ISCN-GULF Sustainable Campus Charter

Report 2013
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Table of Contents

About KTH ................................................................................................................................................... 2
Organisation ................................................................................................................................................ 2
KTH’S environmental impact..................................................................................................................... 2
KTH-Sustainability and Sustainable Campus ........................................................................................... 3
Vision, policies and objectives .................................................................................................................... 3
VISION 2027 ........................................................................................................................................... 3
Policy for sustainable development ........................................................................................................ 3
Environmental policy – and overall environmental objectives ............................................................ 3
Laws and regulations .................................................................................................................................. 4
About this report ......................................................................................................................................... 5
Sustainability Performance of Buildings on Campus.................................................................................... 6
    KTH Objectives relating to principle one ............................................................................................... 6
    Certifying buildings ............................................................................................................................ 6
    Energy consumption ........................................................................................................................... 6
    Chemicals .............................................................................................................................................. 8
    Waste .................................................................................................................................................... 8
Campus-wide Master Planning and Target Setting..................................................................................... 10
    KTH Objectives relating to principle two ............................................................................................. 10
    Strategic plan 2013-2016 ....................................................................................................................... 10
    KTH campus plan – a vibrant campus for a sustainable future .......................................................... 10
    Diversity Policy ................................................................................................................................... 11
Carbon emissions and transportation ....................................................................................................... 12
Integration of Facilities, Research and Education ..................................................................................... 14
    KTH Objectives relating to principle three .......................................................................................... 14
    Education, Research and Cooperation ................................................................................................. 14
    Education ............................................................................................................................................... 14
    Research ............................................................................................................................................... 17
    Collaboration ........................................................................................................................................ 18
Introduction

About KTH

KTH, founded in 1827, is responsible for one third of Sweden’s capacity for technical research and is the country’s largest organizer of technical/engineering education at university level. KTH education and research covers a broad spectrum – from natural sciences to all branches of engineering plus other areas such as architecture, industrial economics, urban planning, work science, philosophy and the history of technology. In addition to the research conducted at KTH Schools, a number of both national and local Competence Centres are located at KTH.

KTH conducts extensive international research and educational exchanges with universities and colleges, mainly in Europe, the USA and Australia as well as with countries in Asia. KTH participates actively in various EU research programs. Cooperation is also carried out with Swedish and international aid agencies. Further, KTH has extensive cooperation with Swedish businesses, governments and organizations. Strategic cooperation agreements have been signed with several major companies and with Stockholm County Council.

KTH has more than 12,500 undergraduate students, more than 1,800 active postgraduate students and just over 4,800 employees. In 2013, KTH’s total revenues amounted to SEK 4,419 million of which circa 22% was funding for basic education and 24% were grants for research and doctoral programs. The remaining 54% was external funding from, amongst others, research foundations and the EU.

Organisation

KTH is organized into ten schools that report directly to the President and are headed by a Dean and a Vice-Dean. The President leads operations and reports to the University Board. The President’s Group deals with strategic educational, research and quality issues and consists of the President, Deputy President, Dean of Faculty, Vice-Dean of Faculty, Vice-President for Research, the University Director and a student representative. The KTH Management Group deals with matters concerning all KTH schools and consists of the President, Deputy President, Dean of Faculty, Vice-Dean of Faculty, Vice-Presidents, University Director, all deans of schools and two student representatives. The Faculty Council bears the academic responsibility for KTH’s education and research. Quality activities – follow-up, evaluation and recommendations – have a prominent place in their operations.

KTH’S environmental impact

KTH contributes to sustainable development through educational programs, research and interaction with the surrounding communities. As a result of its operations, KTH impacts the environment through the production of waste, the use of materials and the use of water, energy and chemicals, through its staff travelling and also through construction work; and indirectly through purchasing and procurement.

At KTH, sustainable development is a common objective for research, education and collaboration conducted and the overall objective is that KTH will become one of Europe’s leading technical universities within this area. In KTH’s strategic plan, the motivation to contribute to a more sustainable future is expressed:

“Humanity faces major global challenges such as climate change, increasing energy requirements, food security, aging populations and growing cities. All these require a more
sustainable approach. In order to find solutions, collaboration between different fields of knowledge is needed. Broad collaboration between universities and other actors in society will become increasingly important.”

KTH-Sustainability and Sustainable Campus

KTH divides the strategic and practical work with environment and sustainable development in two parts: KTH-Sustainability and Sustainable Campus. KTH-Sustainability is responsible for education, research, and collaboration with society and Sustainable Campus is responsible for internal environmental management. KTH-Sustainability, led by the Vice-President for sustainable development, also acts as an advisory body to the President and to the Faculty Board. The Sustainable Campus work is led by the Environmental Manager.

Vision, policies and objectives

VISION 2027

Vision 2027 outlines future goals for KTH; KTH wants to contribute to a brighter future finding smart solutions to present and future challenges. At KTH, sustainable development is a common objective for research, education and collaboration conducted and the overall objective is that KTH will become one of Europe’s leading technical universities within this area.

Policy for sustainable development

The University Board has requested that KTH’s management develop a policy for sustainable development. It will be an overarching policy in relation to other relevant policies such as the environmental policy, policy for equity, personal administration policy, procurement policy, etc. The work started in 2013 and will be finalized in 2014. This resulting policy is expected to represent a broad perspective of sustainable development and open up for a discussion on how other available policies relate to the concept of sustainable development.

