SUCCEED
n e t w o r k

REVISION OF CAMPUS SUSTAINABILITY AND ENERGY EFFICIENCY POLICIES AND PROCESSES IN EUROPEAN UNION UNIVERSITIES

EDULINK

SUCCEED

network

REVISION OF CAMPUS SUSTAINABILITY AND ENERGY EFFICIENCY POLICIES AND PROCESSES IN EUROPEAN UNION UNIVERSITIES

SUCCEED Network consortium:

European Union:
• University of Alicante, Spain (Coordinator)

East Africa:
• Université de Burundi, Burundi
• Moi University, Kenya
• University of Rwanda, Rwanda
• Mzumbe University, Tanzania
• Makerere University, Uganda
• Inter-University Council of East Africa, Uganda

INTERNATIONAL PROJECT MANAGEMENT OFFICE
UNIVERSITY OF ALICANTE

About the Authors:
• Ms. Cristina Beans, M.Sc., is a Senior Project Manager in the OGPI. She has a Master's Degree in Oceanography and an MBA in Project Management.
• Dr. Oana Driha, is a lecturer at the University of Alicante and member of the UA's International Economy Institute. She has a Ph.D. in Economics (focused on internationalisation)

Table of Contents

Foreword

Energy is currently one of the hottest topics that need to be tackled in the East African Region, which is facing serious energy deficits and high-energy costs. The deficit in electricity supply and the lack of access to sustainable energy services hampers the satisfaction of basic human needs. The EU-EA Regional Strategy Paper revealed that 70% of the total inhabitants do not have access to sustainable energy sources. This leaves the region with a high dependence on fossil fuels, energy insecurity and high-carbon emission systems, which together with climate change provoke a very complex situation for the region.

The East Africa Region experiences unsustainable energy practices, which prevents its countries from reaching acceptable standards of socio-economic development. Most recently, the EC Country Strategy Papers stated as common problems in these countries:

- Lack of regional and national policies on Energy Efficiency and Renewable Energy that match the decision maker's decisions with society's actual needs.
- Poor infrastructures to produce, store and distribute energy in a more sustainable way.
- Lack of professionals trained in Energy Efficiency and Renewable Energy.

Due to the innovative nature of this field (particularly Renewable Energy), universities, as providers of research and education, can play a crucial role in overcoming these problems.

Launched in October 2013, the three-year project SUCCEED Network is an ACP/EU funded project under the Edulink programme (contract number FED/2013/320-274), which aims to promote East African university campuses as "living laboratories" for sustainability and energy efficiency, in particular by establishing a sustainable campus development platform to foster collaborative learning and action for energy access and efficiency, with the idea of contributing to solve the problems described above. The project will do this via a set of activities whose objective will be to improve institutional, academic and cooperation building which should result in a stronger institutional background, an enriched academic offer in renewable energy and energy efficiency, and an increased attractiveness for relevant stakeholders in order to establish new cooperation schemes in the field of energy.

The project is coordinated by an experienced team from the University of Alicante (Spain). The members of the consortium in East Africa are all public universities with a national coverage: l'Université du Burundi (Burundi), Moi University (Kenya), the University of Rwanda (Rwanda), Mzumbe University (Tanzania) and Makerere University (Uganda). The project also counts on the support of the Inter-University Council for East Africa (IUCEA) as an associate partner.

Executive summary

The climate change and energy efficiency are not a new topic today, but they are still playing a central role in many debates regarding the future. Under these circumstances, universities, as one of the fundamental pillars of the society, are expected to take the necessary steps for promoting energy efficiency at university level as well as to fight against climate change. It is not just a question of implementing specific studies in these areas (i.e., energy efficiency, renewable energy and climate change), but also the real application of measures that will visibly contribute to these objectives. That means that the community of each university should be familiar with and active users of this kind of measures. In addition, given the objectives and roles universities have, it is likely that the specialized staff of universities in the field of energy and policy could and should considerably contribute to the design of energy efficiency policies.

The European Union has taken the lead of the fight against climate change and the promotion of energy efficiency and renewable energy sources by developing a clear agenda in this line, i.e. the objective 20/20/20 of the initial Lisbon Agenda reshaped and renamed EUROPE 2020.

With the increase of the university community year-by-year, HEIs'energy consumption is also experiencing an increase and, thus, the effect on climate change is getting higher. As budgets rarely increase to match this, HEIs are under constant pressure to make the most of limited resources. Implementing Energy Efficiency measures is requested for a double reason: for environmental and sustainability reasons, but also for economic ones.

In order to successfully implement sustainability policies and actions, sustainability and energy efficiency must be incorporated in a university's strategic plan; this way university community will facilitate their success. A first step could be raising awareness and promoting a few simple techniques (such as turning off the lights when leaving a room) for the sake of reducing energy consumption. More significant work on the field could be based on an in-depth study of the university's energy use. This would also boost the university's environmental credentials and might make it more attractive to potential students, researchers and investors.

1. What is Energy Efficiency?

Reducing the amount of energy we use, and using it more efficiently, has been a concern for people from all walks of life, around the globe, for many years now. In 1992 in Rio de Janeiro more than 178 Governments at the United Nations Conference on Environment and Development (UNCED) adopted _Agenda 21_, a comprehensive, non-binding and voluntarily implemented action plan with regards to sustainable development. It has been reaffirmed and modified in subsequent World Summits (in 2002 and 2012). Among other elements, in the section dedicated to "Energy development, efficiency and consumption", it states that:

> _"Energy is essential to economic and social development and improved quality of life. Much of the world's energy, however, is currently produced and consumed in ways that could not be sustained if technology were to remain constant and if overall quantities were to increase substantially. The need to control atmospheric emissions of greenhouse and other gases and substances will increasingly need to be based on efficiency in energy production, transmission, distribution and consumption, and on growing reliance on environmentally sound energy systems, particularly new and renewable sources of energy. All energy sources will need to be used in ways that respect the atmosphere, human health and the environment as a whole."_

But *what is Energy Efficiency?* **Energy efficiency basically means using less energy to provide the same service.** For example, replacing an incandescent light bulb with a fluorescent one will result in using less energy (approximately one third of that used by an incandescent bulb) to obtain the same illumination.

How is Energy Efficiency different from Energy Conservation? Simply put, energy conservation is a broader term than energy efficiency in that it includes both energy efficiency and other methods to decrease energy consumption, such as for example behavioural changes. This could involve not using or reducing the use of a service in order to save energy. To return to our light bulb example, energy conservation would be remembering to turn off the lights when we leave a room, or turning them on less frequently and for shorter periods of time (but not necessarily changing the bulb to a more energy efficient one).

