BSEC-HDF project:
“Green Cluster of Knowledge Institutions of Black Sea: A Roadmap on Renewable Energy Sources and Energy Efficiency for Research and Academic Institutions”

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*Report prepared by:*

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1. Introduction

In the framework of the objectives of the HDF project “Green Cluster of Knowledge Institutions of Black Sea: A Roadmap on Renewable Energy Sources and Energy Efficiency for Research and Academic Institutions”, a report on Best Practices on Energy Efficiency and use of Renewable Energy Sources has been prepared. The aim of this report is to present successful efforts, implementing energy efficient practices in research and academic institutions. The selected case studies are drawn from a wide range of practices from all over the world, using different environmental strategies and tools. It should be mentioned, that both the international and the European environmental institutional framework, promote a variety of voluntary schemes, which enhance energy efficiency goals and the use of renewable energy sources. This variety is the outcome of the different institutional settings (national, European, international), the different key stakeholders involved (actors constellations), and the different regional and local conditions, in which concrete practices are implemented. However, although diversification exists, common scope/objectives and principles are followed in the implementation of the environmental schemes and tools. All tools enable an organization of any type and size to: a. identify and control the environmental impact of its activities, products or services, b. to improve its environmental performance continually, and c. to implement a systematic approach in order to set environmental objectives, priorities and targets, achieve these and demonstrate that they have been achieved.

The report is structured in two main parts.

The first part presents the existing institutional frameworks related to environment and energy at international, European and Black Sea levels:

- international conventions and energy efficiency goals and the most important voluntary environmental schemes (ISO 14001, Leed scheme, Breeam scheme, Energy Star)
- the European institutional framework with reference to the European Energy Strategy and the main operational tools (EMAS, European Energy Star and Green Public Procurement)
- the Black Sea state of the art regarding environmental and energy related issues

The second part presents selected international, European and Black Sea case studies (mostly Universities and Research Institutions), which are considered to be successful in terms of implementing environmental energy efficiency strategies. The analysis of the case studies follows the same basic structure:

a. Background
b. Objectives and principles
c. Implementation plan
d. Achievements and awards
e. Lessons to be learned

In the conclusions the most important results are highlighted. These can also be considered as lessons for “policy transfer” in other countries, regions and localities.
2. International Framework

2.1 International Conventions and energy efficiency goals

The Kyoto protocol\(^1\) is an international agreement linked to the United Nations Framework Convention on Climate Change. It was adopted in Kyoto, on 11 December 1997 and entered into force on 16 February 2005. The major feature of the Kyoto Protocol was that it set binding targets for 37 industrialized countries and the European community for reducing greenhouse gas (GHG) emissions. These amounted to an average of 5% against 1990 levels over the five-year period 2008-2012. The major distinction between the Protocol and the Convention is that while the Convention encouraged industrialised countries to stabilize GHG emissions, the Protocol committed them to do so.

Recognizing that developed countries are principally responsible for the current high levels of GHG emissions in the atmosphere as a result of more than 150 years of industrial activity, the Protocol places a heavier burden on developed nations under the principle of “common but differentiated responsibilities”.

Under the protocol, countries should meet their targets primarily through national measures. However, the Kyoto Protocol offered them an additional means of meeting their targets through three market-based mechanisms:

- Emissions trading – (“the carbon market”)
- Clean development mechanism (CDM)
- Joint implementation (JI)

The Kyoto Protocol was generally seen as an important first step towards a truly global emission reduction regime that would stabilize GHG emissions, and provide the essential architecture for any future international agreement on climate change.

The Cancun Climate Change Conference in November 2010\(^2\) produced the basis for the most comprehensive and far-reaching international response to climate change, in order to reduce carbon emissions and build a system which made all countries accountable to each other for those reductions. Among the highlights of the meeting, Parties agreed:

- to commit to a maximum temperature rise of 2 degrees Celsius above pre-Industrial levels, and to consider lowering that maximum to 1.5 degrees in the near future
- to make fully operational by 2012 a technology mechanism to boost the innovation, development and spread of new climate-friendly technologies
- to establish a Green Climate Fund to provide financing to projects, programmes, policies and other activities in developing countries via thematic funding windows;
- on the Cancun Adaptation Framework, which included setting up an Adaptation Committee to promote the implementation of stronger, cohesive action on adaptation.

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1 The Kyoto protocol, http://unfccc.int/kyoto_protocol/items/2830.php
On the mitigation front, developed countries submitted economy-wide emission reduction targets and agreed on strengthened reporting frequency and standards and to develop low-carbon national plans and strategies. Developing countries submitted nationally appropriate mitigation actions (NAMAs), to be implemented subject to financial and technical support. Work continued on shaping the form and functions of a registry for NAMAs to enable the matching of such actions with finance and technology. Developing countries were also encouraged to develop low-carbon national plans and strategies.

By agreeing on a maximum two degrees Celsius temperature rise, countries sent the strongest signal ever that there would be shift towards a low-carbon global economy. However, all pledges put forward by governments came to a combined total of only 60% of the emission reductions needed for a 50% chance of keeping temperatures below that goal. And the conference left the future of the Kyoto Protocol unresolved, which also left open the question of the fate of the international carbon market.

The Climate Change Conference 2011 in Durban\(^3\), South Africa, represented the efforts of developed nations to sign up to a second term of the Kyoto Protocol, which specifies legal limits for their carbon dioxide emissions, before it expires in 2012. The main objective was to establish a new treaty to limit carbon emissions.

The conference agreed to a legally binding deal comprising all countries, which will be prepared by 2015, and to take effect in 2020. There was also progress regarding the creation of a Green Climate Fund (GCF) for which a management framework was adopted. The fund is to distribute US$100 billion per year to help poor countries adapt to climate impacts. While the president of the conference declared it a success, scientists and environmental groups warned that the deal was not sufficient to avoid global warming beyond 2 °C as more urgent action is needed.

Indeed, most of the major players made clear their unwillingness to negotiate their positions. The European Union presented a positive position to revive Kyoto, saying it would sign up for a second term. But it stipulated that the world’s two biggest polluters, the United States – the sole developed country to shun Kyoto – and China – still classed as a developing country – should also agree to legally-binding emissions cuts before 2015. The US said that China signing up to such a deal was a “basic requirement” for its own participation but even then, it offered no guarantees. Meanwhile China said that they would insist on developed nations signing a second Kyoto term before agreeing to any global deals themselves.

\[2.2\] Environmental policy tools and energy efficiency

The main more important voluntary environmental policy tools that include goals concerning energy efficiency are the ISO 14001, the LEED scheme, the BREEAD scheme and the Energy Star.

2.2.1 ISO 14001

The first Earth Summit in Rio-de-Janeiro (1992) generated a global commitment to the environment. In the same year, BSI Group\(^4\) published the world's first environmental management systems standard, British Standard (BS) 7750. This supplied the template for the development of the ISO 14000 series in 1996 by the International Organization for Standardization.

The ISO 14000 family addresses various aspects of environmental management. The very first two standards, ISO 14001:2004 and ISO 14004:2004 deal with environmental management systems (EMS). ISO 14001:2004 provides the requirements for an EMS and ISO 14004:2004 gives general EMS guidelines\(^5\). It is worth mentioning that unlike previous environmental regulations, based on strict control approaches, ISO 14000 was based on a voluntary approach to environmental regulation. ISO 14001 is now adopted by more than 220,000 organizations in 159 countries and economies\(^6\).

An EMS meeting the requirements of ISO 14001:2004 is a management tool enabling an organization of any size or type to:

- identify and control the environmental impact of its activities, products or services
- improve its environmental performance continually
- implement a systematic approach to setting environmental objectives and targets, to achieving these and to demonstrating that they have been achieved\(^7\)

As a voluntary tool, ISO 14001 aims at assisting companies in continually improving their environmental performance, whilst complying with any applicable legislation. The standard can be applied to a variety of levels from business and government to society. The ISO 14000 family is designed to be implemented according to the same Plan-Do-Check-Act (PDCA) cycle underlying all ISO management systems standards\(^8\).

**Plan**

Prior to implementing ISO 14001, the organization is advised to conduct an initial review or gap analysis, in order to identify the current operation and the way it interacts with the environment. This review assists the establishment of environmental objectives, the development of management processes and the highlight of any relevant legal requirements.

**Do**

\(^4\) BSI is the National Standards Body of the UK that develops and sells standards and standardization solutions, provides independent third-party certification of management systems and helps improve environmental, social and economic performance (http://www.bsigroup.com/en/About-BSI/).