The policy will be structured in accordance with the international standard ISO 26000 with its seven main core subjects; Organizational governance, Human rights, Labour practices, The environment, Fair operating practices, Consumer issues, Community involvement and development.

Environmental policy – and overall environmental objectives

In order to specify goals and translate them into practical work KTH has an environmental policy including environmental objectives.

The environmental policy decided by the university board reads:

“KTH is the oldest and largest technical university in Sweden. KTH will contribute to sustainable development through education, research, collaboration, and by reducing its own environmental impact. KTH shall:

- Have an identity and a brand that is associated with a sterling work for the environment and sustainable development.
- Be a place where issues of environment and sustainable development are presented and debated, and where different disciplines, approaches and actors meet.
- Have staff, students, alumni, and partners that contribute to sustainable development by developing, disseminating and applying the techniques, methods, approaches and skills considering this.
- Encourage and educate staff and students to environmental awareness within and out-

3
side KTH.

- Constantly and systematically prevent pollution and improve environmental performance.
- Economize energy, goods and materials, and apply environmental requirements in purchase and procurement.
- Comply with environmental laws and requirements that KTH subscribes to.
- Inform and report the environmental performance both internally and externally.”

KTH has decided upon eight overall objectives for 2015 with a baseline value 2012.

**Power consumption:** the aim is to achieve a 5 per cent reduction in KTH’s power consumption (including electricity, heating and cooling systems).

**Transport:** the aim is to achieve a 10 per cent reduction in carbon emissions resulting from business travel compared with the number of employees (annual full-time workforce).

**Use of chemical products:** the aim is for chemicals to be managed in a better, safe, and secure way from an environmental and health perspective.

**Procurement and use of goods and services:** the aim is to improve the routines and procedures in terms of the environmental requirements involved in procurements. The highest environmental standards should be aimed for during the construction and renovation of buildings.

**Waste:** the aim is to improve the possibilities for sorting waste.

**Education:** the aim is for KTH to actively work to increase teachers’ and students’ knowledge of, and involvement in, issues relating to the environment and sustainable development. Those running all KTH programmes should account for how the educational goals laid out in the university regulations, which relate to the environment and sustainable development, are fulfilled and developed.

**Research:** the aim is to increase the amount of research conducted at KTH focusing on the environment and sustainable development. The research conducted in environment and sustainable development must be of a high international standard.

**Collaboration:** KTH is to increase its level of visibility and improve its interaction with society in issues of environmental and sustainable-development.

**Laws and regulations**

In Sweden, the higher education act (Ch. 1, § 5) states:

> “Higher education institutions shall function to promote sustainable development so that present and future generations are assured a healthy and sound environment, economic and social welfare and justice.”

All Swedish government authorities, including KTH must follow the environmental management regulations. This implies that KTH, within the framework of its regular assignments, is obligated to have a System for Environmental Management (EMS) that integrates environmental considerations into the authority’s activities as a means to systematically account for the operations’ direct and indirect environmental. An authority whose activities result in a significant environmental impact should be registered in accordance with the European Parliament and the Council’s regulation\(^1\) or must be certified in accordance to the ISO 14001 standard.

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\(^1\) (EC) No. 761/2001 of 19 March 2001 (EMAS)
The President of KTH has decided that KTH shall have a certifiable environmental management system according to ISO 14001 no later than 31 December 2014.

The overall environmental objectives, within KTH’s System for Environmental Management, have been established in order to achieve continual improvement of environmental performance and practices. Local environmental goals and practices will be established at KTH schools and university administration in accordance with the EMS. A follow-up of the overall environmental objectives will be conducted at least once a year.

**About this report**

This report is compiled for the International Sustainable Campus Network, ISCN\(^2\). It is centred on three principles which ISCN is basing its work on and structures campus commitments about sustainability into a nested hierarchy encompassing individual buildings, campus-wide planning and target setting, and integration of research, teaching, outreach and facilities for sustainability. The three corresponding principles, each with supporting explanatory texts, according to ISCN, are at the core of this report.

This report concerns 2013 and has been compiled by Helene Limén, project leader at KTH-Sustainability together with Teresia Sandberg, project coordinator at KTH-Sustainability. The information and data presented here originates from KTH’s Annual Report 2013, KTH’s Strategic and Action Plan 2013-16, Vision 2027, KTH-Sustainability’s project plan, the KTH Campus plan and KTH’s environmental management system, as well as other supporting documents. The report describes KTH’s environmental and sustainability work related to the three principles of ISCN.

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\(^2\) The International Sustainable Campus Network (ISCN) provides a global forum to support leading colleges, universities, and corporate campuses in the exchange of information, ideas, and best practices for achieving sustainable campus operations and integrating sustainability in research and teaching. Read more: [http://www.international-sustainable-campus-network.org/](http://www.international-sustainable-campus-network.org/)
Sustainability Performance of Buildings on Campus

**Principle 1:** To demonstrate respect for nature and society, sustainability considerations should be an integral part of planning, construction, renovation, and operation of buildings on campus.

A sustainable campus infrastructure is governed by respect for natural resources and social responsibility, and embraces the principle of a low carbon economy. Concrete goals embodied in individual buildings can include minimizing environmental impacts (such as energy and water consumption or waste), furthering equal access (such as nondiscrimination of the disabled), and optimizing the integration of the built and natural environments. To ensure buildings on campus can meet these goals in the long term, and in a flexible manner, useful processes include participatory planning (integrating end-users such as faculty, staff, and students) and life-cycle costing (taking into account future cost-savings from sustainable construction).