So, *why do this?* Motivations for implementing energy efficiency and conservation measures vary, but in many cases an important reason is the reduction of energy costs that will result from these measures. No matter where you use energy, there are ways to improve its efficiency. The cost of the necessary measures to do so will most likely be paid for over time by the savings made from the lower energy bills. Secondly, in situations where a limited amount of energy is available, energy efficiency measures allow us to make the most of what is available. Finally, many see reducing energy consumption (through energy efficiency and conservation measures) as a means to help reduce the amount of greenhouse gas emissions, reduce the carbon footprint and help fight against climate change. Indeed, energy efficiency and renewable energy are the basis of any good sustainable energy policy.

2. The EU Policy on Energy Efficiency

In recent decades, climate change, environment and sustainability have become one of the most relevant topics at all levels (i.e., from individual to institutional, from social to economical and political level). With this framework, Europeans have increasingly become aware of environmental problems and the need of acting in order to reduce their contribution to the climate change. Therefore, the European Commission develops policies and programmes focused on natural habitat protection, keeping air and water clean, ensuring proper waste disposal, improving knowledge about toxic chemicals, and helping businesses and society move towards a sustainable economy. EU environmental and energy efficiency policy has been shaped more actively since the early 1970s as a consequence of the oil crisis and its great dependence on fossil fuels. In this sense, European energy policy is guided by a number of cross-cutting documents and initiatives. The most recent document on energy efficiency was published in July 2014, but many other initiatives have been developed at EU level through Environmental action programmes, the 2020 Biodiversity Strategy and the Low Carbon Economy Roadmap, the Europe 2020 strategy for smart, sustainable and inclusive growth and its previous version as Lisbon Agenda, the EU Sustainable Development Strategy, the Energy Efficiency Plans, etc.

Under the so called "Lisbon Agenda", revised and renamed as "EUROPE 2020", the growth strategy of the European Union for the decade 2010-2020, five main objectives were established for the region. EUROPE 2020 is about delivering smart, sustainable and inclusive growth. A more effective investment in education, research and innovation is to be the basis of smart growth. A decisive move towards a low-carbon economy will lead the EU towards

sustainable growth, while a strong emphasis on job creation and poverty reduction will ensure inclusive growth. The strategy is focused on five ambitious goals in the areas of employment, innovation, education, poverty reduction and climate & energy.

Climate change and energy sustainability are the baseline of the third EUROPE 2020 target and the reason of many of the EU´s actions regarding environment, climate change, sustainability and energy efficiency. The EU is aiming for a 20% cut in Europe's annual primary energy consumption by 2020 with a common framework of measures for the whole region in order to do so. The Commission has proposed several measures to increase efficiency at all stages of the energy chain: generation, transformation, distribution and final consumption. The measures focus on the public transport and building sectors, where the potential for savings is greatest. The objective is to reduce greenhouse gas levels by 20% compared to the levels of 1990, increase share of renewable energy to 20% of total energy use and reduce energy consumption by 20% (also called as "20/20/20" objective).

To fulfil EUROPE 2020 targets, 7 flagship initiatives were drawn. Both the EU and national authorities have to coordinate their efforts within each initiative, thus they are mutually reinforced. To address the climate & energy goal the "Sustainable growth" flagship was developed including the "Resource efficient Europe" initiative. More detailed, the EU adopted different measures in order to improve energy efficiency, including:

- An annual reduction of 1.5% in national energy sales;
- EU countries making energy efficient renovations to at least 3% of buildings owned and occupied by central governments per year;
- Mandatory energy efficiency certificates accompanying the sale and rental of buildings;

- Minimum energy efficiency standards and labelling for a variety of products such as boilers, household appliances, lighting and televisions (EcoDesign);
- The preparation of National Energy Efficiency Action Plans every three years by EU countries;
- The planned rollout of close to 200 million smart meters for electricity and 45 million for gas by 2020;
- Large companies conducting energy audits at least every four years;
- Protecting the rights of consumers to receive easy and free access to data on real-time and historical energy consumption.

In a nutshell, table 1 resumes the most relevant initiatives on energy efficiency at EU level.

The Energy Efficiency Plan, as one of the most relevant initiatives, covered targets, public sector measures, buildings, energy supply obligations, cogeneration and industry. It also planned to finance and promote smart meters and smart grids, expanding the National Energy Efficiency Action Plans to cover the entire energy chain and not just energy demand. In this sense, some relevant Directives and legislative Frameworks for (end-use) energy efficiency are presented in table 2.

Table 1: Energy efficiency key initiatives in the EU[1]

Initiative
The EU Strategy on adaptation to climate change
Energy 2020: A strategy for competitive, sustainable and secure energy
Energy infrastructure priorities for 2020 and beyond – A Blueprint for an integrated European energy network
Tackling the challenges in commodity markets and on raw materials
Low-carbon economy 2050 roadmap
European Energy Efficiency Plan 2020
White Paper on the future of transport
2020 EU biodiversity policy and strategy
Revision of the Energy Taxation Directive
Roadmap for a resource-efficient Europe
Common Agricultural Policy Reform
Common Fisheries Policy Reform
Cohesion Policy Reform
Energy infrastructure package
Trans-European Networks for Transport (TEN-T) revision
Energy Roadmap 2050
Security of energy supply and international cooperation
Review of priority substances mentioned in the Water Framework Directive
Strategy for the sustainable competitiveness of the EU construction sector
Action Plan towards a sustainable bio-based economy by 2020
Strategic Transport Technology Plan
Revision of the legislation on monitoring and reporting of greenhouse gas emissions

Source: http://europa.eu/rapid/press-release_MEMO-11-43_en.htm?locale=en

---

1. For concrete examples you can consult: http://europa.eu/rapid/press-release_ MEMO-11-43_en.htm?locale=en

Table 2: Relevant Directives and Legislatives Frameworks for Energy Efficiency at EU level

Directives and Legislative Frameworks
Energy Efficiency Directive (EED)
Energy Performance of Buildings Directive (EPBD)
Ecodesign of Energy-Using Products Directive (regulating minimum energy performance of products)
Energy labelling of Domestic Appliances Directive
Energy labelling of Tyres Regulation (this is a specific regulation – Regulation (EC) No 1222/2009 of the European Parliament and of the Council of 25 November 2009)
Consumer Information on Fuel Economy and CO2 Emissions of New Passenger Cars (Directive 1999/94/EC)
Emission Performance Standards of Passenger Cars – Regulation (EC) No 443/2009 of the European Parliament and of the Council of 23 April 2009 setting emission performance standards for new passenger cars
Emissions Trading System. This Directive sets quotas for carbon emissions and established a trading system. It has relevance for energy efficiency because it should be seeking the most cost-effective ways to reduce carbon emissions, but it is debated whether the system has really led to energy savings.

The legislative result of the latest version of the Energy Efficiency Plan (published in March 2011) was the Energy Efficiency Directive (approved in 2012). The Directive puts a major focus on targets:

1st - The indicative 20% target which calls for energy consumption for the entire EU of no more than 1474 Mtoe of primary energy and/or no more than 1078 Mtoe of final energy in 2020;
2nd - The Public Sector is to lead by example by purchasing products, services and buildings with high energy efficiency standards, as well as renovating public buildings (among other measures).