\(^5\) ISO 14000 essentials (http://www.iso.org/iso/iso_catalogue/management_and_leadership_standards/environmental_management/iso_14000_essentials.htm)


\(^7\) An ISO 14001:2004 based EMS (http://www.iso.org/iso/iso_14000_essentials)

\(^8\) The ISO 14000 family (http://www.iso.org/iso/theiso14000family_2009.pdf)
During this stage the organization identifies the resources required and works out those members of the organisation responsible for the EMS’ implementation and control. This includes the participation of all levels of the organisation in the implementation phase, along with the education and active involvement of all employees which is a vital part of the ISO implementation.

**Check**

During the check stage, performance is monitored and periodically measured to ensure that the organisation’s environmental targets and objectives are being met. In addition, internal audits are regularly conducted to ascertain whether the EMS itself is being implemented properly and whether the processes and procedures are being adequately maintained and monitored.

**Act**

After the checking stage, a regular planned management review is conducted to ensure that the objectives of the EMS are being met and to evaluate changing circumstances, in order to make recommendations for further improvement of the system. These recommendations are then fed back into the planning stage to be implemented into the EMS moving forward.

### 2.2.2 LEED scheme

LEED (Leadership in Energy and Environmental Design) is the most recognised building environmental assessment scheme and it was developed by the U.S. Green Building Council (USGBC) in 2000. LEED provides building owners and operators with a framework for identifying and implementing practical and measurable green building design, construction, operations and maintenance solutions. LEED certification provides independent, third-party verification that a building, home or community was designed and built using strategies aimed at achieving high performance in key areas of human and environmental health: sustainable site development, water savings, energy efficiency, materials selection and indoor environmental quality.

### 2.2.3 BREEAM scheme

BREEAM is the most widely used building environmental rating scheme in the U.K. Although it is a voluntary standard, the energy performance assessment adopts the U.K. Building Regulation as a benchmark to rate the level of performance improvement.

The main difference between LEED and BREEAM is the process of certification. BREEAM has trained assessors who assess the evidence against the credit criteria, who validate the assessment and issue the certificate. While LEED does not require training, there is a credit available if an accredited professional (AP) is used. The role of the AP is to help gather the evidence and advise the client. The evidence is then submitted to the US-GBC which does the assessment and issues the certificate.

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11 Ibid.
14 [http://www.bsria.co.uk/news/breeam-or-leed/](http://www.bsria.co.uk/news/breeam-or-leed/)
2.2.4 Energy Star

Energy Star\footnote{Energy Star, http://www.energystar.gov/} is a joint program of the U.S. Environmental Protection Agency and the U.S. Department of Energy aiming at protecting the environment through energy efficient products and practices.

Energy Star can be implemented either in homes or in businesses. For homes, energy efficient choices include:

- new household products and new homes that have earned the Energy Star and meet strict energy efficiency guidelines
- improvements to existing houses that will reduce energy bills and improve home comfort

For businesses, the Energy Star offers an energy management strategy that helps in measuring current energy performance, setting goals, tracking savings, and rewarding improvements. EPA provides an energy performance rating system which businesses have already used for more than 200,000 buildings. EPA also recognizes top performing buildings with the Energy Star.

3. European Framework

3.1 European Energy strategy

On 10 November 2010, the European Commission adopted the Communication “Energy 2020 - A strategy for competitive, sustainable and secure energy”\footnote{Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions Energy 2020 a Strategy for Competitive, Sustainable and Secure Energy (http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:52010DC0639:EN:HTML:NOT)}. The Communication defines the energy priorities for the next ten years and sets the actions to be taken, in order to tackle the challenges of saving energy, achieving a market with competitive prizes and secure supplies, boosting technological leadership, and effectively negotiate with our international partners.

The new energy strategy focuses on five priorities:

1. Achieving an energy efficient Europe;
2. Building a truly pan-European integrated energy market;
3. Empowering consumers and achieving the highest level of safety and security;
4. Extending Europe’s leadership in energy technology and innovation;
5. Strengthening the external dimension of the EU energy market.

According to the EU, the scope of a European energy policy is threefold: combating climate change, limiting the EU’s external vulnerability to imported hydrocarbons, and promoting growth and jobs, thereby providing secure and affordable energy to consumers. Additionally, the Commission proposes that the European Energy Policy should be highlighted by:

- an EU objective in international negotiations of 30% reduction in greenhouse gas emissions by developed countries by 2020 compared to 1990. In addition, 2050 global
greenhouse gas emissions must be reduced by up to 50% compared to 1990, implying reductions in industrialised countries of 60-80% by 2050;
- an EU commitment now to achieve, in any event, at least a 20% reduction of greenhouse gases by 2020 compared to 1990.

Meeting the EU’s commitment to act now on greenhouse gases should be at the centre of the new European Energy Policy for three reasons: (i) CO2 emissions from energy make up 80% of EU greenhouse gas emissions, reducing emissions means using less energy and using more clean, locally produced energy, (ii) limiting the EU’s growing exposure to increased volatility and prices for oil and gas, and (iii) potentially bringing about a more competitive EU energy market, stimulating innovation technology and jobs.

3.2 Operational policy tools

3.2.1 EMAS

The EU Eco-Management and Audit Scheme (EMAS) is a management tool for companies and other organisations to evaluate, report and improve their environmental performance. The scheme has been available for participation by companies since 1995 and was originally restricted to companies in industrial sectors.

Since 2001 EMAS has been open to all economic sectors including public and private services. In 2009 the EMAS Regulation was revised and modified for the second time. Regulation (EC) No 1221/2009 of the European Parliament and of the Council of 25 November 2009 on the voluntary participation by organisations in a Community eco-management and audit scheme (EMAS) was published on 22 December 2009 and entered into force on 11 January 2010.

Currently, more than 4,500 organisations and approximately 7,800 sites are EMAS registered. EMAS is a voluntary tool available for any kind of organisation aiming to:

- Improve its environmental and financial performance and
- Communicate its environmental achievements to stakeholders and society in general

The EMAS’ key elements are:

1. Performance: annual updates of environmental policy targets and actions to implement and evaluate these targets
2. Credibility: Third party verification by independent auditors guarantees the value of both actions taken and disclosed information
3. Transparency: Environmental statements provide public information about the environmental performance of the organisation

To receive an EMAS registration, an organisation should comply with the following stages:

- Conduct an environmental review assessing all environmental aspects of the organisation
- Adopt an environmental policy with a binding commitment to comply with the relevant environmental legislation and achieve continuous improvement

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• Develop an environmental programme setting specific targets
• Establish an effective environmental management system (EMS) aimed at achieving the organisation’s environmental policy
• Carry out an environmental audit for the assessment of the EMS
• Provide an environmental statement of its environmental performance and the future steps to be undertaken
• The validated statement needs to be sent to the EMAS Competent Body for registration and made publicly available before an organisation can use the EMAS logo

The European Commission has recognised that ISO 14001: 2004 is an integral part of EMAS III. However, EMAS takes into account additional elements to support organisations in continually and significantly improving their environmental performance, as it is illustrated in the following picture.


### 3.2.2 European Energy Star

The European Energy Star Programme\(^\text{18}\) is a voluntary energy labelling programme for office equipment. The Energy Star logo helps consumers identify office equipment products that save them money and help protect the environment by saving energy. Office information and communication technology equipment (computers, monitors, printers, fax machines, copiers, scanners and multifunction devices) is responsible for a growing share of electricity consumption in the EU.

Manufacturers, assemblers, exporters, importers and retailers are invited to register with the European Commission allowing them to place the Energy Star label on products that meet or exceed energy-efficiency guidelines. The participation in the programme is voluntary.

The EU Energy Star programme follows an Agreement between the Government of the US and the European Community (EU) to co-ordinate energy labelling of office equipment. It is managed at

by the European Commission. US partner is the Environmental Protection Agency (EPA) that started the scheme in the US in 1992\(^\text{19}\).

3.3.3 Green Public Procurement

Green Public Procurement (GPP) is defined as "a process whereby public authorities seek to procure goods, services and works with a reduced environmental impact throughout their life cycle when compared to goods, services and works with the same primary function that would otherwise be procured"\(^\text{20}\), according to the Communication “Public procurement for a better environment” (COM (2008) 400, which was published on 16 July 2008.

Public authorities are major consumers in Europe, spending approximately 2 trillion euros annually, equivalent to some 19% of the EU’s gross domestic product. By using their purchasing power to choose goods and services with lower impacts on the environment, they can make an important contribution to sustainable consumption and production.

GPP is a voluntary instrument, which means that Member States and public authorities can determine the extent to which they implement it.

Green purchasing is also about influencing the market. By promoting and using GPP, public authorities can provide industry with real incentives for developing green technologies and products. In some sectors, public purchasers command a large share of the market (e.g. public transport and construction, health services and education) and so their decisions have considerable impact.