(From ISCN charter instructions)

**KTH Objectives relating to principle one**

Following environmental objectives at KTH relate to Sustainability Performance of Buildings on Campus.

- **Energy consumption:** 5 per cent reduction in KTH’s energy consumption (including electricity, heating and cooling systems) by 2015
- **Chemicals:** chemical management and safety should be improved from environmental and health perspectives
- **Waste:** Opportunities for waste separation will be improved
- **Buildings:** Best environmental practices should be aimed for during new constructions and renovation of facilities.

**Certifying buildings**

Sweden uses different certification systems for buildings – among the most frequent are:

- **Miljöbyggnad:** a system for certifying buildings in relation to energy, indoor climate and materials. It is a classification system in the construction and property sector launched to accelerate the use of certification of buildings in Sweden.
- **Green Building:** A Green Building certified building has to achieve 25% less energy use than in the past or compared to new construction requirements of The Swedish National Board of Housing, Building and Planning
- **BREEAM-SE:** Sweden Green Building Council has developed a version of BREEAM (BRE Environmental Assessment Method) for the Swedish market, BREEAM-SE provides the Swedish manual and handles registrations and technological development.

KTH’s operations are conducted within rent premises held mostly by the property owner Akademiska Hus. Akademiska Hus has decided that all new buildings at the KTH campus must meet the requirements for Miljöbyggnad Silver and in some cases Gold. Miljöbyggnad Gold sets higher requirements for energy efficiency and energy sources, content of hazardous substances and documentation of materials as well as the indoor environment considering for example radon and ventilation. An approved survey of resident’s perception of the indoor environment is also required.

**Energy consumption**

The landlord’s goal is to reduce energy consumption, calculated as supplied energy/m², by 50% between 2000 and 2025. In order to reach the goal the pace of energy efficiency must increase considerably, to about 4% / year.
Energy consumption varies among KTH schools due to significant differences in buildings and operations. Total energy use is monitored and compared with the size of the annual full-time workforce and full-time students, and is calculated per square meter.

KTH has premises in seven locations with 42 buildings and a total area of 266,753 m². The electricity consumption of the Centre for Parallel Computers (within the School of Computer Science and Communication or CSC) is measured separately since it amounts to 25% of the total amount of electricity used at KTH. KTH-premises have relatively high average energy consumption. Purchased energy for cooling, heating and electricity is currently circa 272 kWh/sqm.

Initiatives to reduce energy consumption
Several initiatives have been taken by both KTH and our landlord, Akademiska Hus to monitor and reduce energy consumption—both from an environmental and economic perspective. Examples are:

Information and follow-up:
- Electricity: information about the electricity used is declared and the origin shall be hydro-based and produced in Nordic hydropower plants. In 2013, 99% of the electricity came mainly from hydroelectric power and a small amount from wind power.
- Follow-up: in order to conduct effective energy work monitoring is an important part of Akademiska Hus—a system for automatic reading of energy consumption has been installed.
- Energy analysis and measures: annual in-depth energy analysis are performed in selected buildings using external experts. This provides a basis for future work.

Measures to reduce energy consumption:
- Cooling: the district cooling network has been expanded
- Excess heat used: at the Center for High Performance Computing, a system has been developed to recover the excess heat from the supercomputers to heat one of the buildings at KTH. Energy benefits of this system are to decrease the use of district heating in the winter and to a certain degree use the energy for cooling of the computer center. KTH benefits economically through less consumption of district cooling and Akademiska Hus does not have to pay to heat the chemistry building. Last winter, KTH saved 820 MWh equivalent to about 400,000 Skr (40,000 Euro). In addition to the economic benefits, this heat re-use approach also helps save the environment by taking advantage of the heat energy that is produced by the supercomputers, instead of just wasting it.

Planned activities and collaborations between Akademiska Hus and KTH:
- A strategic partnership agreement between Akademiska Hus and KTH with a focus on sustainability (more details about the partnership under Principle 3).
- KTH Campus becomes a beta test object for sustainability certification under BREEAM Communities.
- A heat pump system for central heat recovery and cooling supply will be built. The planned measure is expected to result in a 25% reduction in energy supply at Campus.
- A comprehensive survey of suitable roof space for the placement of solar panels on existing buildings within KTH Campus to be conducted in early 2014.
- Opportunities to install solar panels on the roof and wall surfaces in new construction projects will be considered.
• Opportunities to replace outdoor lighting and general lighting to energy-efficient LED alternatives are to be investigated.
• Akademiska Hus assists KTH Schools in their effort to reduce energy use by including extended and adapted energy statistics and accounting expertise.
• Akademiska Hus and KTH collaborate to visualize energy consumption in order to stimulate to energy efficient behavior.
• Solar-powered charging stations for electric cars are to be built within KTH Campus in 2014.
• Opportunities to utilize energy from restaurant waste are to be investigated within KTH Campus.

Chemicals
During 2013 different initiatives have been taken to improve chemical management at KTH. A general procedure for managing chemicals has been established as well as local goals and procedures at each school. Strategic information about chemical management and other types of capacity building have been done at central and school level. Also the IT system used at KTH for registration of chemicals and safety data sheets have gone through several major updates in 2013 to become more user friendly.