The directive also includes several proposals, which should result in creating benefits for consumers through the provision of tailored energy services and information, as well as proposals to improve

energy efficiency in the transformation and distribution of energy throughout the EU. Finally, as awareness of these matters is a key factor in the general public adopting them, several measures have been proposed to increase awareness for benefits stemming from energy efficiency improvements in industry.

As already mentioned, the EU does not only have a 2020 target, but goes even further, up to 2030 and beyond. Hence, in March 2013, the European Commission adopted a Green Paper on "A 2030 framework for climate and energy policies" and launched a public consultation, allowing Member States, other EU institutions and stakeholders to express their views. The main questions raised in the Green Paper are the following:

- What type, nature and level of climate and energy targets should be set for 2030?
- How can coherence between different policy instruments be attained?
- How can the energy system best contribute to EU competitiveness?
- How can Member States' different capacities to act be taken into account?

In October 2014, EU countries agreed on a new energy efficiency target of 27% or greater by 2030. Thus, the European Commission had proposed a target of 30% by 2030. With a greater planed framework, EU leaders have endorsed the objective of reducing Europe's greenhouse gas emissions by 80-95% by 2050 compared to 1990 levels as part of efforts by developed countries as a group to reduce their emissions by a similar degree. These seems to be endless stories the fight against climate change and the commitment to energy efficiency as each year there are even more commitments in this direction.

3. Energy Efficiency campus policies in Higher Education Institutions in the E.U.

3.1. Sustainable Development at European Higher Education Institutions

Higher Education Institutions (HEIs), such as universities, have a key role in the development of future citizens by influencing their students as they educate them. Hence, universities have a special societal responsibility, mainly with regard to youth training and public awareness regarding sustainability. They have a responsibility to lead by example and to inspire society to improve by showing them how it can be done. Hence, universities should promote a pattern of development compatible with a safe environment, biodiversity, ecological balance, and intergenerational equity (Alshuwaikhat and Abubakar, 2008). The role of universities regarding sustainability is presented in figure 1.
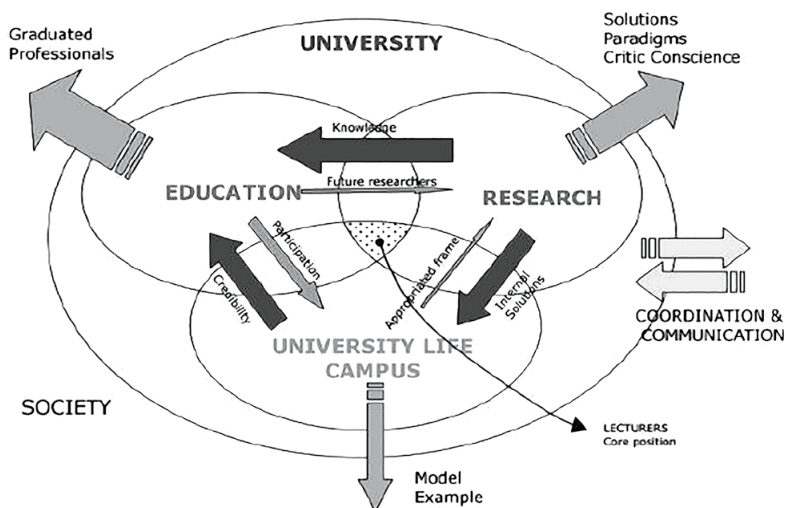
Figure 1: The role of university in society regarding sustainability
(Source: Ferrer-Blas, Bruno, de Mingo and Sans (2004)

There doesn't appear to be any leading Energy Efficiency Policy for European HEIs, the policies applied by the various universities are a part of their efforts in sustainability. There have been however several declarations concerning sustainable development (including energy efficiency) and higher education institutions, both at a Global scale and a European scale (Table 3).

Among these declarations, the **COPERNICUS "University Charter for Sustainable Development"**, promoted by the Conference of European Rectors (CRE), has been the basis for sustainable development in EU universities since 1994 (as of 2005 there were 328 signatories of the charter). It states that a comprehensive strategy is required to build a sustainable future for all human beings. To do this a new set of values would be needed, and education would be critical in promoting them, as well as to improve people's capacity to address environment and development issues. Furthermore, the charter states that universities and equivalent higher education institutions have a duty, as they train the coming generations of citizens, to propagate environmental literacy and promote the practice of environmental ethics in society. In order to do this, universities are urged to implement the following ten principles of action:

- Institutional commitment to the principle and practice of environmental protection and sustainable development within the academic milieu.
- Environmental ethics promoted among teaching staff, students and the public at large.
- Education of university employees on environmental issues so that they can pursue their work in an environmentally responsible manner.
- Programmes in environmental education involving teachers, researchers and students.

Table 3: Declarations on Higher Education and Sustainable Development

DECLARATION NAME	YEAR	SIGNATORIES
Stockholm Declaration	1972	UN Conference on Human Environment
Talloires Declaration	1990	Association of University Leaders for a Sustainable Future
Agenda 21: Chapter 36	1992	UN Conference on Environment and Development ("Rio")
Swansea Declaration	1993	Association of Commonwealth Universities
Kyoto Declaration	1993	International Association of Universities (IAU)
Copernicus Charter	1994	Association of European Universities (CRE)
Thessaloniki Declaration	1997	UNESCO Conference on Environment and Public Awareness for Sustainability
World Declaration on Higher Education for the Twenty-first Century and Framework for Priority Action for Change and Development in Higher Education	1998	UNESCO World Conference on Higher Education
Lüneburg Declaration	2001	GHESP partners (International Association of Universities, University Leaders for a Sustainable Future, COPERNICUS CAMPUS and UNESCO)
Declaration of Barcelona	2004	Education in Sustainable Development (EESD) 2004 conference scientific committee
The Graz Declaration	2005	COPERNICUS-CAMPUS, the Karl-Franzens-University Graz, the Technical University Graz, Oikos International
Declaration on the Responsibility of Higher Education for a Democratic Culture – Citizenship, Human Rights and Sustainability	2006	Council of Europe Global Network for Higher Education and Democratic Culture
RIO+20 Treaty	2012	COPERNICUS Alliance, United Nations University Institute of Advanced Studies (UNU IAS), International Association of Universities (IAU)

- <u>Interdisciplinarity</u> and collaborative education and research programmes related to sustainable development as part of the institution's central mission.
- <u>Dissemination</u> of knowledge to students, professionals, decision-makers and the general public by preparing information didactic material, organizing public lectures, and establishing training programmes.
- <u>Interdisciplinary Networking</u> of environmental experts at the local, national, regional and international levels, with the aim of collaborating on common environmental projects in both research and education.
- <u>Partnerships</u> with other concerned sectors of society, in order to design and implement coordinated approaches, strategies and action plans.
- <u>Continuing education programmes</u> for different target groups (business, governmental agencies, non-governmental organizations, the media).
- <u>Technology transfer</u> of educationally sound and innovative technologies and advanced management methods.