The implementation of GPP provides a series of environmental, social, economic and political benefits:

- The achievement of environmental targets by public authorities
- The provision of example to private consumers and organisations, demonstrating that environmental action is possible, it leads to positive outcomes and they can also use green procurement
- The raise of awareness of environmental issues by identifying the environmental impacts of a product/service and the benefits of greener alternatives
- The improvement of quality of life, since the working environment becomes healthier
- The establishment of high environmental performance standards for products and services
- The saving of money and resources, for example lower electricity use
- The provision of incentives to industrial sector in order to promote innovation
- The reduction of prices for green technologies
- The demonstration of the public sector’s commitment to environmental protection and sustainable consumption and production

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4. The state of the art in the Black Sea countries

The energy sector constitutes the backbone of economy for the countries of the Black Sea, concerning either production or transportation, and therefore environmental impacts in the area are more evident than anywhere else. Guided by the significance of the energy sector in further economic development and its interrelation with environmental sustainability, the Black Sea countries emphasize on regional cooperation as a prerequisite for coordinated actions aiming at sustainable development.

More specifically, the Organisation of the Black Economic Cooperation (BSEC) has established the Working Group on Energy, where representatives from the BSEC member-states (among them Greece, Turkey and Russia) participate in forming strategies and objectives for future action. For example, in the last Working Group (Istanbul, 3-4 April 2012) the Agenda included topics such as:

- Steps to be undertaken in order to advance towards the goal of establishing an integrated Black Sea energy market
- Strengthening cooperation between BSEC and other international organisations and agencies in the field of energy
- State of implementation of the provisions of the declarations and decisions of Ministers of energy of BSEC member states, as well as BSEC council resolutions and decisions

In the same spirit and acknowledging the importance of the convergence of the energy strategies, taking into account the national interests and the region as a whole, the Working Group on Energy prepared an Action Plan focusing on the following main areas:

- Energy security, ensuring reasonable level of energy security for each BSEC MS and the region as a whole through intensification of cooperation among them aimed at maximal utilization of domestic energy resources for power generation and implementation of appropriate diversification policy by the development of generating sources, intensification and extension of cooperation in the transportation/transiting of energy resources across the BSEC region and other countries, including development of new routes of supply and new regional infrastructures
- Legislation and regulations, aiming at promoting the gradual harmonization of the relevant national legislations of the BSEC Member States toward the establishment of an integrated BSEC energy market
- Environmental protection, ensuring effective action against climate change to strengthen environmental protection through the application of best practices and environmental standards during designing and implementation of national and regional projects in energy
- Energy efficiency, promoting energy efficiency throughout the region and develop long-term targeted energy efficiency campaigns, including research, demonstration, market incentives, best practices, and develop relevant investment projects
- Alternative and renewable sources, aiming at the increase of the use of solar energy, biomass, wind energy, geothermal energy and others and recognizing the important role and encouraging the use of advanced technologies towards a clean environment
- Promotion of BSEC, international cooperation and project development, promoting BSEC region as an emerging important player in international energy security architecture and engaging in a more cooperative and comprehensive basis cooperation with other important stakeholders in the field
• Monitoring of the implementation of the provisions of the BSEC declarations on cooperation in energy, ensuring coherency, consistency and continuity in implementing the Action Plan of the BSEC Working Group on Energy

Apart from the BSEC's Working Group on Energy, the Organisation regularly hosts the Task Force on Green Energy Development and Ministerial Meetings for the same purpose, proving that the energy sector is taken into serious consideration.

It is worth mentioning that there is a plethora of various institutions and structures in the Black Sea area, including international and regional organizations and forums (e.g. the Black Sea Commission on the Protection of the Black Sea Against Pollution), but also EU driven policies and programmes (e.g. Black Sea Synergy of 2007). However, despite the multiplicity of institutions and actors, it seems that there is a lack of political commitment from the side of national governments, which negatively influences policy making procedures and national or regional cooperation. This leads to a highly fragmented system with misplaced priorities and misused funds, unable to operationalise the results of conventions, protocols and policies. The result is inefficiencies and inconsistencies in implementation procedures, and therefore the need for a strengthened, more effective, and more coherent institutional and legislative framework for international and regional cooperation and environmental governance in the Black Sea is now more evident that ever.

5. Best practices

The aforementioned international and European policy tools prove the diversity of possible choices offered to an organization that is keen on implementing an environmental scheme. The purpose of this report is not to assess and compare these different tools, but to provide an overview of the benefits of each one, in selected practices of implementation. For this reason, the following seven "good"/"successful" case studies are presented. They are cases of academic institutions (Universities, Research Centres) that have implemented energy efficiency and use of RES schemes, in order to become environmentally friendlier. Each one has its own achievements and there are lessons to be shared by the implementation of different environmental practices.

The structure for the presentation of each case study is identical for all academic institutions and includes the following steps:

a. Background
b. Objectives and principles
c. Implementation plan
d. Achievements and awards
e. Lessons learned
Case study 1: University of Applied Sciences in Eberswalde (Germany)

Background

The University of Applied Sciences in Eberswalde\(^{21}\) is dedicated to the sustainable development of rural areas. Today it counts about 1,500 students and 50 academic staff, being the State of Brandenburg’s smallest university of applied sciences and considered as one of Germany’s best universities of applied sciences. It is worth mentioning that the university’s lead project called “Renewable Energy from Forestry and Agricultural Biomass” takes into account the overall concept of sustainability.

Objectives and principles

The main objective of the University was the certification of environmental management by EMAS.

The goal of voluntary implementation of structured environmental management was:

- to use resources economically and to reduce the negative environmental effects caused by the university
- to create transparency in all environmentally relevant processes
- to use energy and materials more efficiently and more ecologically
- to involve all staff and students in this process.
  - Practice related teaching and research on environmental protection employing techniques of environmental management (lectures, seminar reports and essays)
  - Public information on environmental management at the university, also with a view to motivating others to do business in an environmentally sound manner

With its structured environmental management, the University surpasses the environmental criteria demanded by law.

Implementation plan

The preliminary conceptual work was performed by a group of voluntary members of an environmental management workgroup. The concept has since been further developed and the environmental manager has structured it into specific projects and processes.

Achievements and awards

The university was praised for its use of green IT – choosing computers and servers on the basis of their energy consumption and their ability to be dismantled and recycled. Notable actions include green procurement of office materials and equipment, a wood pellet heating system, as well as the use of green electricity and solar panels. Students are also educated on sustainability issues.

The University has been awarded as the winner in the category of public administrations and small organisations (European EMAS Award 2010).

Lessons learned

\(^{21}\) http://www.hnee.de/Environmental-Management/Environmental-Management-K2131.htm
The driving force for this initiative was a voluntary group of academic staff, aware of the importance of environmental management schemes. Certainly, a decisive factor that should not be underestimated is the background of the University which is “dedicated to sustainable development” and the relevant expertise of the group involved. Although EMAS refers to a wide spectrum of green practices (water, waste, energy, green procurement etc.), the focus in this case study was on energy consumption, green procurement and green electricity (solar panels and use of renewable energy sources).

A very important lesson to be learned from this case study is that for the successful achievement of any environmental scheme, the active involvement of all staff (academics, students, administrators) is a prerequisite. Additionally, information of the public enhances transparency and disseminates new knowledge for other similar cases to follow.

Case study 2: University of Gavle (Sweden)

Background

According to its mission, the University of Gävle\textsuperscript{22} is human-centred and develops the understanding of a sustainable living environment. It has a leading position in education and research for a sustainable human living environment. It has approximately 12,000 registered students and about 800 employees.

Objectives and principles

The University’s Board developed a concrete policy for sustainable development in 2010: “University of Gävle (HiG) strives for a sustainable living environment (ecological, social and economic) for everyone in all its activities. These are to be conducted in such a way that their positive impact on the present environment is increase and negative reduced continuously”. This is done when:

- the management stimulates continuous work for sustainable development with focus on continuous improvement.
- Sustainable development content is integrated into relevant courses and research projects
- HiG enhances the sustainable development competence of its faculty, staff and students regarding
- Legislation and other requirements form the minimum level of compliance
- HiG considers the sustainable development activities of its suppliers in procurement
- The use of energy and material is made more efficient and pollution prevented
- HiG’s work for sustainable development is transparent and open for all

In parallel, three main objectives were set for a specific time horizon from 2011 until 2016:

1. The competence of faculty, staff and students regarding sustainable development
2. The integration of sustainability aspects in
   - education and research where relevant

\textsuperscript{22} \url{http://www.hig.se/Ext/Sv/Verktyg-i-hoger/In-English/About-the-University-of-Gavle/Environmental-work/Environmental-management-system-.html}

Lessons learned
- procurement and purchasing
- collaboration with the surrounding society

3. The reduction of material and energy

Implementation plan

The implementation of an environmental management system started in 1995 but the formal decision to work for a certification was taken by the university board 2001-12-07 and during 2002-2004 an environmental management system was developed according to the environmental management standard ISO 14001.