Waste
KTH has a goal to improve the separation of waste. A general procedure for waste management has been established and in 2013 and an evaluation of new recycling furniture has started with involvement of all schools at KTH.
### Table 1 – Targets and results related to Principle 1;

<table>
<thead>
<tr>
<th>Topics</th>
<th>Goals and Initiatives</th>
<th>Priority areas</th>
<th>Key initiatives</th>
<th>Performance 2013</th>
<th>Performance 201</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy consumption</td>
<td>5 per cent reduction, including electricity, heating and cooling systems</td>
<td>Energy saving projects together with Akademiska Hus, KTH’s landlord. Education and capacity building at schools</td>
<td>Total consumption: 72 634 842 kWh Consumption/annual man power: 20 059 kWh</td>
<td>Total consumption: 79 078 666 kWh Consumption/annual man power: 22 326 kWh</td>
<td></td>
</tr>
<tr>
<td>Chemicals</td>
<td>Improvements regarding safety and health</td>
<td>A general procedure for chemical management has been established as well as local goals and procedures. Education and capacity building at schools</td>
<td>No figures</td>
<td>No figures</td>
<td></td>
</tr>
<tr>
<td>Waste</td>
<td>Improvements concerning separation of waste</td>
<td>A general procedure for waste management has been established. Evaluation of recycling furniture.</td>
<td>No figures</td>
<td>No figures</td>
<td></td>
</tr>
<tr>
<td>Buildings</td>
<td>Best environmental practices should be aimed for during new constructions and renovation of facilities.</td>
<td>All new buildings shall be at least classified as Miljöbyggnad Silver – when possible Gold</td>
<td>No figures</td>
<td>No figures</td>
<td></td>
</tr>
</tbody>
</table>
Campus-wide Master Planning and Target Setting

Principle 2: To ensure long-term sustainable campus development, campus-wide master planning and target-setting should include environmental and social goals.

Sustainable campus development needs to rely on forward-looking planning processes that consider the campus as a whole, and not just individual buildings. These processes can include comprehensive master planning with goals for impact management (for example, limiting use of land and other natural resources and protecting ecosystems), responsible operation (for example encouraging environmentally compatible transport modes and efficiently managing urban flows), and social integration (ensuring user diversity, creating indoor and outdoor spaces for social exchange and shared learning, and supporting ease of access to commerce and services). Such integrated planning can profit from including users and neighbors, and can be strengthened by organization-wide target setting (for example greenhouse gas emission goals). Existing low-carbon lifestyles and practices within individual campuses that foster sustainability, such as easy access for pedestrians, grey water recycling and low levels of resource use and waste generation, need to be identified, expanded and disseminated widely.

KTH Objectives relating to principle two

Strategic plan 2013-2016

Based on KTH’s Vision 2027 objectives, a strategic plan for the period 2013-2016 has been outlined. The University board established the development plan in the end of 2012 and all schools and the university administration draw up their own development plans in 2013. Overall objectives in the strategic plan, relevant to campus development are:

- Collaboration with external stakeholders will be facilitated and increase in magnitude
- The proportion of women in the faculty and among students will increase and gender equality improve
- KTH campus environments will be characterized by creativity and sustainable development

The campus environment is an important part of KTH’s identity. It is a creative, sustainable and international meeting place for students, teachers and researchers. KTH’s main campus is in the process of becoming better integrated into the science city and its surroundings (Norra Djurgården - Albano – Hagastaden). Other branches of KTH in the suburbs are already integrated into the surrounding research and business environment. Collaboration opportunities increase when the rest of society and KTH interact more closely. It is also important that KTH has close contact with regional and municipal decision makers and acts proactively to accelerate campus development. Forward-looking development plans for the campus, buildings and land will be developed.

KTH campus plan – a vibrant campus for a sustainable future

Vision 2027 has been a starting point for the development of the KTH Campus Plan with an overall goal to create a vibrant and Sustainable Campus.

The work with the new campus plan has been conducted in collaboration between KTH and its landlord Akademiska Hus. It sets the direction for further development of the KTH Campus in a sustainable manner encompassing all perspectives of sustainability, ecological, economic and social sustainability; lower energy consumption, conscious choices of material, improved transportations, flexible use of land and buildings are for example important objectives. Unlike previous plans, overall operations are related to the physical conditions of the
campus. The planning span of the plan, 15-20 years, is also slightly longer than it has been in previous plans. The work has been conducted as an inclusive process; Stakeholders have participated in workshops and have been regularly informed of the progression of the work. The vision of the campus plan is a vibrant and sustainable campus characterized by diversity, new operations and activities and increased international exchange. Aspects of the vision are sorted under the BREEAM Communities five headings with the addition of Innovation:

- **Participation**: the users of the campus are involved in decisions that affect the design, operation and long-term management of the area.
- **Well-being**: the campus is a sustainable, vibrant and safe part of town, with a clear identity. An environment that attracts visitors to stay, over days and throughout the year.
- **Resource management**: available resources on campus are utilized in a sustainable manner.
- **Ecology**: the campus grounds are used in a sustainable and effective manner. Ecological values are maintained and strengthened. Biological diversity is preserved and developed.
- **Transportation**: campus has an accessible structure to support the use of sustainable transport modes.
- **Innovation**: the conditions for a creative and innovative climate on campus is optimized. New, smart, sustainable solutions are visualized and it is apparent that the work to solve the challenge of today and tomorrow is ongoing.

**Diversity Policy**

The aim of KTH’s work with diversity is to promote a respectful and flexible organizational culture. Central to this work are equal rights, opportunities and obligations regardless of ethnicity, gender, gender identity or gender expression, religion or belief, disability, social background, sexual orientation or age. KTH looks primarily at diversity efforts as a democratic issue where social responsibility is included.