The COPERNICUS Charter was redesigned and released in 2011 as "COPERNICUS CHARTA 2.0" by the COPERNICUS Alliance (previously COPERNICUS CAMPUS).

COPERNICUS CAMPUS published a series of guidelines in 2005 in order to help universities incorporate the principles of sustainable development into the Bologna process. These include a mention of reducing the universities' carbon footprint by implementing measures for water and energy conservation, sustainable building construction and renovation and other operational practices.

Despite the lack of an Energy Efficiency Policy for HEIs, over the past decades, more universities have increased their sustainable responsibility. There are three approaches that are widely used by

HEIs: green building initiative, ISO 14001 and European Eco-Management and Audit Scheme (EMAS).

- The green building initiative, also known as green campus, eco-urbanism, green urbanism, high performance buildings, etc., is a sustainable design concept. One of its main goals is promoting construction of energy and resource efficient buildings. However, on its own it cannot guarantee sustainability due to its lack of a systematic and continuous campus quality improvement. Other shortcomings of this initiative are the lack of a policy approach to environmental sustainability and measurement of progress.
- The ISO 14001 standards promote the design and implementation of environmental goals, policies and responsibilities, as well as regular auditing of its elements. Alshuwaikhat and Abubakar (2008) stipulated that the standard has no weaknesses, but the lack of social and economic dimension, its generic character, its focus on the industry, no mention on strategic planning for sustainability, etc., are some of its limitations. However, Simkins and Nolan (2004) highlighted as main objectives of this initiative the following:
  - Reduce waste, resources depletion and environmental pollution;
  - Promote environmental awareness among employees and within the community;
  - Provide a platform for companies to demonstrate their commitment to environmental protection;
  - Help management pursue continual improvement in environmental performance;
  - Provide a worldwide focus on environmental management;
  - Promote a voluntary, consensus standard approach for environmental issues;

- Demonstrate a commitment to moving beyond regulatory compliance.
- The European Eco-Management and Audit Scheme (EMAS), developed in 1993, is to bring about changes in environmental performance. This may be the most demanding, especially with the verified environmental declaration which has resulted in a lukewarm public and large disappointment.

Consistent with the specialized literature, adopting any of the above initiatives alone will not ensure sustainability due to their weaknesses. By looking into all the sustainability issues in a systematic and integrated way and trying to overcome their limitations, Alshuwaikhat and Abubakar (2008) called for an adaptation proposal (figure 2).
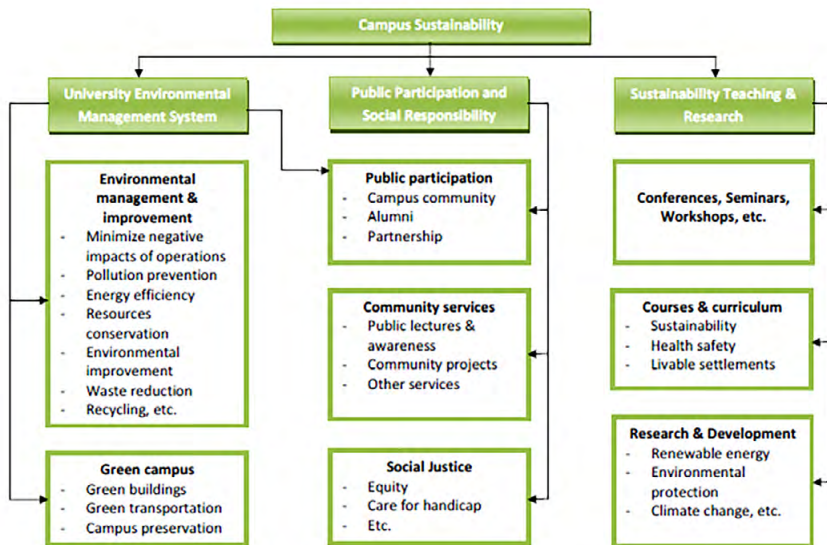

Figure 2: Framework of the proposed approach to achieving campus sustainability (Source: Alshuwaikhat and Abubakar (2008))

Accordingly, the university should have a very clear vision and commitment of management of sustainability, as well as the need of establishing an organizational structure (a department or a committee) and resource provision. There are three recommended strategies under the umbrella of this integrated approach for campus sustainability: environmental management system implementation, public participation and social responsibility, and sustainability teaching and research[1].

3.2. Green Campuses

After having signed one (or more) of the sustainability in higher education declarations, universities must put the precepts of sustainability into practice within their own institutions. This has resulted in a global trend of HEIs revising their mission and restructuring their courses, research programs and campus operations.

A **Green Campus is a higher education institution that is working to improve its energy efficiency, resource conservation and enhance its environmental quality**. It does this by educating its personnel and students in matters of sustainability, as well as by creating healthy learning and living environments.

3.2.1. "Green" Ranking Systems: UI GreenMetric

One result of this "greening" process of university campuses has been to add a new metric when it comes to evaluating universities and comparing them to each other at both a national and international level. Not only are sustainability aspects now taken into account to establish university rankings, but also several organisations have set up an exclusively _"green" ranking system_. These evaluate and compare universities exclusively based on sustainability criteria.

---

1. For more details, see Alshuwaikhat and Abubakar (2008).

One example of these green ranking systems would be UI Green-Metric. It is a "green" World University Ranking initiative launched by Universitas Indonesia in 2010 and designed to classify participating universities according to the score resulting from a survey regarding their current condition and policies related to Green Campus and Sustainability. Their objective with this system is to draw the attention of university leaders and stakeholders to sustainability matters in the hope that this will result in more conservation efforts by these institutions. They also intend for this ranking to bring more visibility to universities that are already leading the way in sustainability initiatives, which isn't necessarily well reflected in their position in other World University Rankings systems. In order to establish these rankings they measure 33 indicators in 5 different categories:

1. Setting and Infrastructure (15%). For example spaces on campus covered by vegetation, sustainability budget compared to total university budget etc.
2. Energy and Climate Change (21%). For example energy efficient appliances, renewable energy, energy conservation, green buildings etc.
3. Waste (18%). For example recycling programs, reduction of the use of paper and plastic etc.
4. Water (10%). Water conservation.
5. Transportation (18%). For example number of cars, bicycles, transportation policies etc.
6. Education (18%). For example sustainability courses, research, publications, events, organisations (students), website etc.

This system depends on the voluntary participation of universities worldwide that have to fill out a survey with the pertinent data. In 2010 only 95 universities participated. That numbered nearly doubled to 178 in 2011, and has regularly increased since then (215 in 2012, 301 in 2013 and 361 in 2014).