The University’s students and employees can contribute to the environmental work by following the routines for handling waste and to give good suggestions or tell if something does not work as it was meant in the nonconformities and improvement system. All responsibilities are divided and every year internal and external audits are made as a part to check how the environmental management is working.

Achievements and awards

Seven years after the ISO 14001 certification the employees’ and students’ efforts took University of Gävle to the absolute top in EPA 2008 and 2009 ranking of the environmental work at all Sweden’s authorities. On the following pages you can read how it was done and how you can contribute to the environmental work in the future.

Lessons to be learned

The process for ISO certification is a time consuming and demanding process which presupposes systematic efforts of all involved actors. The 8-year process (1996-2004) until the final ISO 14001 certification in the Gävle University proves the above.

Decisive for the successful implementation of ISO 14001 is the solid organisational structure of a council for sustainable development which consists of environmental coordinators coming from the different University’s faculties, the administration and the students (one representative). Furthermore, the participation of students and academic staff in all green practices is an important factor for the further improvement of the University’s environmental performance as it is proved by the annual audits.

Another important lesson is that the analytical knowledge and the detailed data of direct environmental impacts concerning transports and use of energy and materials, and indirect environmental impacts from education and research, help to set up environmental goals for energy efficiency. These concrete environmental goals are a prerequisite in every case where an environmental scheme is about to be implemented.

Case Study 3: Maynooth (Ireland University)

Background

National University of Ireland, (NUI) Maynooth considers sustainability as a core function within its procurement cycle. After an evaluation of the existing frameworks and consultation

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23 http://www.hig.se/download/18.3dc8981a12efa8d4bdc8000537/Policy+and+objectives+2011-16+eng.pdf
with stakeholders, the university realized that the tender processes for laboratory supplies could be aggregated. The existing situation involved a high volume of low-value transactions and multiple-drop deliveries on various days. Users had traditionally placed requisitions and both expected and received next day delivery with an invoice directly related to each order.

Objectives and principles

The challenge was to arrive at a specification that encompassed the operational requirements of the laboratories and research areas, while ensuring that statutory requirements for safety and quality were met. The overall requirement for quality goods at the right price in the right place remained a priority.

Implementation plan

In 2006, the university successfully introduced sustainability into a tender competition for office supplies and consumables by offering green options on a wide range of office consumables to users. The next step was to address the carbon footprint of the procurement cycle itself, rather than concentrating solely on the commodity. With a diverse product and service portfolio, the aggregation of tenders, supplies and deliveries was identified as offering potential to reduce the university’s carbon footprint while delivering better value for money.

Achievements and awards

Evaluation of the tenders received showed an immediate reduction in cost from the consolidation of deliveries and invoices. The concept of reduced order and invoice documents resulted in considerable process savings. The delivery schedules dropped from up to 20 per day to less than 40 per week. The resulting reduction in traffic movement on campus and delivery traffic within buildings was noted with many favourable comments made by staff and students alike.

The reduction in the total number of orders, deliveries and invoices has been remarkable – despite an increase in the total volume of supplies being used by staff and students at the university. Annual orders dropped from 6,000 to 1,500, deliveries from 2,700 to 540 and invoices from 7,500 to 2,250. All suppliers also participate in a recycling scheme for packaging and glassware.

Lessons learned

Transportation is an important factor that should not be neglected during the implementation of environmental schemes. The Maynooth University took the initiative to reduce, on the one hand the transport routes within the campus among laboratories and on the other hand, the external transportation towards the campus. Additionally, another major goal was the systematization and the reduction of invoices and deliveries.

An important factor towards the success of this story was the prior consultation with the relevant stakeholders, who assisted the smooth transition to a more efficient and lower-impact process. The buyers willingly moved to a system whereby orders were placed through a single point on a bi-weekly basis. The supplier base readily co-operated and helped with the idea of providing a single consolidated monthly invoice per business unit, rather than an invoice per purchase order.

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24 http://www.envirocentre.ie/includes/documents/Issue12_Case_Study30_Maynooth_Laboratory.pdf
Case Study 4: Green Procurement in Badalona’s schools

Background

The City Council of Badalona25 (the third largest city in Catalonia, Spain) has almost ten years of experience in implementing GPP. In 2009 a project was started to encourage GPP in public schools, with the support of Ecoclinstitut Barcelona. The aim of the project was to spread GPP knowledge and best practice to all schools in the city.

Objectives and principles

Six schools were chosen to participate in a project aimed at analysing and developing best practice guidelines for the green procurement of five product groups: school materials, building maintenance, cleaning, food and IT products. In addition, the City Council procured a kit of green school materials available to the six participating schools on demand, also available for other interested schools if they are keen to find out more.

Implementation plan

Particularly for the IT products and building materials (that are directly related to the energy field), a detailed procurement and user guidance was developed which can be summarized as follows:

- For IT products, procurement would include recycled toner and inkjet cartridges and energy efficient equipment based on Energy Star criteria. The usage guidance aimed at reducing printing, energy saving by switching off monitors when they are temporarily not in use and obsolete equipment donated for recycling to NGOs working on social inclusion projects.

- For building maintenance, procurement would include environmental criteria for contracting maintenance services (e.g. materials using less water and energy). The usage guidance targeted at users behaviour (e.g. switching off lights when leaving rooms).

Achievements and awards

The information obtained from the procurement analysis led to the elaboration of six individual Action Plans on GPP. The Plans defined detailed measures that each authority (the Catalan Government, the Badalona City Council or the school) should implement. The analysis methodology and good practice experiences, from the six participating schools, were compiled in the Green School Procurement Practice Guide, available in Catalan.

A Green Schools Network in Badalona is currently being set up, as a further result of this initiative, to monitor the usability of the guide in terms of issues, follow-up, challenges and achievements in order to revise it accordingly.

Lessons learned

The information obtained from the procurement analysis led to the elaboration of six individual Action Plans on GPP. The Plans defined detailed measures that each authority (the Catalan Government, the Badalona City Council or the school) should implement. The analysis methodology and good practice experiences, from the six participating schools, were compiled in the Green School Procurement Practice Guide, available in Catalan.

A Green Schools Network in Badalona is currently being set up, as a further result of this initiative, to monitor the usability of the guide in terms of issues, follow-up, challenges and achievements in order to revise it accordingly.

The Badalona case study was a top down innovative approach from the City Council of Badalona, the third biggest city of Catalonia (Spain). The overall goal was to implement green practices in six selected schools including energy efficiency (school materials, building maintenance, cleaning, food and IT products) among others. The city council having a long experience in GPPs and with the support of the regional government of Catalonia produced guidelines for the implementation of GPP in schools.

It is important to stress that this top down procedure had difficulties in the dispersion of the decision making actors (regional authority of Catalonia, city council of Badalona and schools). An important lesson to be learned is the concrete definition of roles and specific responsibilities assigned to each stakeholder and especially the active direct involvement of the school communities. Once again, it should be noted that active participation is a key prerequisite for the successful implementation of environmental green practices and that in future actions specific responsibilities should be assigned to each stakeholder.

Case Study 5: University of Michigan

Background

Utilities and Plant Engineering (UPE) is a division of the Plant Operations Department of the University, made up of 135 dedicated employees responsible for providing utilities and plant engineering services for the University. A division of the Utilities and Plant Engineering organization, Energy Management strives to fulfill the University’s commitment to minimizing energy consumption and containing energy expenditures. With more than 30.6 million square feet of building space, the energy needed for heating and cooling, lighting, and power is substantial. This amount totaled more than $111.9 million for Fiscal Year 2007 alone, and increases in the years ahead as more buildings are added and fuel costs rise.

Energy Management engages in to create energy-efficient building operations and promote energy conservation practices throughout the University. All programs are managed by a dedicated staff. In addition, the team is supported by a number of departments and skilled trades that collaborate and cooperate in the mission of maintaining high performance and energy efficiency.

Objectives and principles

The University of Michigan’s commitment to Energy Star began with a Memorandum of Understanding (MOA) between the U.S. Environmental Protection Agency and the University executed on June 19, 1997. The MOA signified the University’s intention to implement the five-step Energy Star program in all major General Fund facilities, which at that time comprised 119 buildings having a floor area of 12 million square feet and a combined energy budget of $38 million.

Implementation plan

26 http://www.plantops.umich.edu/utilities/energy_management/programs/energystar_greenlight.php
The five steps of the program included:

1. "Green Lights" - Lighting System Retrofits
2. Building Mechanical System Tune-up
3. Heating, Ventilating & Air Conditioning (HVAC) Load Reduction
4. HVAC Distribution Improvements
5. HVAC Plant Improvements

The University's approach to Energy Star was spelled out in a proposal dated April, 1997 which was presented to Plant Operations management, and subsequently to the U-M Board of Regents in October, 1998. The proposal laid out a detailed strategy for completing the five Energy Star stages in all General Fund buildings.