**Overall diversity objectives**

KTH’s diversity efforts are focused on working conditions, education, research and technology development. Different experiences and perspectives on technology, technology development positively enriches teaching and research. As an educational organization, KTH shall, from a diversity perspective promote:

- broadening student recruitment
- good study social conditions
- facilitate the transition between university education and work
- an awareness of what a diversity perspective can bring to basic education

As a research organization, KTH shall work for:

- research collaboration and exchange of technological issues between different countries and cultures
- an awareness of what a diversity perspective can bring to the research
As an employer, KTH provides employees equal opportunities, rights and obligations, regardless of ethnicity, gender, gender identity or gender expression, religion or belief, disability, social background, sexual orientation or age in terms of:

- influence, responsibility and authority in the current employment
- appointment process
- development opportunities

**Carbon emissions and transportation**

The total carbon emissions from travelling decreased by 19% during 2013 compared to 2012. However, short distance flights (<500km), that are the main focus for carbon reductions increased by 30% during the same period.

Examples of incentives for carbon reductions include: train travel is the first alternative in the online-booking system, investment in phone and web-conference equipment and staff training in the use of this equipment. In 2014, KTH will continue to provide incentives and opportunities for web-conferencing; a new travel policy will be developed including a routine for environmental considerations in travelling.
Table 2 – Targets and results related to principle 2;

<table>
<thead>
<tr>
<th>Topics</th>
<th>Goals and Initiatives</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Priority areas</strong></td>
<td></td>
<td><strong>Performance 2013</strong></td>
</tr>
<tr>
<td>Improve gender equality</td>
<td>The proportion of women in the KTH faculty will increase to at least 25% (2016)</td>
<td>Proportion females in the faculty 19%</td>
</tr>
<tr>
<td></td>
<td>Appointments of new positions can be used as an effective instrument.</td>
<td>Proportion of female professors: 14%</td>
</tr>
<tr>
<td></td>
<td>Follow-up of the development at different levels; departments, schools and at KTH-level</td>
<td>Proportion of female teachers: 21%</td>
</tr>
<tr>
<td></td>
<td>Study mechanisms that contribute to uneven gender equality and remove barriers</td>
<td>Proportion of post-graduate females were 30%</td>
</tr>
<tr>
<td>Reduce carbon emissions from transportation</td>
<td>The aim is to achieve a 10 percent reduction in carbon emissions resulting from business travel compared with the number of employees (annual full-time workforce) until 2015.</td>
<td>Monitoring air travel through the travel agency and travel manager.</td>
</tr>
<tr>
<td></td>
<td>Monitoring air travel through the travel agency and travel manager.</td>
<td>86 kg CO₂/annual working force (flights below 500 km)</td>
</tr>
<tr>
<td></td>
<td>Train is the first choice in the web-based travel booking system.</td>
<td>1155 kg CO₂/annual working force (flights over 500 km)</td>
</tr>
</tbody>
</table>
Integration of Facilities, Research and Education

**Principle 3: To align the organization’s core mission with sustainable development, facilities, research, and education should be linked to create a “living laboratory” for sustainability.**

On a sustainable campus, the built environment, operational systems, research, scholarship, and education are linked as a “living laboratory” for sustainability. Users (such as students, faculty, and staff) have access to research, teaching, and learning opportunities on connections between environmental, social, and economic issues. Campus sustainability programs have concrete goals and can bring together campus residents with external partners, such as industry, government, or organized civil society. Beyond exploring a sustainable future in general, such programs can address issues pertinent to research and higher education (such as environmental impacts of research facilities, participatory teaching, or research that transcends disciplines). Institutional commitments (such as a sustainability policy) and dedicated resources (such as a person or team in the administration focused on this task) contribute to success.

**KTH Objectives relating to principle three**

**Education, Research and Cooperation**

KTH contributes to sustainable development by providing educational programs, conducting research and by interacting with the surrounding community. The KTH-Sustainability council has been formed to work with aspects of environment and sustainable development in education, research and cooperation. The council, headed by the Vice-President for Sustainable Development, is composed of teachers, student representatives and the Environmental Manager. It was formed as a project for the years 2011 and 2012 and has since been extended to 2015.

**Education:** The aim is for KTH to actively work to increase teachers’ and students’ knowledge of and involvement in, issues relating to the environment and sustainable development. Those running all KTH programmes should account for how the educational goals laid out in the university regulations relating to the environment and sustainable development, are fulfilled and developed.

**Research:** The aim is to increase the amount of research conducted at KTH focusing on the environment and sustainable development. The research carried out must be of a high international standard.

**Collaboration:** KTH is to increase its level of visibility and improve its interaction with society within the area of environment and sustainable development.

**Education**

All programmes have to integrate environment and sustainable development in the curricula in order to fulfil the overall learning objectives as described in the Higher Education Ordinance. All schools at KTH have developed an action plan during 2013 for how to develop and integrate environmental and sustainable development objectives into their educational programs. A number of new educational initiatives were taken in 2013. At several schools, new courses with relevance to environment and sustainable development evolved and new elements have come into existing courses.
Course module “Introduction to Sustainable Development”
During 2013, sustainability was introduced into several of KTH education programmes within the framework of a small course module that contains teaching elements based on an innovative approach to teaching. To date, circa 1000 students have taken variations of the module, through a total of seven different courses. Assessments of the module have been done combining classroom activities, written reflection assignments and a multiple choice test. Several innovative teaching activities are integrated into the module, such as interactive large theatre lecturing (with teacher moderated student debate for up to 180 students at the time) and the use of board games (which include preparatory quiz questions and peer-discussion). The purpose of the module is to introduce sustainability early in the engineering education, as a part of the fulfilment of the first taxonomy steps in the CDIO model.