3.2.2. Sustainable Campus Networks: ISCN

Another result of this "greening" process of HEIs around the world has been the creation of _networks of sustainable campuses_, such as the ISCN or "International Sustainable Campus Network". Founded in 2007, the ISCN's mission is to provide a "_global forum to support leading colleges, universities and corporate campuses in the exchange of information, ideas and best practices for achieving sustainable campus operations and integrating sustainability in research and teaching._" The ISCN promotes "_continuous improvement through learning and innovation on all aspects of sustainability on campus._" The key goals for this were developed in the ISCN-GULF Sustainable Campus Charter (developed together with GULF, the Global Universities Leaders Forum), and complemented by a detailed Charter Guidelines. The Charter was presented to the World Economic Forum in Davos in January 2010 and has been signed by many top-level educational institutions from around the globe.
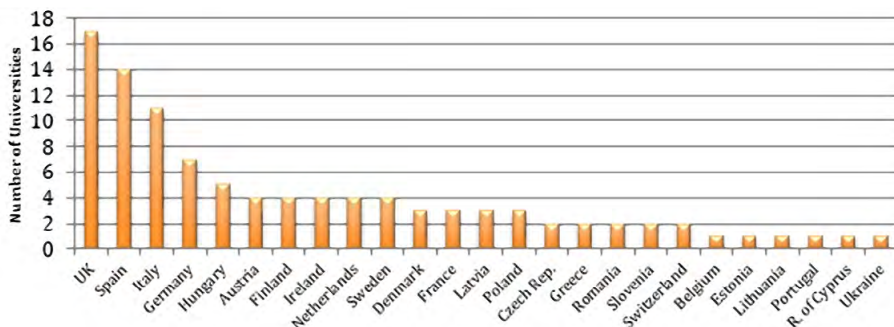
The signatories of the ISCN-GULF Sustainable Campus Charter are publicly engaging their institutions to aligning their operations, research and teaching with the goal of sustainability. They are thus committed to setting concrete goals in order to implement the three ISCN-GULF sustainable campus principles, and report regularly (and publicly!) on their organisation's performance regarding them:

- Principle 1: To demonstrate respect for nature and society, sustainability considerations should be an integral part of planning, construction, renovation and operation of buildings on campus.
- Principle 2: To ensure long-term sustainable campus development, campus-wide master planning and target setting should include environmental and social goals.

- Principle 3: To align the organisation's core mission with sustainable development, facilities, research and education should be linked to create a "living laboratory" for sustainability.

3.3. Sustainability at some EU HEIs

There doesn't appear to be a comprehensive study of sustainability (let alone energy efficiency) policies covering all European HEIs. We can nevertheless use systems like the UI GreenMetric to get an idea of how EU HEIs are doing in this field. Of course, as it is a voluntary study, the results are incomplete as there are many universities that haven't participated in the survey. We do however have quite a large sample size since 102 universities out of the 301 that participated in the 2013 survey were European (Fig. 3).

Figure 3: European Universities in the 2013 UI GreenMetric Rankings

Of these 8 were ranked in the top 20 overall (Table 4): University of Nottingham (UK), University College Cork National University of Ireland (Ireland), University of Bradford (UK), University of Plymouth (UK), Universidad de Alcalá (Spain), University of Bath (UK), Bangor University (UK), Linkoping University (Sweden). If we add in University of Sussex (UK) and Autonomous University of Madrid (Spain) then we have our European top 10.

Table 4: Top 10 ranked EU Universities in the 2014 UI GreenMetric Rankings. Red indicates top score amongst this group

Global Ranking	EU Ranking	University	Country	Total Score	Setting And Infrastructure	Energy and Climate Change	Waste	Water	Transportation	Education
	Total points possible			10000	1500	2100	1800	1000	1800	1800
1	1	University of Nottingham	UK	7521	687	2025	1575	990	1650	594
2	2	University College Cork National University of Ireland	Ireland	7328	619	1890	1575	1	1625	619
4	3	University of Bradford	UK	7112	666	1880	1575	995	1575	422
7	4	University of Plymouth	UK	6808	303	1820	1425	1	1500	760
12	5	Universidad de Alcala	Spain	6748	643	1905	1500	850	1325	524
15	6	University of Bath	UK	6712	855	1695	1425	1	1250	486
19	7	Bangor University	UK	6549	1031	1670	1500	995	750	603
20	8	Linkoping University	Sweden	6547	588	1625	1575	1	1275	484
21	9	University of Sussex	UK	6539	732	1350	1425	1	1625	407
24	10	Autonomous University of Madrid	Spain	6501	641	1710	1425	1	1175	550

The dominance of British universities in the list is clear. They are both the European country with the largest number of participants (17), and with the highest ranked universities (4 in the top 10 overall, 5 in the top 20, 12 in the top 100). Among European universities, University of Nottingham has the best scores for Energy and Climate Change, Waste (tied with Cork, Bradford and Linkoping in Sweden) and Transportation. Bangor University leads in Setting and Infrastructure and Water (tied with Bradford), while Plymouth leads in Education. In fact, in the four years since this survey began, one British university has been globally ranked either #1 or #2 every year: <u>University of Nottingham</u>.

According to their Sustainability website, University of Nottingham is "(…) *committed to becoming a leading green university. We are building on our teaching, research and operational excellence to achieve this.*" In fact, environmental sustainability is one of the guiding principles of the University's Strategic Plan, and staff and students are actively involved in sustainability matters through "Environmental Champions" and "Eco-Warriors", two groups of committed staff and student respectively.

The University of Nottingham's Environmental Strategy focuses on:

- Internationally recognised research strengths in the environment and sustainable energy fields.
- Courses in sustainability and environment related areas as well as modules for other areas of study.
- Estates operations built upon a strong environmental ethos.
- Adoption of progressive environmental strategies in their capital projects. Sustainability has been embedded into the heart of the designs.

This involves Key Operational Areas such as:

- Waste and recycling.
- Energy and water.
- Travel and transport.
- Procurement.
- Campus development.
- Awareness raising, training and communication.
- Corporate governance.
- Information services.
- Landscape.
- Teaching and learning.
- Research.

As a part of this strategy, the university has put into place a "Carbon Management Plan" to aid in reaching their target reductions in CO_2 emissions by 2020. Their focus, to ensure they achieve their initial aims by 2015, includes "*Move towards carbon-neutral energy performance through a major new carbon investment programme*" and "*Raise awareness of environmental sustainability among staff and students*". This requires the engagement of participants at all levels of the University – from individual behavioural changes to institution-led initiatives.

The Carbon Management Plan identifies the investment framework required over a 5-year period (2010-2015) in order to deliver the CO_2 savings needed to meet their targets. It also identifies the main proposed areas of activity, which will be regularly updated as new opportunities are identified. The principal areas of investment are centred on:

1. Improvements in energy efficiency of buildings, including insulation, heating and lighting.
2. More efficient use of existing equipment, including switching off when not in use.