The proposal budget indicated that a six-year commitment would be required to complete the tune-up, engineering analysis, and capital improvement phases of Energy Star, five years at a funding level of $4.4 million, and a sixth year at $2.5 million. The budget was allocated as follows:

The proposal estimated that the implementation of Energy Star would result in energy cost reductions, at the end of the program, of $5.7 million annually.

Achievements and awards

In 2004, the U-M received the Energy Star Partner of the Year Award for Leadership in Energy Management. An Energy Star partner since 1997, the U-M was honoured to accept this award—one of the most prestigious bestowed by the EPA—and other similar kudos over the years as a recognition of its commitment to energy conservation.

Lessons learned

Crucial for the commitment and systematic implementation of Energy Star in this case study was the Memorandum of Understanding between the U.S. Environmental Protection Agency and the University that was executed on June 19, 1997 and bounded the University in concrete and systematic steps in implementing the energy scheme.

The broad spectrum of green actions in the 119 buildings of the University and in several energy sectors (lighting, building materials, heating, ventilation etc.) demanded a big investment of 24.5 million dollars (6-year investment program from 1998-2004). However, it is estimated that the implementation of Energy Star would result in energy cost reductions, at the end of the program, of $5.7 million annually. This means that after the end of the program in 5 years, the University will be able to depreciate the full investment.

A prerequisite for the successful implementation in such a vast higher education institution (total enrolment in fall 2010: 58,947, instructional staff in all campuses in fall 2010: 8,791) was the specific organisational structure of the University and specifically the Utilities and Plant Engineering, a division of the Plant Operations Department, made up of 135 dedicated employees responsible for providing utilities and plant engineering services for the University 24 hours per day, 365 days per year.
Case Study 6: University of Bristol

Background

The University of Bristol[^22] has more than 5,000 staff, 17,000 students and occupies just over 300 buildings. Its operations have a significant local, national and global environmental impact. The primary role of the Sustainability Department is to reduce this impact through implementing environmental improvements. This will help conserve energy and water, save money, make finite resources last longer and help reduce pollution and our contribution to climate change.

The University’s wide accreditations, ISO 14001, an environmental management system standard and ISO 14064 (CEMARS), a carbon and emissions management and reduction standard mark a major step forward in the University’s efforts in managing its sustainability.

Bristol has achieved ISO 14001, in order to manage and improve its environmental performance. The accreditation, which encompasses the University’s 300 buildings and 23,000 students and staff, was obtained through the introduction of an environmental management system and implementation of an externally-audited environmental performance evaluation standard (BS 8555) that enabled the University to identify all its environmental impacts and put into effect strategies to reduce them.

These include, achieving an office waste-recycling rate of 49%, the introduction of a food waste composting facility for its catering centre and halls of residences, a plastic recycling facility for all students and staff, a new student bus service to help reduce car use, sustainable refurbishment of buildings, and an internal green awards scheme involving 40 departments.

Objectives and principles

The University of Bristol adopted a Policy and Strategy for Sustainability for the period 2009-2016[^28], as a commitment to operate in a sustainable manner. This strategy aims to:

a. Reduce the environmental impact of the University through better management of its resources

b. Integrate environmental principles into the University’s operational procedures and educational activities

c. Meet the requirements of all relevant legislation and exceed them where they best support the University’s other objectives

d. Adopt best practice to ensure the prevention of pollution

e. Monitor and regularly review the environmental performance and set objectives to ensure its continual improvement

f. Train and render aware students and staff

To achieve these aims the University decided to implement specific strategies in the following sectors:

a. Energy management

[^22]: https://www.bris.ac.uk/environment/
[^28]: https://www.bris.ac.uk/environment/ems/policy_strategy_sustainability
b. Water management
c. Waste management
d. Sustainable purchasing
e. Sustainable construction
f. Transport
g. Biodiversity

From the above sectors, the most relevant ones with energy use are assessed below:

**Energy management**

The main objective of the University was to provide a framework for reducing the environmental impacts and costs coming from energy use in buildings through the better management of resources and at the same time complying with the legislation. The specific target is to reduce the energy consumption of the University’s building stock up to 80% by 2050, from a 2007/8 baseline, entailing a reduction of 15% by 2016.

**Sustainable purchasing**

- To carry out purchasing activities in an environmentally responsible and sustainable manner
- To ensure that sustainable purchasing activity is consistent with best purchasing practice as stated in internal policy
- To do this in the most cost-effective manner possible, while providing a service consistent with good practice

**Sustainable construction**

To provide fit for purpose buildings which actively support energy, water, waste, biodiversity, transport and sustainable purchasing targets

**Transport**

To maintain staff and student travel Plans consistent with best practice and user/business needs and to deliver these plans in such a manner as to be cost-neutral to the University.

**Implementation plan**

Actions for saving energy in buildings will fall into a number of areas, awareness raising, good housekeeping, investment in spend to save technologies, the following of good practice, standard operating procedures and monitoring and targeting. Actions will include metering and monitoring systems and site surveys to help identify where waste is occurring, major switch off campaigns, ensuring existing building systems are operating in efficient way especially heating and cooling, investments in energy saving technologies like lighting and heating controls, insulation, voltage optimization.

Regarding sustainable construction, the university will follow the BREEAM process in order to achieve the specific targets set in its strategy, integrating design planning and costing.

The new purchasing system includes whole life cost assessments, risk analysis of products in terms of environmental management, engagement with suppliers on their environmental and social impacts relating to their products and services, working with departments to identify how they
might have synergies that will save them money and reduce environmental impact, e.g. pooling of product resources.

Actions in the field of transport include new facilities for cycling and walking, interest free loans for season tickets, cycle training, car sharing and awareness raising to encourage use of sustainable transport.

Achievements and awards

Both accreditations (ISO 14001 and ISO 14064) have been awarded to the University for its wide-ranging green initiatives, led by the Sustainability Team, which have demonstrated year-on-year improvements and investment in energy-saving measures, sustainable transport projects, and a reduction in its carbon emissions.

Lessons learned

The University of Bristol is a good example of an academic institution which decided to commit itself to an environmental strategy, setting a vision and concrete priorities and principles for its operation in a sustainable manner in the long term. The University’s engagement was to play a positive role not only in the city, but also in the region and the nation. The overall integrative strategy extending in a wide range of sectors and especially energy efficiency is based on the implementation of world wide acknowledged environmental tools, such as ISO and BREEAM and reflects the sincere intentions and commitment of the University’s Sustainability Team.

Case Study 7: Torino University

Background

The University Sports Centre in Turin (CUS Torino) is the operating arm of the University of Turin and the Polytechnic of Turin, Piedmont is the ultimate expression for the number of multi-sports disciplines practiced, for the continuity and level of activities.

Objectives and principles

The main objective of CUS Torino was to install photovoltaic systems reducing the energy consumption from non-renewable sources.

Implementation plan

The CUS Torino team worked on the construction of the photovoltaic system in CUS (the first in Italy of a sports facility) and finally installed 40 kWp of power. The plant will help reduce the consumption of sports center Cussino Via Panetti for a share of over 50% fully covering the needs of office building, the bar and service areas.

The spread and duplication of the CUS experience in Italy and later on in Europe was prevented by the financial crisis. The Politecnico of Torino has a plan to build an enormous campus with top level sport facilities, solar thermal collectors, photovoltaic arrays and special technology for swimming pools designed by Veolia Water in order to manage less chlorine and save water and energy. But the project has no financial resources at the moment.

Achievements and awards

The project has already succeeded through the incremental implementation of the overall plan, while the whole project has been postponed for the future.
Lessons learned

The step by step approach that was followed in this case is also the main lesson that can be learned. It is important to set an integrated long term plan from the beginning, even though it will prove difficult to be completed in the course of the process.

6. Best practices in Black Sea countries

Apart from the good case studies that were presented above, the Black Sea countries have also numerous examples of research and academic institutions that have implemented green practices, aiming at becoming more energy efficient, increasing the use of renewable energy sources and reducing energy costs. For this purpose, the project partners have prepared a questionnaire addressed to the Management of 2 knowledge institutions that are considered good case studies and have implemented successful energy efficiency and renewable energy sources schemes in Greece, Turkey and Russia. Based on the filled questionnaires, all partners prepared short summaries corresponding to these 2 relevant good case studies from their countries. This explains the different outline of the following good practices in relation to the international and European examples of the previous chapter.

GREECE

Case study of University of Macedonia

A. In General

The University of Macedonia has developed an integrated environmental management system (EMS), which is certified with EMAS since 2005. The University aims at continuously reducing the material, energy and water consumption, decreasing emissions, increasing the rate of recycling, enhancing formal environmental education and increasing environmental awareness at the University and the local society. Regarding energy efficiency, the University sets yearly targets, so that it continuously reduces both electricity and thermal energy consumption.