Course module “Environmentally driven business development”
Together with a technical consultant company, KTH has during the past two years developed a course module focusing on environmentally driven business development. In 2013, a pilot version of the module was given to approximately 45 students from one of KTH’s engineering programs as part of a course in environmental economics. The module is comprised of lectures, group discussions and a hand-in assignment. The module is partly taking place at the consultant company with e.g. presentation from their Sustainability Director. The course evaluation showed very good results. In 2014, the course module will be further developed as a means for inclusion into more of KTH’s engineering programs, and for adaption to different educational levels.

New pedagogical course for teachers – Learning for Sustainable Development
A new pedagogical course for university teachers was given in 2013; “Learning for Sustainable Development”. The overall aim with the course is that participating teachers will acquire knowledge about best practices on how to integrate sustainability issues into their teaching of their respective subject perspective. In turn will improve engineering students’ knowledge and skills in sustainable development as well as strengthen their abilities of independent reflection and evaluation regarding sustainability issues within the scope of their own subject perspective.

Research study - Integrating social sustainability in engineering education at KTH
In this study, the main challenges associated with integration of social sustainability in engineering education at the KTH was investigated. Semi-structured interviews were conducted with programme leaders and teachers at four of KTH’s engineering programmes, focusing on three questions: How is the concept of social sustainability defined and operationalized in the selected engineering programmes? How is social sustainability integrated and taught in the selected engineering programmes? What resources are required in order to support teachers and programme leaders in their professional roles as (social) sustainability educators? The interviews confirmed that programme leaders and teachers at KTH struggle with how to understand the concept of social sustainability. The vague and value-laden character of the concept is considered a challenge when operationalizing educational policy goals on sustainability into effective learning outcomes and activities. Allocation of resources in the form of assisted peer discussion, supplementary sustainability training for teachers, feedback on initiatives taken, and economic incentives were among the factors identified as being crucial to successful integration of (social) sustainability in engineering education at KTH. The findings of this

3 The CDIO™ INITIATIVE is an innovative educational framework for producing the next generation of engineers http://www.cdio.org/
study can be used as a basis for improving social sustainability training in engineering education, which up to recently has attracted relatively little attention.

A **toolbox for integrating sustainable development in higher education**

A toolbox was developed during 2013 for integrating sustainable development in higher education. The toolbox is an open website, published at the University homepage (www.kth.se). The design of the toolbox builds on the philosophy of constructive alignment, aiming at illustrating good examples of how to set up learning outcomes, teaching activities and ways of examination in relation to sustainable development. The toolbox aims to be a source of inspiration and guidance for teachers who would like to work more actively with these issues. The project also seeks to create and provide teachers with opportunities to meet and discuss possibilities and obstacles regarding integrating sustainability issues in education and to share experiences. The toolbox project started in mid-2012 and a first pilot version was launched in spring 2013. New content is continuously added, and a dialog with users for example by workshops and discussing the contents of the toolbox in pedagogical courses is therefore prioritized in the work.

**Support to students**

A student organization called “The reflective Engineer” received financial support from KTH-Sustainability in 2013 to organize events around the theme of consumption. They organized lunch lectures, veggie-night, a book exchange, etc. KTH-Sustainability also arranged a Science Café on the same theme for the students to discuss sustainable production and consumption.

**Initiatives for PhD students**

A PhD students Forum for Sustainability was established in 2013 to provide students with an interactive space for discussion. The forum is designed to stimulate sustainability thinking and to catalyze transdisciplinary research collaboration. Several meetings were organized during 2013 with PhD students from different disciplines to discuss various themes and to organize a dialogue with PhD students in the region.

**Stockholm PhD Student Dialogue on Sustainability**

The Stockholm PhD Student Dialogue was organized by PhD students at KTH together with KTH-Sustainability as a means to increase and strengthen research collaboration across disciplinary and institutional boundaries. PhD students from five universities in the region were invited to participate. The overall theme of the dialogue was: How to promote a sustainable Stockholm urban and regional development?

Students from different disciplines participated in roundtable discussions around themes including: climate change, future energy mix, planning for sustainable cities, production and consumption, transition to a sustainable society, transportation and water management. At the end of the discussions, students were offered to compile an application for seed money coupled to the themes (one per table). Two projects were financed in order to stimulate to further cooperation.

1. Closing the material loop: A multidisciplinary approach to driving supply chain sustainability in system dynamics models – The case of mobile phones
2. Electricity system in the context of environment and society; a two part seminar series with young researchers

**PhD courses**

In 2013, an inventory of PhD courses in the area of environment and sustainable development started to create a basis for further development of courses offerings. A dialogue with PhD
students was also organized to get input from the students on the present courses offered and needs for further development. This development of new trans-disciplinary courses will continue in 2014.

**Seminars and meeting places**

Seminars and other meeting places have been organized for teachers, researchers and students. The aim has been to encourage networking and increased collaboration among researchers and teachers in various areas of KTH. Examples are:

- Seminar/workshop on the economic and social sustainability
- The Monitoring and Forecasting of Air Quality to Impact People’s Traveling Behavior with Prof. Jianping Wu from Tsinghua University, China
- Beyond Planetary Boundaries - Future Directions for Global Sustainability with Prof. Johan Rockström

**Research**

It is important that KTH’s research generate knowledge that can contribute to the sustainable development of society. This implies that a long-term perspective should be adopted with focus on solutions that do not constitute a threat to the ability of future generations to satisfy their needs. It also implies a holistic perspective where the introduction of new technology is seen in interaction with society.