3. Generation of energy from small/medium scale renewable energy systems.
4. Informing and training staff and students in order to engage them with the objectives of the Plan.
5. A cultural change in the use of high-energy consumption activities within premises and a strategy to replace them with lower energy alternatives.

Their performance targets are summarised in table 5. In order to achieve them, they will need to counter the historic rises seen in energy usage and obtain average annual reductions in energy consumption of 6GWh and CO_2 emissions of 2,800 tonnes.

Table 5: University of Nottingham performance targets in energy consumption and emissions for 2015

	Baseline 2008/09	Objective 2014/15
Total energy consumption / year	198 GWh	168 GWh
Total energy emissions / year	68,000 tonnes	54,000 tonnes

These reductions will be verified with yearly reports to monitor and report on their progress and performance achievements. This will also serve to provide an update on the CO_2 reduction projects to ensure that the remaining targets and objectives are met.

4. A closer look at one HEI's Energy Efficiency measures: the University of Alicante

4.1. Sustainability at the UA

4.1.1. A green campus

The four functions which society attributes to the University (teaching, research, cultural and social) would not be possible without the right environmental quality. The setting is something more than the framework in which teaching is conducted: it is a place where everyone "may live healthily". The University of Alicante, aware that environmental conditions and the correct disposition of the setting determine the result and quality of activities and interpersonal relations, unites this tradition with a modern concept of a space for communication.

Only a few years ago, the San Vicente site on which the University of Alicante campus is located, on the outskirts of Alicante's first airport, presented a desolate scene and a hostile environment. It was a compact and impermeable layer of limestone, whose only green area was a small pine forest surrounded by a great stretch of dry and dusty wasteland. The transformation of the University of Alicante, which occupies one of the best planned campuses in Europe, has been the result of a continuous effort within a tight plan of clearly defined criteria and in which a concern for the natural heritage is a fundamental axis. Step by step, with limited resources but with a determined willingness and great persistence, this negative situation – a wasteland – has been converted into a privileged place for study. The appropriate analysis and action taken on the adverse conditions have resulted in a clearly positive evolution. The extensive park and tree-lined areas, the limited height of buildings and the width of pedestrianized zones permit an environment conducive to outdoor activity and exchanges that constitute a truly pri-

University of Alicante campus. Photo by C.Beans.

vileged setting. This contributes to a better quality of life, both on a personal as well as on an academic level.

The achievement of a perfect coexistence between the university community, its buildings and nature is an old idea whose execution is one of the challenges that the University of Alicante has faced up to with the most decisiveness, following the conviction that a climate conducive to study, creativity and research is the indispensable condition for a suitable development of university life. Throughout the university's short history, one of the tasks which has been the given greatest priority is that of creating an appropriate equilibrium between the campus and its environment. The planning which has taken place previous to any construction has led to a harmonious university in which the clear relationships between

the university community, building and nature has been obtained. Indeed, no building work is initiated in the University without first being adapted to the coordination plan that adheres to a series of clearly defined landscaping criteria. Water, trees and gardens are basic components in the city of knowledge, conceived as a setting, which has a positive influence on the work of students, teachers and administrative staff. The University of Alicante is determined to consolidate a campus capable of naturally combining and integrating the green and garden areas and architecture, creating an ideal environment for study and research, culture and sport. The ultimate aim is to convert Alicante's campus into a natural and cultural park open to society. Both care and respect towards the Mediterranean natural environment, in particular its flora, as the application of a model of integral management subject to the hypotheses of a sustainable environment will lead to the attainment of an Ecological University.

The campus has been developed as a sustainable space for the development of all kinds of exchanges, with the presence of collective places characteristic of a tradition based on coexistence, on meetings. A key element in the Mediterranean environment, a vital aspect of the Mediterranean character, is the town or village square: an open space, a place for communication, exchange and participation. The University of Alicante is physically structured around a series of open spaces (Plaza de Miguel Hernández, Plaza de Europa, Plaza Olímpica…), which form part of the heart of the University City. Squares, gardens and wooded areas allow for a wide range of outdoor activities; Architecture and Engineering students sketching during their practical drawing lectures share these spaces with those who attend the storytelling workshops in the "Pinada de los Cuentos", as well as with those who are going from one Centre to another, or simply strolling in their free time, in a precise mixture of Mediterranean idiosyncrasy. Next to the square, the garden,

which is conducive to going form walks and meeting people, continuous contact with Mediterranean nature. Both of these, added to the good climate, make outdoor activity possible.

Alicante is not only a city on the coast; it is a city open to the sea. The University also looks out to the Mediterranean Sea and sees in it not only a setting for study or for leisure, but rather the meeting point with the countries around its basin, with whom it shares interests, traditions, culture and the future. The University of Alicante pays special attention to the historical, cultural, economic or geographical aspects of the Mediterranean world, along with its wealth, and devotes part of its efforts to nautical teaching, tourism planning, marine biology or the coastal ecosystem.

With regards to transportation to and from the University, the use of collective transport has been encouraged, promoting its use from anywhere in the province. Pedestrianization of a large part of the university domain and the location of car parks on the outskirting areas intend to be dissuasive measures for the use of private transport. Parallel to this, several awareness campaigns have been launched with the objective of encouraging the use of public transport or the sharing of private vehicles.

The University of Alicante aims to appropriately combine its attention to the aspects which most interest to the society, to whose development it feels committed, with universal approaches and an essentially European perspective. One of the most constant concerns is that of reaching the necessary balance between growth and preservation, which it puts into practice in the approach of solutions to its own needs, openly backing the sustainable development principle.

All this is that makes the University of Alicante a place for creation and creativity.

4.1.2. Strategic planning

In order to face the challenges of the 21st century, and best serve its own staff, students and society in general, it is essential for a university to have a solid strategic plan. This should include a long-term vision for the university, as well as measures to ensure efficiency, effectiveness and transparency. With the participation of the entire university community, the University of Alicante recently revised its Strategic Plan and updated it to cover the next five years (PEUA40).

The University of Alicante's mission is to provide an integral academic training to its students, while being committed to the improvement of society through the creation and transfer of knowledge, as well as technical, scientific and cultural development. It includes key concepts such as quality, social commitment, **environmental knowledge**, cooperation for development, equality, integration, participation, critical thinking, tolerance and transparency.

Sustainability is one of the many elements included in the university's vision for itself by the year 2019. This includes the need to have adequate spaces and infrastructures available for the university community, which are **sustainable and efficiently managed**, in particular those spaces dedicated to teaching, research and transfer. The institution should also be socially responsible, ethical and engaged with sustainable development and the promotion of good citizenship values. A complete implantation of digital systems will allow for the optimization of resources.