B. Institutional framework and policies

One faculty member took the initiative to create an environmental group (EG) at the University, which was supported by the rector and his office at its initial steps. Since there was no specific policies and support, the EG applied and was awarded with the financial support of a LIFE-Environment project in 2004, which funded the development of the EMS and was crucial for the development of the initiative at its early stages.

C. Commitment and decision making

The EMS has an academic manager, an environmental manager, a group of staff and a group of volunteer students. The EMS was supported by a consulting company (paid through the LIFE-Environment project). The final decision was taken by the Rector’s Office. The only problems were the usual bureaucratic problems and inertia.

D. Energy assessment of the institution
Analysis regarding energy use was conducted in the sectors of: heating and cooling, hot water, lighting, ventilation, construction design and materials, green procurement as horizontal action and the behaviour of students and academic staff. Regarding energy, the University collects data on electricity and natural gas consumption, makes estimations on atmospheric and CO2 emissions and constructs indicators, such as consumption per staff member etc. The obstacles envisaged are categorized into the 3 following phases: a) assessment of the energy characteristics of the institution: unavailability of data, b) development of the Plan: lack of expertise c) implementation of the Plan: bureaucratic inertia, public employees’ attitudes.

E. Development and implementation of Action Plan

All main stakeholders were involved in the Action Plan’s implementation: teaching and administrative staff, researchers, students, providers and others (e.g. visitors). All staff, faculty and students that were involved in the EMS had specific roles (monitoring, reporting, education, designing and implementing awareness raising activities, etc). The University is running awareness campaigns within and outside the University. The stronger interest comes from the students and then the staff members follow. However, all members of the academic community feel proud being part of the only Greek University with an EMAS certification.

F. Evaluation of outcomes and continuing improvement

The University has won a number of distinctions and awards for its activities (such as best EMAS project in Greece), but the best recognition is the transfer of knowledge to other Greek Universities that is slowly starting. Additionally, most Greek Universities have recently started relevant actions. The University has actually developed a Green Greek University cluster.

Case-study of Center of Renewable Energy Sources (CRES)

A. In General

CRES implements as part of its daily operation a strategy referring to energy efficiency and waste management policy. This is more a daily operation routine than a strategy and has to do with a working behaviour that complies with the energy efficiency and waste management practices. In the long-term, CRES has renovated its central building with ETICS systems (External Thermal Insulation Composite Systems) and a green roof application and has been connected to the grid of a total of 55kW PV systems and the operation a 3 MW wind park in Lavrio area. CRES has also initiated an energy awareness center in Lavrio where pilot application from all RES forms can be found (geothermal, biomass, PV, solar heating and cooling) along with a 3 MW wind park.

B. Institutional framework and policies

The initiative for the renovation of CRES’ central building has derived from CRES’ Division of Development programmes who found EE companies which sponsored the project and under CRES staff guidance the project has been implemented. The upgrade of CRES’ central building is mainly based on the practices set on the New Energy Efficiency Regulation for Buildings (KENAK) which corresponds to the implementation of the 2002/91 EC directive for energy efficiency on buildings and the ETICS system that is applied around the world.

C. Commitment and decision making

There was no appointment of an Energy Manager / Team, because there is a technical unit led by a technical manager supervising the energy issues of the building. Due to the character of the
institute, consisting of numerous energy efficiency experts, there was no need for appointing an external energy expert. The final decision was taken by the CRES president and its board members after the recommendation of division of development programmes. The decision making process follows the CRES’ regulation procedure including bureaucracy, approval of memos etc.

D. Energy assessment of the institution

Analysis regarding energy use was conducted in the sectors of heating and cooling, construction design and materials, specific renewable energy sources actions and green procurement as a horizontal action. For energy efficiency actions and RES measurements, CRES uses energy audit reports and data history records. The obstacles envisaged are categorized into the 2 following phases: a) assessment of the energy characteristics of the institution: unavailability of data, b) implementation of the Plan: implementation during the working hours and weather conditions. The monitoring of the building envelope systems efficacy is done by energy audits.

E. Development and implementation of Action Plan

The stakeholders involved in the Action Plan were CRES’ researchers. Each one undertook a specific part of the action plan, according to their expertise. The training programs and awareness campaigns organized by CRES targeted mostly students and young engineers. Their participation shows that the interest is strong.

F. Evaluation of outcomes and continuing improvement

The energy performance of the building upgraded from scale Z to B and the plan is to issue an energy certificate as a recognition greening practice.

The solar heating/cooling project can be considered as best practice as it is developed through a FP7 project and thus is following all the steps for being characterized as best practice. CRES is interested in clustering with other bodies in the energy efficiency area, as long as there is potential and prospects in the cluster on know how exchange, pilot demonstration possibilities and capacity building of cluster members.

TURKEY

Case study of Ege University

A. In General

Ege University is one of the best established universities in Turkey. It was founded in 1955 and it showed a rapid progress in the following years with the establishment of its faculties. As an example of scientific awareness, the university established the Ege University - Solar Energy Institute (GEE) in 1978 for graduate education and research on solar energy and its applications. Along with the solar energy, other renewable energy resources like wind, biomass and geothermal are being studied for energy saving and efficiency aspects. GEE (24 academic, 16 administrative staff, 50 MSc & 53 PhD students) has concluded 190 projects on renewables (http://eusolar.ege.edu.tr). Therefore the Solar Energy Institute has become the renewable energy center of the university, by reflecting the university’s approach on renewable energy. On the other hand the university has a voluntary Renewable Energy Team composed of the students from different faculties of the university and working in coordination with Solar Energy Institute.
Ege University is very powerful in technical education of renewable energy researchers as well as keeping the awareness about renewable energy and establishing networks that reach to private, public and international research institutions and industrial organizations.

**B. Institutional framework and policies**

The University management of the time was the decision maker for the establishment of the Solar Energy Institute. Beside the graduate education programme, important initiatives are taken by the Solar Energy Institute Directorate together with its researchers. The most important initiatives have been Turkish PV Technology Platform (UFTP) and Renewable Energy Technology Center – YETMER.

Solar Energy Institute leads to the Turkish Photovoltaic Technology Platform (UFTP) which covers public bodies, local authorities, universities, trade and professional chambers and industrial companies with financial support of TÜBİTAK (The Scientific & Technological Research Council of Turkey). UFTP has been commissioned to execute IEA PVPS (International Energy Agency-Photovoltaic Power Systems) activities on behalf of the Turkish Government. UFTP creates contact points in decision making bodies of private, public and international research institutions and industry organizations and aims to define an accurate and effective PV Technology Roadmap for Turkey. UFTP prepared a PV technology roadmap within participation of the related bodies (http://www.uftp.org.tr).

Turkish PV Technology Platform (UFTP) run by Ege University Solar Energy Institute continues its endeavors to bring related bodies together on a common platform and facilitate information flow. Solar Energy Institute plans to form a Turkish Renewable Energy Platform (UYEP) which will also take the initiative to prepare a roadmap for the other renewable energy and energy efficiency technologies.

The other important initiative of Solar Energy Institute is the establishment of Renewable Energy Technology Center – YETMER. In collaboration with the Ministry of Energy and Natural Resources, a new zero emission building construction as a renewable energy research and implementation center, so called Renewable Energy Technologies Center-YETMER, is being studied. Japan NEDO would supply a grant along with the Ministry of Energy and Natural Resources. Protocols are being studied. The center is planned to be designed as it will be first in Turkey and Europe.

Lastly, it is worth mentioning the Starlight-Ecostar Solar Car Project, conducted by voluntary students under the head of Renewable Energy Society. This project has been a great motivation source not only in terms of implementing a concrete renewable energy system but also increasing awareness.

**C. Commitment and decision making**

There were no considerable problems in decision making to run the mentioned initiatives. The stakeholders were the administrative staff, researchers, students, administrative staff and providers for the realization of all the activities of UFTP. They are also being in circle through a series of meetings with the related partners for the realization of YETMER project.

**D. Energy assessment of the institution**

Analysis regarding energy use was conducted in the sector of specific renewable energy sources actions. The main data for energy analysis are invoices. The best implementations were done in the area of Solar Energy, i.e. the photovoltaics. The Institute has a 25 kWp PV power system which covers grid-connected and stand-alone applications in the university.
Along with the solar energy, other renewable energy resources like wind, biomass and geothermal are being studied for energy saving and efficiency aspects.

The institute is also educating the researchers in energy management area. “Energy Management” group covers the management studies for industry and buildings. Throughout the master and doctorate education, students’ efforts are to reduce waste energy and an example to promote energy efficiency. Every semester, an actual industrial energy management research project is evaluated. The group consults for the existing and new constructing buildings in Aegean Region on the topic of energy efficiency. By fulfilling buildings’ energy efficiency tests, the energy performance levels are determined and then the efficiency and management projects are developed.