**Objective and results**

The aim is to increase the amount of environment and sustainable development research of high international standard at KTH. A search based on an extensive list of keywords found that 258 scientific articles within the area of environment and sustainable development from KTH were published during 2013 which is three times more publications compared to 2010.

![Number of peer reviewed articles within sustainable development](image)

**New department to strengthen research and education**

Around 50 research groups at KTH have environment and sustainable development as either the central aspect in their research, or as a key component of the research carried out within their specific field. In addition, KTH is involved in a dozen centres linked to the environment
and sustainable development. In 2013, KTH launched a new department aimed at more closely integrating research and education in the field of sustainable development. The new Department for Sustainable Development, Environmental Sciences and Engineering (SEED) is to build on the activities of three established KTH units: the Department of Land and Water Resources Engineering, the Division of Environmental Strategies Research (FMS), and the Division of Industrial Ecology.

Research review
In 2012, an RAE (Research Assessment Exercise) was performed, resulting in rich material about KTH’s research. One of the recommendations from the RAE was that Sustainable Development (SD) should be more strongly integrated into KTH’s research base and education programs. Given the aim that KTH should be one of Europe’s leading technical universities within the area of environmental and sustainability research, KTH-Sustainability saw a need for identifying present strengths and weaknesses of KTH’s sustainability research and to obtain advice on strategies for the future work in the area. Three reviewers/advisors assessed the RAE material from 2012 along with a voluntary one-page update and conducted a round of interviews with 50 researchers and 50 PhD students in April 2013. In line with recommendations from the reviewers, KTH-Sustainability started in 2013 the following processes recommended by the advisors:

- Facilitating the interpretation of the concept Sustainable Development
- Identifying lighthouse projects together with researchers
- Creating a PhD meeting place

Initiatives to increase external funding and promote research in the field of Sustainability
In order to support trans-disciplinary research, KTH-Sustainability supported several projects with seed money in 2013. Several network meetings were also arranged in order to allow researchers from different disciplines to meet and exchange ideas.

Internal newsletter with calls
A newsletter including information about new research calls within the sustainability field was compiled and sent out to KTH researchers approximately every fortnight. As it has been proven very useful for researchers the newsletter is continuing during 2014.

Smart Sustainable Cities
KTH Smart Sustainable Cities is a new KTH-wide initiative aiming to bundle resources, activities and competence at the intersection of technology, sustainability studies and urban planning. The primary goal of KTH Smart Sustainable Cities is to create a contact point at KTH for this rapidly growing field of research. A steering group with research leaders from five different KTH-schools is assigned to promote research within the field at KTH and facilitate cooperation and networking with external partners. KTH-Sustainability was a co-funder for the initiative in 2013.

Collaboration
KTH strives to become a leading university within the area of environment and sustainable development. To reach this goal, collaboration with society is essential. A number of actions and activities have taken place during 2013 in order to stimulate cooperation between KTH and the surrounding community within the field of sustainable development. Examples of some initiatives are presented below.
**KTH-Sustainability Day**

KTH-Sustainability Day was arranged in 2013, for the third consecutive year. The target groups for the day were researchers at KTH, industry, government agencies and organizations. Themes for the day were innovations and entrepreneurship for a sustainable society, limited resources – new innovations, community development - technical limitations and opportunities. The program was composed of short presentations and panel debates.

**Internal and external newsletters**

An internal newsletter with general information about sustainability activities at KTH is distributed approximately once per month. In 2013, an external newsletter targeting the business community, policy makers, government agencies and organizations was created. It will be released approximately six times per year.

**Zero-Emission Campus Lab**

Zero Emission Campus Lab, a project inspired by KTH’s Vision 2027 worked with a number of initiatives during 2013 providing examples of sustainable solutions to KTH’s students, visitors and partners. The word "lab" implies that the project is an ongoing experimental place where the acquired knowledge can be used, but also where new research findings can be tested and evaluated.

**Open Lab**

Stockholm is growing rapidly which implies a number of challenges for future sustainable solutions concerning infrastructure, housing and the environment. OpenLab is a physical place where students, educators and researchers from Karolinska Institutet, KTH Royal Institute of Technology, Stockholm University and Södertörn University work with clients from the City of Stockholm, Stockholm County Council and Stockholm County Administrative Board. The goal is to produce proposals for solutions to complex social issues for this growing region through new interdisciplinary collaboration between traditional knowledge areas. OpenLab offers a new way of learning new things in a partnership between various sectors of society; between different fields and professions; between medicine, engineering, natural sciences, social sciences, the humanities and the arts.

**Greenhouse Labs**

Greenhouse Labs is a physical place where young high-tech and growth-oriented chemistry related businesses can establish themselves for a limited time. Greenhouse Labs offer a state of the art lab and office with an efficient infrastructure. It is directly connected to teaching and research in the School of Chemical Science and Engineering, in the middle of the KTH campus, in an environment that fosters innovation and entrepreneurship. A facility of this kind is new in the Stockholm area and it is expected to be a great asset for start-ups companies in area chemistry. The closeness to researchers opens up many possibilities – for example to solve problems in a new way and to recruit young scientist to companies. Examples of new companies ideas, established at Greenhouse Labs, are new sustainable materials for the packaging industry and recycling of cotton from the clothing industry.