The university's Strategic Plan is organized along six axes of actions: training, research and innovation, the university collective (staff & students), university policies, entrepreneurship and material resources. This last one includes strategic actions for campus and environmental sustainability.

The university's Vice-chancellorship for Infrastructures, Spaces and Environment is responsible for the university's sustainability measu-

res. As part of the sectional Environmental Strategic Plan, in 2007 the University of Alicante developed Agenda21 (based on the principles put forth in Rio'92), an engagement with the community to stimulate in a structured manner the development of measures to make social and economic development compatible with a respect for the environment. The intention with Agenda21 is to obtain – via the participation of the entire community – a sustainable campus: ecological, supportive of the environment and participative.

In this context, an **Energy Efficiency Action Plan** was put forth, after having measured and analysed the university's energy consumption as well as taken into account aspects such as the presence of a solar energy plant, transformation centres, natural gas network, fuel deposits, energy efficiency in existing buildings, exterior lighting, etc. Its objective is to maximise energy savings and increase the use of clean and renewable energies. In order to do that a series of actions were proposed to improve energy management, both in the optimization or resource consumption in the installations, as in the use of sources of renewable energy. These actions include:

- Program VII.1 – Improvement of the energy efficiency of the infrastructures and equipment on campus.
  - Efficient electricity consumption in UA installations
  - Improvement of the energy efficiency in the exterior lighting on campus
  - Application of energy efficiency criteria in UA buildings

- Program VII.2 – Promotion of the use of less-contaminating sources of energy
  - Reduction of the contamination generated by fleet of vehicles
  - Installation of new solar panels
  - Extension of the natural gas network

- Program VII.3 – Equipment and Installations maintenance
  - Efficient management of the prevention and correction maintenances of equipment and installations
  - Efficient management of the prevention and correction maintenance of electric transformers
  - Efficient management of the prevention and correction maintenance of the fuel deposits

4.2. Units at the UA involved in Energy Efficiency and Sustainability Measures

4.2.1. EcoCampus Office for Environmental Management (include EcoCampus logo)

EcoCampus began in 2007 following the recommendations of the "Working Group for Environmental Quality and Sustainable Development" of the CRUE (Consejo de Rectores de Universidades Españolas – Spanish council of university presidents), and falls under the umbrella of the Vice-chancellorship for Infrastructures, Spaces and Environment. The office is in charge of promoting the participation of the university community (staff and students) in developing proposals and solutions in defence and improvement of the environment. In order to do this, EcoCampus is in regular contact with and has the support of the Green Office of the Student Council, the Committee for Health and Safety, the University Technical Services, the Syndicates and representatives of the centres.

The lines of work the EcoCampus office is involved in include:

- Waste management
- Sustainable mobility
- Natural resource management
- Environment

Gradually, EcoCampus has been developing the following functions:

- Development of proposals for management and environmental quality actions, delivered to the Vice-chancellorship for Infrastructures, Spaces and Environment.
- Being a link between all the agents, in particular the Environmental Quality Commissions of the Centres.
- Coordination and monitoring tasks for the execution of the protocols derived from the university's Agenda21 program, as a part of the Environmental Strategic Plan.
- External fundraising: programs, financial assistance, grants, scholarships, etc.
- Advise any future Environmental Quality Commissions that are created on-campus.
- Promotion of the organisation of training courses for the university personnel in environmental matters.
- Promotion of awareness and information campaigns amongst the university community (Fig. 4).
- Gathering of environmental initiatives from the university community.

Figure 4: Environmental and Sustainability Awareness Campaigns at the UA.

4.2.2. Infrastructure and Services Unit

The Infrastructures Service, through its Technical Office, is continuously working to provide energy efficiency and sustainability to the UA campus. Its mission is to ensure the proper functioning of the infrastructure and outsourced services, following planning criteria, efficiency and continuous improvement.

The Technical Office acts in the following fields:

- Rationalisation and control of expenditure.
- Supervision and coordination of the implementation of construction projects.
- Realization of technical studies, technical reports, technical specifications and economic evaluations.
- Control of energy and water consumption.
- Technical Studies in Telecommunications needs.
- Planning the requirements for furniture to equip buildings.
- Organization of events.
- Running actions on prevention of occupational risks.
- Coordination of internal mail system.
- In conjunction with the Maintenance Office, gives feedback on the reports produced in its field.

4.2.3. Management of Infrastructures for Energy Efficiency at the UA

To achieve energy efficiency on-campus, the UA team follows these basic steps:

- **DESIGN**. The first thing to do is to study the design of the building, whether it be new or about to be restored. This needs to be done taking into account sustainability principles (building orientation, location of the windows in order to optimize the use of daylight, etc.)

- **USE.** This refers to the use of the installations and the training of the users (staff and students). Who will be using the installations? What kind of activities will they be doing? What sort of timetable will they be following? How will the users learn good practices for sustainability in general (and energy efficiency in particular)? This level is where the Eco-campus team steps in. There is also a "welcome" manual available for janitors and other building managers.

- **CONTROL AND ENERGY CONSUMPTION** is done by the Technical Office. Among the various measures they implement to control the consumption of energy at the UA:
  - Changing the air conditioning system in several buildings (Aulario I, Germán Bernácer, Ciencias Sociales), which, along with the system in the new Education building, is now controlled electronically from the Technical Office to optimize the expense.
  - In buildings where this change hasn't been applied yet, a scheduling device has been installed so the system turns on and off automatically, thus negating the risk of the user forgetting to do so.
  - A monthly check of energy usage and billing is done in order to detect any leaks or problems.
  - Power optimisation has been done. The university has a contract with the energy supplier for only the power it actually consumes, which reduces the cost considerably (about 100 000 € / year).
  - Any future installations are planned from the very beginning to be as efficient as possible.
  - High energy-efficient machinery and equipment is purchased.
  - Illumination controls are done both in the interior (via daylight-level sensors or motion detectors for low-occu-

pancy areas, among other systems) and the exterior. Light systems have been replaced by energy efficient lighting.

- A lot of savings in water are achieved through regular maintenance checks as they allow for the detection of any leaks. Faucets have also been set to a minimum time of water dispersion to reduce water consumption. And the water used for gardening comes from the local well, after having been processed in the desalination plan.