E. Development and implementation of Action Plan

Stakeholders of existing implementations are administrative staff, researchers, students, administrative staff and providers. Students are also very active inside the voluntary research projects under the umbrella of Renewable Energy Society.

F. Evaluation of outcomes and continuing improvement

Ege University with the efforts of its Solar Energy Institute and with other departments that are collaborating has become the leading center among the universities in Turkey in the area of Renewable Energy research and applications. National Qualifications Authority (MYK) has signed a protocol with Solar Energy Institute for preparing vocational qualification standards of basic renewable energy (wind, PV, solar thermal, biomass) jobs. Solar Energy Institute prepared these vocational qualification standards and delivered to MYK.

It should be noted that Ege University through the activities of Solar Energy Institute and Renewable Energy Society is very strong in technical education, increasing awareness by stimulating voluntary activities and establishing networks. However, there is need to develop a more integrated strategy to increase the effectiveness of the existing activities.

Case study of University of TUBITAK Marmara Research Center (MRC)

A. In General

TUBITAK MRC is implementing an environmental management system (EMS) based on ISO 14001 (certified in 2004) together with Total Quality Management System and other ISO standards. Specific policies and actions are described in TS EN ISO 14001 EMS. Therefore, within the context of EMS, environmental aspects arising from research activities conducted in the Center are determined and evaluated, and environmental performance is being reviewed continuously. The key areas determined are reduction in electricity consumption, efficient use of natural gas, emission management, efficient cooling-heating, water consumption and waste management. One important point is that some of the implementations are already obligatory practices. TUBITAK MRC, as being a governmental institution, environment- and energy strategy has to be in concordance with Energy Efficiency Strategy Paper for Turkey: 2012-2023. Besides, TUBITAK has to pursue its practices on environmental and energy performance according to the instructions of Prime Ministry, Ministry of Energy and Natural Resources and Ministry of Science, Technology and Industry aimed specifically at governmental institutions.

B. Institutional framework and policies
TUBITAK MRC Presidency with the Directors of 7 Research Institutes of the Center took the initiative to be certified with ISO 14001. But the process started before 2004 with ISO 9001 and 17025 certifications in 2002, and has continued with 18001 (in action since 2005).

**C. Commitment and decision making**

ISO 14001 certification and energy management (with some other implementations) are separate processes, although they are closely related and complementing each other. Regarding the ISO 14001 EMS, TUBITAK Presidency was the final decision maker. There were no considerable problems in decision making, except the time taking bureaucratic processes. Regarding the energy management, Turkish Energy Efficiency Law (No.5627/2007) makes the appointment of an energy manager obligatory for governmental institutions with an annual consumption rate over 250 TPE. There are also other regulations that bring obligatory practices.

**D. Energy assessment of the institution**

Analysis regarding energy use was conducted in the sectors of: heating and cooling, hot water, lighting, ventilation, construction design and materials. Solar Enlightenment in some parts of the campus can also be seen. Energy management regulations have been in effect since 2007. Their aim is to control the consumption of the fuel and electrical energy use at TUBITAK MRC Institutes/Units in an effort to minimize negative effects on environment and human health, implement technical and administrative rules and regulations and increase consciousness of the TUBITAK MRC staff about energy efficiency issues.

As part of these aims, implementations related to electricity consumption are in action, like photocell lighting, special window design for efficient utilization of daylight in the main building of Energy Institute and replacement of incandescent bulbs with energy-efficient bulbs. Monitoring natural gas consumption by SCADA and a heat control valve system in boilers are other actions related to fuel consumption. For an efficient cooling-heating, an air conditioning/heating system based on ambient heating/cooling is installed in the main building of the Energy Institute. In buildings / new constructions heat-isolation is applied. Regarding water consumption management use of photocell taps, use of waste water in irrigation of Campus plants and pond water use in irrigation are important implementations.

On the other hand, the Energy Institute of the Center, which is conducting R&D projects in energy technologies area, used solar and wind energy for production of hydrogen that is needed in some R&D projects (especially fuel cell projects). This was done under the project of Hydrogen Demonstration Park-HyDePark- to show how renewable energy can be used for the production of another clean energy source, i.e. hydrogen.

**E. Development and implementation of Action Plan**

TÜBİTAK MRC as a research center is mainly composed of administrative staff and researchers. Therefore, in the Action Plan’s implementation administrative staff and researchers have been the main stakeholders. A Corporate Quality Manager is responsible to ensure accurate implementation of the Total ISO 9001 Quality Management System (QMS) and 14001 EMS practices in the Campus (whole Research Center). In addition, every institute has an appointed QMS and EMS Responsible and Inspector who works in coordination with the general QMS and EMS Responsible of the entire Campus. To increase the awareness QMS and EMS Information Training is given to all staff that join the MRC. The Energy Manager also takes trainings on ISO 50001 Energy Management System. Periodic Tree Planting Ceremonies are important activities to keep the Green Campus awareness alive.
F. Evaluation of outcomes and continuing improvement

Although it proves to be difficult to implement standardized rules regarding energy efficiency /RE in such a big R&D Center like TUBITAK MRC, which includes 7 institutes conducting several projects at once (over 100 for TUBITAK MRC in general, over 35 for Energy Institute) with varying scale, characteristics and timing, it should be perceived as a bold step by the Center to adopt ISO 14001 standard, and stimulate practices of energy efficiency /RE.

Following the accurate implementation of energy efficiency and environment practices inside the campus are not the primary duties of the staff, so specific problems may arise in the implementation of the plan. There are several education programmes available to increase awareness of the staff about energy efficiency issues and minimize problems caused by their actions. Another issue is that TUBITAK MRC is a governmental institution that has to act according to Public Tender Law. Green procurement is currently a high-cost action and this makes it difficult to install the latest modern systems of energy monitoring or other related systems, materials, etc. The other important issue that creates difficulty in implementation is, as stated above, the increase in the number of laboratory and office buildings, different consumption characteristics of the projects that start every month/year in the campus and that create unexpected changes in the consumption rates.

However there is a strong willingness to overcome these problems. The newly emerged energy efficiency team in the Energy Institute which has a more voluntary feature and is a supportive group for the official energy management now works on saving energy by simple daily actions and on the other hand, tries to determine the new infrastructure requirements for a better energy management.

RUSSIA

Case study of Ural Federal University

A. In General

UrFU is the basic institution to implement and coordinate energy efficiency measures, in high schools of the Ural Federal District (in accordance with the orders and letters of the Ministry of Education and Science of RF). In addition, UrFU was for many years the leading organization in energy audit and subsequent implementation of a complex of measures on energy saving. The peculiarity of UrFU strategy for improving energy efficiency and renewable energy sources is to combine the capacity of relevant departments and institutions involved in relevant areas (energy conservation, energy efficiency and renewable energy).

B. Institutional framework and policies

The initiative to implement energy affective measures took the management of Urals Energy Institute (UralENIN), the department: "Nuclear power stations and renewable energy", "Energysaving" and others, as well as the rector of UrFU and the management of experimental-industrial complex (EIC) of UrFU. UrFU performs a constant contact with organizations and institutions that implement programs for energy conservation, improvement of energy efficiency, development of renewable energy in Germany, the Czech Republic, Great Britain, France and the United States. The main negative factor is the lack of own resources to conduct large-scale events and develop innovative products. Public support mechanisms are not used enough because of poor performance of Federal Target Programs and other mechanisms.
C. Commitment and decision making

In accordance with the order of the rector of UrFU in 2011 a science, technology and industrial structure was created - the "Council on energy conservation and efficiency of UrFU". Activities of the Council and the Program for energy efficiency of UrFU (approved on 11/01/2011) include: improvement of the production efficiency, distribution and consumption of heat, electricity and water, energy audit of buildings and of the University facilities, improvement of their thermal protection and replacement of inefficient equipment. UrFU has its own intellectual resources to address the issues and doesn’t attract external energy experts; however, UrFU supports joint projects on energy efficiency.

In 1999 in UrFU was established the first Department of Energy saving in Russia, which, along with educational activities at different levels (student learning, skills development, scientific and methodical work, publishing) implemented the advanced planning and coordinating mechanisms of energy audit, energy conservation in the public sector, industry, construction, housing and utilities. Even earlier, in 1997 UrFU opened a specialty "Alternative and renewable sources of energy." The main initiators were the regional administration, university administration and management of the department "Nuclear Energy" ("Nuclear power stations and renewable energy sources").

There are two main difficulties in decision making-process. The first is the mentality and lack of awareness among management of many enterprises. The second one is the lack of funding arrangements and technical activities.