**Green Leap**

Green Leap, is a network for design and sustainable development at KTH in collaboration with Konstfack - University College of Arts, Crafts and Design. The overall objective of Green Leap is to act as a catalyst for change by involving design in sustainable development. The key element in all operations is the combination of design and sustainable development. The work is directed into three areas: to act as a matchmaker between partners, to share knowledge
through courses, workshops, the Green Leap website and conferences and to take action by initiating and managing projects that in different ways brings us closer to the overall goal – a sustainable society. During 2013 a demo of the project “Prototyping the future” was presented. The aim with the project is to bring life to a sustainable society through design driven visualizations that people can understand, consider and relate to.

**AIMday® - to stimulate contacts between researchers, companies and organizations**

AIMday is a concept where researchers, during one day, discuss concrete solutions on actual problems that companies and organizations are facing. Companies and organizations send in their questions they want to discuss with the researchers in advance. The questions are published on a website and researchers from KTH and other universities can sign up for one or several questions. Participation in AIMday® can result in new contacts between researchers and business/organisations, future collaborations and new research ideas. Two AIMdays were organized in 2013;

**Sustainable solutions for cities**

AIMday® Sustainable Solutions for Cities became a great success with many good and interesting discussions between companies, organizations and researchers. A total of 47 questions from 24 different companies and organizations were discussed with 75 researchers, most of them from KTH but also from other universities and research institutes in Sweden. Evaluations showed that more than 90% of the participants had gained new knowledge and new contacts. Further, 98% of the participants found the day relevant for their work and would recommend it to their colleagues. Several discussions resulted in project ideas that became financed with seed money (a maximum of 5000 Euro).

**AIMday®Transport**

In December 2013 KTH organized AIMday® Transport with Scania, the Swedish National Road and Transport Research Institute (VTI) and Linköping University as partners. Representatives from industry and organizations met with researchers to address questions within the field of transport such as:

- Holistic Transport System
- Future Transportation Infrastructure
- Innovative Vehicle Concepts
- Transport in the Information Age
- Policy and Institutional Frameworks

**Communication Plan**

A communication plan was further developed in 2013 with focus on increasing the visibility of KTH’s sustainability research. Examples of activities include the development of web-sites, increasing the visibility of sustainability research at KTH, increasing the number of press releases related to KTH’s sustainability research and organizing seminars.

**Memorandum of Understanding with two research institutes**

In 2013 an initiative was taken to strengthen and expand cooperation between KTH and two research institutes, IVL, Swedish Environmental Research Institute, and SEI, Stockholm Environment Institute). A memorandum of understanding was signed between KTH and the two partners. These partnerships are expected to strengthen the long term cooperation and facilitate further cooperation in the area of environment and sustainable development, amongst others within the field of renewable energy, transportation and environmental engineering.
Memorandum of Understanding between KTH and its landlord Akademiska Hus

KTH and Akademiska Hus have signed a Memorandum of Understanding with the aim to develop their cooperation within the area of environment and sustainability. The goal is to stimulate interaction both at the management and operational level in research, education and innovation, and to strengthening sustainability research further. The enhanced cooperation will focus on areas relating to energy, construction processes and building materials. Also, estate management will be a prioritized area with special focus on sustainability and integrated processes. It will be concretized through the establishment of a new professorship in estate management partly funded by Akademiska Hus. The collaboration will include exchange of personnel, guest lectures and joint research projects.

Seed money to stimulate cooperation

Resources from the Sea

KTH-Sustainability supported an initiative focusing on the Baltic Sea in 2013. The project aimed at strengthening the work with local authorities, stakeholders and the public and stimulate to new research opportunities and innovations. The project focuses on turning an environmental problem into a resource for example turning algae biomass into biogas.

KTH Life Cycle Network

A network for researchers working with life cycle analysis has been established at KTH. It has attracted researchers and PhD students from different departments and schools and accounts now to more than 50 members. An additional funding provided by KTH-Sustainability has given the network the opportunity to give a seminar series and to take new initiatives for collaboration within the network.

Stormvarning

Stormvarning (Storm warning) is an initiative to communicate scientific findings on climate change and limited resources through music and musicians. The aim is to touch, inspire and engage to act within the climate issue. It is an initiative taken by scientists, communicators, musicians, producers and citizens. During 2013 KTH-Sustainability supported researchers at KTH involved in this new initiative.
Table 3 – targets and results related to Principle 3

<table>
<thead>
<tr>
<th>Topics</th>
<th>Goals and Initiatives</th>
<th>Results</th>
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<tbody>
<tr>
<td>Priority areas</td>
<td>Education All educational programmes address the specific and general learning outcomes for the environment and sustainable development. New educational programmes must address environmental and sustainable development.</td>
<td>In 2013 schools at KTH developed an action plan for how to develop and integrate the objectives on environment and sustainable development in their educational programs. Not measured</td>
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<td></td>
<td>Research The aim is to increase the amount of research carried out at KTH that is focused on the environment and sustainable development. The research carried out should be of a high international standard.</td>
<td>Internal newsletter with information about relevant and new calls Meeting places for researchers to discuss new collaborations in the field Seed money for transdisciplinary projects Extended cooperation with two research institutes 258 peer-reviewed articles were published within the area of environment and sustainable development</td>
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<tr>
<td></td>
<td>Collaboration Increase KTH's level of visibility and improve its interaction with society</td>
<td>External newsletter started. AIMday® KTH- Sustainability day Strategic partnerships</td>
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