun torthaí maithe comhshaoil a sholáthar agus chun díriú orthu siúd nach gcloíonn leis na córais sin.*

Eolas: *Soláthraímid sonraí, faisnéis agus measúnú comhshaoil atá ar ardchaighdeán, spriocdhírithe agus tráthúil chun bonn eolais a chur faoin gcinnteoireacht ar gach leibhéal.*

Tacaíocht: *Bímid ag saothrú i gcomhar le grúpaí eile chun tacú le comhshaol atá glan, táirgiúil agus cosanta go maith, agus le hiompar a chuirfidh le comhshaol inbhuanaithe.*

Ár bhFreagrachtaí

Ceadúnú
Déanaimid na gníomhaíochtaí seo a leanas a rialú ionas nach ndéanann siad dochar do shláinte an phobail ná don chomhshaol:
- saoráidí dramhaíola *(m.sh. láithreáin líonta talún, loisceoirí, stáisiúin aistrithe dramhaíola)*;
- gníomhaíochtaí tionsclaíocha ar scála mór *(m.sh. déantúsaíocht cógaisíochta, déantúsaíocht stroighne, stáisiúin chumhachta)*;
- an diantalmhaíocht *(m.sh. muca, éanlaith)*;
- úsáid shrianta agus scaoileadh rialaithe Orgánach Géinmhodhnaithe *(OGM)*;
- foinsí radaíochta ianúcháin *(m.sh. trealamh x-gha agus radaiteiripe, foinsí tionsclaíocha)*;
- áiseanna móra stórála peitril;
- scardadh dramhuisce;
- gníomhaíochtaí dumpála ar farraige.

Forfheidhmiú Náisiúnta i leith Cúrsaí Comhshaoil
- Clár náisiúnta iniúchtaí agus cigireachtaí a dhéanamh gach bliain ar shaoráidí a bhfuil ceadúnas ón nGníomhaireacht acu.
- Maoirseacht a dhéanamh ar fhreagrachtaí cosanta comhshaoil na n-údarás áitiúil.
- Caighdeán an uisce óil, arna sholáthar ag soláthraithe uisce phoiblí, a mhaoirsiú.
- Obair le húdaráis áitiúla agus le gníomhaireachtaí eile chun dul i ngleic le coireanna comhshaoil trí chomhordú a dhéanamh ar líonra forfheidhmiúcháin náisiúnta, trí dhíriú ar chiontóirí, agus trí mhaoirsiú a dhéanamh ar leasúchán.
- Cur i bhfeidhm rialachán ar nós na Rialachán um Dhramhthrealamh Leictreach agus Leictreonach (DTLL), um Shrian ar Shubstaintí Guaiseacha agus na Rialachán um rialú ar shubstaintí a ídíonn an ciseal ózóin.
- An dlí a chur orthu siúd a bhriseann dlí an chomhshaoil agus a dhéanann dochar don chomhshaol.

Bainistíocht Uisce
- Monatóireacht agus tuairisciú a dhéanamh ar cháilíocht aibhneacha, lochanna, uiscí idirchriosacha agus cósta na hÉireann, agus screamhuiscí; leibhéil uisce agus sruthanna aibhneacha a thomhas.
- Comhordú náisiúnta agus maoirsiú a dhéanamh ar an gCreat-Treoir Uisce.
- Monatóireacht agus tuairisciú a dhéanamh ar Cháilíocht an Uisce Snámha.

Monatóireacht, Anailís agus Tuairisciú ar an gComhshaol
- Monatóireacht a dhéanamh ar cháilíocht an aeir agus Treoir an AE maidir le hAer Glan don Eoraip (CAFÉ) a chur chun feidhme.
- Tuairisciú neamhspleách le cabhrú le cinnteoireacht an rialtais náisiúnta agus na n-údarás áitiúil *(m.sh. tuairisciú tréimhsiúil ar staid Chomhshaol na hÉireann agus Tuarascálacha ar Tháscairí)*.

Rialú Astaíochtaí na nGás Ceaptha Teasa in Éirinn
- Fardail agus réamh-mheastacháin na hÉireann maidir le gáis cheaptha teasa a ullmhú.
- An Treoir maidir le Trádáil Astaíochtaí a chur chun feidhme i gcomhair breis agus 100 de na táirgeoirí dé-ocsaíde carbóin is mó in Éirinn.

Taighde agus Forbairt Comhshaoil
- Taighde comhshaoil a chistiú chun brúnna a shainaithint, bonn eolais a chur faoi bheartais, agus réitigh a sholáthar i réimsí na haeráide, an uisce agus na hinbhuanaitheachta.

Measúnacht Straitéiseach Timpeallachta
- Measúnacht a dhéanamh ar thionchar pleananna agus clár beartaithe ar an gcomhshaol in Éirinn *(m.sh. mórphleananna forbartha)*.

Cosaint Raideolaíoch
- Monatóireacht a dhéanamh ar leibhéil radaíochta, measúnacht a dhéanamh ar nochtadh mhuintir na hÉireann don radaíocht ianúcháin.
- Cabhrú le pleananna náisiúnta a fhorbairt le haghaidh éigeandálaí ag eascairt as taismí núicléacha.
- Monatóireacht a dhéanamh ar fhorbairtí thar lear a bhaineann le saoráidí núicléacha agus leis an tsábháilteacht raideolaíochta.
- Sainseirbhísí cosanta ar an radaíocht a sholáthar, nó maoirsiú a dhéanamh ar sholáthar na seirbhísí sin.