Thanks to the work of the various units of the University of Alicante involved in Sustainability and Energy Efficiency, particularly the Technical Office, the UA has seen its annual consumption of energy (natural gas + electricity) decrease by about 1.000.000 KWh on a yearly basis since 2010. The expected savings between 2010 and 2013 is 3.568.624 KWh, or 15,75% of the university's energy consumption. (Fig. 5)
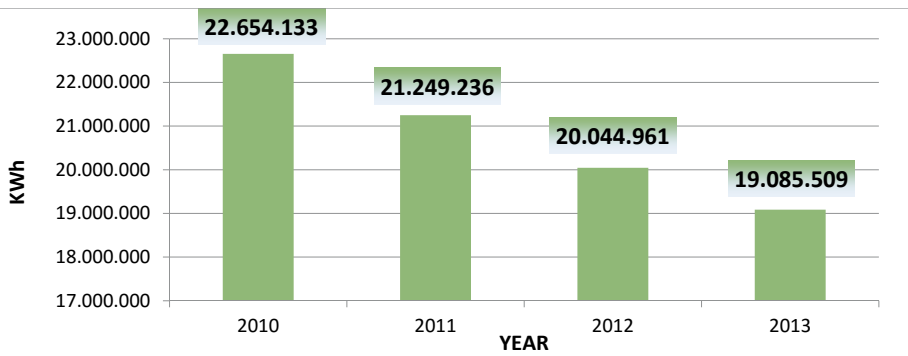

Figure 5: Annual Energy Consumption (natural gas + electricity) at the UA

In order to achieve such reductions in energy consumption, the UA team has worked through six phases:

- Phase I: Identification of the need and study possible solutions. An Energy Audit is done to see if the expected savings will cover the cost of the necessary investment.

- Phase II: Basic Project Design and Project Execution by an external team. If the solution selected is a simple one (for example, replacing lighting), and a project to implement it isn't needed, then the solution will be put into effect directly by the Technical Office.
- Phase III: Supervision of the project and testing to see if the implemented solution is appropriate, done by the Technical Office.
- Phase IV: Execution of the building works.
- Phase V: Monitoring of the new infrastructure functioning, including the consumption rates, by the Technical Office.
- Phase VI: To optimize the solution with its use and maintenance.

Some measures applied to reduce electricity consumption in the university buildings, which take into account the buildings' use, include:

- Closing of buildings during the holidays.
- Concentration in a single building of all exams done on Saturdays.
- Reduction in hours of outdoor lighting.
- Regulation of indoor lighting according to the available sunlight.
- Reduction in hours of air conditioning use.
- Having an automatic switch on and off system for air conditioning in all buildings.
- Involving the administrative staff in all buildings to switch off lights when not needed.
- An awareness campaign to have users take the stairs instead of the elevator.

5. Conclusions

Higher education is a growing sector, each year the number of students attending universities and other HEIs increases. This results in an increasing consumption of energy by HEIs worldwide, with its resulting environmental impact. Unfortunately budgets rarely increase to match this, and thus HEIs are under constant pressure to make the most of limited resources. Implementing Energy Efficiency measures (to obtain the same – or better – results by using less energy) therefore makes sense not only for environmental and sustainability reasons, but for economic ones as well.

Incorporating the concept of sustainability and energy efficiency in a university's strategic plan is crucial to obtaining the support of the university community for implementing sustainability policies and actions. There are many examples and success stories of this process worldwide. However there is no need to start with any drastic measures, it could be a simple matter of raising awareness and promoting a few simple techniques (such as turning off the lights when leaving a room) that can reduce energy consumption. An in-depth study of the university's energy use will guide the way for more significant work in the field. It will also boost the university's environmental credentials, which could make it more attractive to potential students, researchers and investors.

Finally, higher education institutions have a responsibility to help develop the society they are a part of, whether it be by training future citizens, or leading by example and inspiring others to do the same. They have therefore a key opportunity to lead the way along a path of sustainability and energy efficiency, and hopefully the rest of society will follow.

References

Alshuwaikhat, H.M., Abubakar, I. (2008). "An integrated approach to achieving campus sustainability: assessment of the current campus environmental management practices", *Journal of Cleaner Production 16*: 1777-1785.

COPERNICUS CAMPUS (2005). *COPERNICUS – Guidelines for Sustainable Development in the European Higher Education Area. How to incorporate the principles of sustainable development into the Bologna* Process. 40pp.

Faghihimani M. (2010). *Best Green University Practice.* Grønt UiO. 26pp.

Ferrer-Balas, D., Bruno, J., de Mingo, M., Sans R. (2004). "Advances in education transformation towards sustainable development at the Technical University of Catalonia, Barcelona". *International Journal of Sustainability in Heigher Education 5(3)*: 251-266.

International Sustainable Campus Network. Global University Leaders Forum. (2010). *ISCN/GULF Sustainable Campus Charter*.

International Sustainable Campus Network. Global University Leaders Forum. (2010). *Implementation Guidelines to the ISCN-GULF Sustainable Campus Charter*. 32pp.

Lowe, P. (2011). *A new Directive on Energy Efficiency - Challenges addressed & solutions proposed. Directorate-General for Energy*. European Commission.

Simkins, G, Nolan, A. (2004). "Environmental management system in universities". *Occasional paper for the environmental association for universities and colleges (EAUC)*.

United Nations Sustainable Development. (1992). *Agenda 21. From United Nations Conference on Environment & Development*. Rio de Janeiro, Brazil, 3 to 14 June 1992.

University of Nottingham. (2010). *Environmental Strategy*. 20pp.

University of Nottingham. (2010). *Carbon Management Plan 2010-2020*. 20pp.

Online resources

Association of University Leaders for a Sustainable Future (ULSF) http://www.ulsf.org/

COPERNICUS Alliance - http://www.copernicus-alliance.org/

COPERNICUS – The University Charter for Sustainable Development (1994) – http://www.iau-hesd.net/sites/default/files/documents/copernicus.pdf

Efficient energy use - http://en.wikipedia.org/wiki/Efficient_energy_use

European Commission Energy Efficiency Directive - http://ec.europa.eu/energy/efficiency/eed/eed_en.htm

International Institute for Sustainable Development (iisd) - http://www.iisd.org/

International Sustainable Campus Network (ISCN) - http://www.international-sustainable-campus-network.org/

Sustainable Development On Campus. Tools for Campus Decision Makers. http://www.iisd.org/educate/

University of Alicante – Agenda21 - http://web.ua.es/en/agenda21/presentation.html

University of Alicante EcoCampus – http://web.ua.es/en/ecocampus/initiation.html

University of Alicante Strategic Plan PEUA40 - http://web.ua.es/en/peua/strategic-plan-ua-40.html

University of Nottingham Sustainability – http://www.nottingham.ac.uk/sustainability/index.aspx

University of Waterloo – Sustainability Assessment Framework http://www.adm.uwaterloo.ca/infowast/watgreen/projects/library/w04sustframework.pdf

European Commission – Climate Action - http://ec.europa.eu/clima/policies/brief/eu/index_en.htm

European Council – For an energy efficient economy - http://www.eceee.org/

EU Energy Policy - http://gef.eu/wp-content/uploads/2017/01/GEF-10-06_NREAP_EN_web_final.pdf

For more information about SUCCEED Network,
please visit our website:

www.project-succeed.eu

SUCCEED Network
'East African Higher Education Network on Sustainable and Energy Efficient Campus Development'
(FED/2013/320-274)