D. Energy assessment of the institution

UrFU conducts analysis regarding energy use in heating, hot water consumption, lighting, efficiency of construction design and materials. The effectiveness of air conditioning is not analyzed because of insufficient broad and short-term use of air conditioning systems. Divisions of Council on energy conservation and efficiency (Chief Engineer, Department of Energy Chief, Division of General Mechanics) in conjunction with the Office of Accounting and Audit analyze energy consumption in various objects of the university in physical and value terms.

UrFU launched two pilot RES schemes with a wide range of renewable energy. The first is located in Urfa (Department "Nuclear power stations and renewable energy") and is equipped with the necessary set of stands, pilot plants, laboratories and equipment samples of RES. The second is the energy efficient home with a set of renewable energy sources (wind turbines (windmills), photovoltaic cells (solar cells), solar collector, biogas unit (BSU), heat pump, portable micro-hydro, wind mill for lifting water from wells). Green procurement actions of UrFU include acquisition of experimental biogas plant "BSU-1,5P" for landfill RES (realized in 2003). UrFU also purchased a research setting to conduct experiments on alcohol gasoline blends.

Energy saving measures are implemented consistently in accordance with the Plan of the energy audits of UrFU to reduce energy consumption by not less than 3% annually. Integrated monitoring system is implemented at some sites of UrFU in full, at some partially.

E. Development and implementation of Action Plan

In the implementation of the Action Plan are involved teaching staff (more than 1,000 people), researchers (more than 100 people), students (more than 500 people), and administrative staff (relevant service institutions and the university administration).

Each group has a specific range of responsibilities: Teachers: giving lectures and conducting courses on "Power and Electrical Engineering," Energy saving ", etc.; Researchers: conducting
modeling, calculations, surveys and processing the results of energy audits, development of innovative solutions to improve energy efficiency; Students: participation in research projects of students on the areas of energy efficiency and renewable energy sources.

UrFU conducts joint training and research activities (scientific and practical conference, seminars, excursions, etc.) among graduates of the Russian Federation and the United Kingdom with the release of the collection of materials in English and Russian languages.

**F. Evaluation of outcomes and continuing improvement**

On the direction of improving the efficiency of energy production and use, considerable work was done. In 2005 UrFU established and put into operation a steam back pressure turbine (turbine generator) power 0.75 MW, which works in parallel with the distribution network 6 kV, which made it possible to convert the boiler into CHP.

UrFU installed metering of heat energy and water consumption metering devices at a number of objects. Insulation and reconstruction of heat, electricity and water supply of some objects is also carried out. Reduction in energy and water consumption amounted to no less than 6% over the past two years. Upcoming events include energy survey of all objects of UrFU, further installation of accounting systems and regulation of heat energy consumption at the facilities of UrFU, the installation of monitoring systems and energy management, development of waste utilization technologies, ongoing research and patenting in the field of renewable energy.

Initiatives on energy conservation and efficiency and also the work of UrFU in the sphere of organization of educational activities, scientific and methodological work in energy efficiency, has been repeatedly noted at the level of the Governor and the Government of Sverdlovsk region, the Ministry of Education and Science of the Russian Government.

In 2010 the Ministry of Education and Science of Russia, according to the order of the Government of the Russian Federation, carried out an analysis of training experience on energy conservation on the basis of UrFU and gave a positive assessment of that experience, and recommended it for wide distribution.

**Case study of Nizhniy Novgorod State Technical University**

**A. In General**

NSTU conducts energy efficient measures in the sphere of scientific-methodical development of energy conservation systems campus, development of comprehensive performance indicators of energy conservation, creation and implementation of new technologies and methods of energy conservation. Special attention is given to energy efficiency in buildings. The combination of administrative and technical measures, as well as staff training aimed at energy efficient behavior.

**B. Institutional framework and policies**

The initiator of the energy efficiency improvements was the top management of the University and Nizhny Novgorod investment center on energy efficiency. The most important factor for efficient actions is an overall understanding and support of the Action plan among the staff and students of NSTU. NSTU is now one of the leading universities in energy efficiency issues and it mainly doesn’t depend on external energy experts.

**C. Commitment and decision making**
Issues of energy efficiency improvement are taken into consideration in a long-term. Many divisions are already deeply involved in educational, methodical and practical work, such as the Nizhny Novgorod investment center on energy efficiency of NSTU and the Department of electric power, which are focused on energy saving issues.

**D. Energy assessment of the institution**

NSTU conducts analysis regarding energy use in the spheres of heating and cooling, hot water consumption, lighting, ventilation, construction design and materials, renewable energy sources and green procurement. University regularly collects data on costs of energy sources (electricity and heat supply), transportation and consumption losses, calculation of the tariff for transportation of electricity, monitoring energy efficiency projects and calculation of actual and standard costs for production and transport of heat.

**E. Development and implementation of Action Plan**

All staff categories are involved in energy efficiency issues and work on: the development of training systems and methodological support in the field of energy efficiency; scientific-methodical development of energy conservation systems in educational institutions; development of comprehensive performance indicators of energy conservation, creation of new technologies and methods of energy conservation.

NSTU conducts training courses on the following directions: the regulatory framework and financial mechanisms to implement energy-saving technologies and equipment; energy efficiency programs in industry and public sector; feasibility studies for investment and business plans for energy-saving projects aimed at reducing consumption of electricity, gas, heat and water; methodologies to energy conservation; norms and standards for heat consumption for domestic and industrial consumers; energy audit of companies and organizations; assessment of the potential energy savings with the introduction of new technologies etc.

**F. Evaluation of outcomes and continuing improvement**

In accordance with the State Program on energy saving and State Law 261 NSTU reduces energy consumption by not less than 3% annually.

NSTU is responsible for the development of regional strategies of energy saving by the decision of Ministry of Education and Science. NSTU experience is recommended for implementation of similar activities in other universities.

**7. Conclusions**

The diversity of environmental strategies and environmental tools adopted by the aforementioned institutions and the different outcomes in the implementation processes indicate the broad spectrum of opportunities offered and choices to be decided. Each case study has its own particular components and specific needs; therefore each organization follows a different path, from integrated strategies on environmental management (e.g. the overall strategy of Bristol University) to specified practices on a particular field (e.g. office consumables in Maynooth of Ireland). But no matter the diversity of these cases, there are certain main outcomes that can be drawn and be applied in every institution that wishes to make a voluntary commitment for the sustainable management of all its operations and procedures.

1. **Knowledge of existing environmental tools**
For a research or academic institution, the first thing to be done is the thorough search and assessment of the various international and European existing tools, so as to obtain deep knowledge of the existing frameworks and be able to decide which one is the most suitable. Certainly the final selection will be based on the demands, the specific needs of the institution and the vision of the leadership (person / team in charge).

2. Knowledge of national environmental frameworks

Familiarity with the existing national legal and administrative framework in the sector of the environment and especially energy efficiency practices can be a crucial factor in the process of selecting a certain tool or an overall strategy. Comprehending the opportunities from the existing incentives or the restrictions that are foreseen by law or by the administrative regulatory framework, can save time and money from the very beginning.

3. Initial decision and commitment

Usually, all good practices were initialised by a dedicated environmental expert or a team, who had a vision and took the initiative (leadership) to implement an environmental practice that would benefit the institution and would consequently disseminate these outcomes to the city or even to the country. In most cases, the initial decision is taken by the recognition of a necessity for change and amelioration of the existing situation.

4. Integrated strategy

Setting an overall integrated strategy for the environmental management of the institution is the best way to start. Energy efficiency and RES schemes can be implemented, apart from the buildings, in the sectors of transport, waste and water management etc. The strategic goals and priority settings are usually set by the leader of this effort (the expert or the team), who has the necessary expert knowledge. Then, it is up to the institution’s leadership to take the necessary decisions and implement the strategy in all or partially. The case studies presented in the previous section prove that it is important to start even in an incremental way, with a step by step approach.

5. Awareness raising

Another important outcome from the best practices is the increase of awareness of all relevant users and stakeholders (mainly University students and academic staff and administrators). Their role is crucial since not only do they become aware and environmentally sensitive, but also they can assist through their active involvement in implementing projects, campaigning, or simply learning how their activities affect the environment. It should also be added that key stakeholders’ participation, even though it is optional, is helpful, because it increases legitimacy of decision-making.

6. Systematic evaluation and monitoring

Every activity needs to be assessed and monitored in a regular basis, so as mistakes can be identified and corrected. The evaluation of outcomes is essential and leads to transparency and continuing improvement.

7. Awarding

Moreover, the evaluation of efforts shows the way for external recognition, awarding and publicity. Awards offer material and moral benefits satisfaction, active deliberative actions and a push for continuation of efforts.
Finally, it should also be noted that the most recognized and used environmental policy tools are ISO, EMAS and GPP. Therefore, the main deliverable of the project “Roadmap for awareness and implementation of energy efficient and use of RES schemes” will take into serious consideration these tools.