Treoir, Faisnéis Inrochtana agus Oideachas
- Comhairle agus treoir a chur ar fáil d'earnáil na tionsclaíochta agus don phobal maidir le hábhair a bhaineann le caomhnú an chomhshaoil agus leis an gcosaint raideolaíoch.
- Faisnéis thráthúil ar an gcomhshaol ar a bhfuil fáil éasca a chur ar fáil chun rannpháirtíocht an phobail a spreagadh sa chinnteoireacht i ndáil leis an gcomhshaol *(m.sh. Timpeall an Tí, léarscáileanna radóin)*.
- Comhairle a chur ar fáil don Rialtas maidir le hábhair a bhaineann leis an tsábháilteacht raideolaíoch agus le cúrsaí práinnfhreagartha.
- Plean Náisiúnta Bainistíochta Dramhaíola Guaisí a fhorbairt chun dramhaíl ghuaiseach a chosc agus a bhainistiú.

Múscailt Feasachta agus Athrú Iompraíochta
- Feasacht chomhshaoil níos fearr a ghiniúint agus dul i bhfeidhm ar athrú iompraíochta dearfach trí thacú le gnóthais, le pobail agus le teaghlaigh a bheith níos éifeachtúla ar acmhainní.
- Tástáil le haghaidh radóin a chur chun cinn i dtithe agus in ionaid oibre, agus gníomhartha leasúcháin a spreagadh nuair is gá.

Bainistíocht agus struchtúr na Gníomhaireachta um Chaomhnú Comhshaoil
Tá an ghníomhaíocht á bainistiú ag Bord lánaimseartha, ar a bhfuil Ard-Stiúrthóir agus cúigear Stiúrthóirí. Déantar an obair ar fud cúig cinn d'Oifigí:
- An Oifig um Inmharthanacht Comhshaoil
- An Oifig Forfheidhmithe i leith cúrsaí Comhshaoil
- An Oifig um Fianaise is Measúnú
- Oifig um Chosaint Radaíochta agus Monatóireachta Comhshaoil
- An Oifig Cumarsáide agus Seirbhísí Corparáideacha

Tá Coiste Comhairleach ag an nGníomhaireacht le cabhrú léi. Tá dáréag comhaltaí air agus tagann siad le chéile go rialta le plé a dhéanamh ar ábhair imní agus le comhairle a chur ar an mBord.

EPA Research Report 280

Developing the Potential of Third-level Campuses as Change Agents in Transition towards Sustainable Communities

Authors: Bernadette O'Regan, Richard Moles, Rachel Shawe and William Horan

Identifying Pressures

Meeting current and urgent environmental challenges requires the active engagement of all possible sectors and organisations. Through an evaluation of a diverse set of national and international case studies, this research identified further opportunities to be exploited by Irish higher education institutes (HEIs) to greatly enhance campus sustainability. Both technological and management actions were included in the analysis. The significant extent of feasible actions in reducing material and energy consumption was demonstrated by calculating savings to be gained under three policy scenarios (business as usual, incremental change and step change) in relation to energy production and consumption, water use and transport. A second part of the research concerned the potential for HEIs to act as catalysts in moving wider society to greater sustainability. The case studies identified many feasible approaches that have been found to be successful, for example "living labs" and greater off-campus engagement with industry and business, communities and local authorities. These include dedicated on-campus structures (often termed "sustainability offices") with the purpose of further facilitating researchers in all disciplines to share their expertise and knowledge with off-campus partners keen to learn how to make their communities more sustainable. From other EPA-funded projects undertaken by the research team, it is clear that, with this help, actions taken by communities will be much more effective at delivering behavioural change.

Informing Policy

The findings of this research demonstrate that there are very significant opportunities for enhancing existing policy when the potential of HEIs to act as catalysts is fully exploited. In relation to the *Public Sector Energy Efficiency Action Plan*, HEIs are required to reduce energy consumption by 33% by 2020. The findings from this research demonstrate the many ways in which this target can be met. The *National Strategy for Higher Education to 2030* stipulates that engagement with the wider community ought to be a core mission of HEIs. Findings from this research identify and evaluate a wide range of feasible actions by HEIs that will encourage and facilitate communities to move towards greater sustainability. *Our Sustainable Future: A Framework for Sustainable Development for Ireland* calls for the evaluation of sustainable consumption patterns in energy, transport, food, planning and implementation, with HEIs to provide the skills and training necessary for a more sustainable society and economy. Findings from this research provide a blueprint for the deeper and wider engagement of HEIs in meeting these policy goals.

Developing Solutions

Evaluation of the environmental and socio-economic factors that either drive, or create barriers to, behavioural change allows identification of further opportunities for and models of action of the higher education sector. There is a clear need to create a system that allows for the identification and evaluation of campus environmental impacts, to create a baseline and allow verification of future improvements. This research report provides this, through the Higher Education Advancing Development for Sustainability (HEADS) framework. HEIs should build on existing structures to facilitate both on-campus and off-campus behavioural change. This report explores sustainability strategies; improvements in data collection, an assessment framework for monitoring, reporting and evaluation, and publication of data; the need for sustainability offices; and the role of teaching, outreach and research in developing greater sustainability. National and international case studies demonstrate the feasibility and value of these structures. Implementation of these will facilitate the HEI sector in realising its potential to drive campus and community sustainability. It should be noted that the research team does not support the idea of using data gathered to rank the success of HEIs: campuses differ in many ways, and such ranking is considered counter-productive. Governmental support through the Higher Education Authority and the Department of Education and Skills, and recognition of the full potential role of HEIs, will in turn aid the implementation of national policy. The report also identifies funding sources that have been exploited by Irish and other European HEIs.

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