Sustainable Campus Management at Freie Universität Berlin—Governance and Participation Matter

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Abstract

Sustainable campus management at Freie Universität Berlin has long placed special emphasis on climate protection and the goal of assuring sustainable development within the scope of its own institutional responsibilities. The university illustrated this by founding its own administrative unit for energy and environment management in 2001. Since then, the university has gradually implemented various initiatives and instruments such as energy efficiency programs focusing on the modernization of buildings and technical facilities, a bonus scheme for energy savings, a green IT program and several team building processes—all of which pursue the objective of realizing a systematic combination of technical, organizational and behavior-focused measures. Overall, these measures have led to a substantial drop in energy consumption of nearly 25 %, or 40 million kilowatt hours, with generally stable space utilization since the program's inception in 2001. This reduction comes in connection with annual budget savings of €3.5 million and a significant decrease in CO_2 emissions. The contribution highlights 'lessons learned' from the perspective of the sustainability manager, who has been in charge for the whole process from the very beginning in 2001. It focuses on the need for a holistic view of technology, organizational development, social learning processes and communication, as well as on the particular significance of governance aspects and stakeholder participation in terms of a whole-institution approach.

Keywords

Sustainable campus management · Energy efficiency strategies · Participation · Case study · Success factors

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1 Introduction

A special feature of the sustainability and climate change debate is the discussion related to reviving the political role of science and scientific institutions to meet their societal and social responsibility. There is no question that universities—as the core of the academic and educational system—have a special responsibility to contribute to sustainable development. This was already cited in the Copernicus Charter (1994) and the German Commission for UNESCO on Higher Education for Sustainable Development (UNESCO 2010).

But declarations alone result neither in concrete action nor success. Over the past twenty years we have seen a step-by-step, bottom-up development of universities in their role as sustainability pioneers. In the initial years, these activities focused mainly on environmental aspects with the other dimensions of sustainability being incrementally reflected in the higher education sector worldwide.

As an internationally-oriented university with more than 35,000 students, 171 degree programs, more than 5100 employees and 200 buildings with an annual budget of over €400 million, the Freie Universität Berlin considers sustainability relevant in all areas, from research and teaching to operations. Sustainability is not only the focus of diverse activities in research, teaching, and outreach activities with various stakeholders, but also its own area of campus management along with systematic climate mitigation activities. With these activities, the university is on the one hand contributing to the German energy transition. On the other hand its activities since 2000 clearly show that universities are able to make a valuable contribution to energy efficiency, which is often an underestimated or underrepresented policy field.

With regard to the challenges of climate protection one should keep in mind that energy efficiency activities—due to their precautionary orientation—clearly represent one of the most appropriate and relevant approaches to improve institutional and energy supply-based resilience. This statement is also true for the structural financial relief of universities' budgets, as well as participatory approaches, as we will see later.

The Freie Universität acknowledged its responsibility for sustainable campus management in 2001 with the creation of an energy and environment unit as part of its facility management department. With the environmental guidelines drawn up in 2004, the simultaneously launched environmental certification according to ISO 14001, the sustainability mission statement and the assignment of the sustainability and energy management unit direct to the executive board in 2015, the university has made its sustainability commitment explicit (FUB 2016).

After a brief overview of the university's energy balance, this article describes the most important activities and instruments it uses for energy and climate management, which were from the very beginning the flagship of its sustainable campus management.

This article is primarily a report of experiences from the perspective of a practitioner, who understands sustainable management as part of organizational development as well as transformative and social learning. The article closes with a discussion of success factors, which will outline the relevance of governance and participatory strategies (Bass et al. 1995; Disterheft 2011; Disterheft et al. 2015; Wanke 2014).

2 The Freie Universität's Energy Balance, 2000–2014

From 2001 to 2011, the Freie Universität Berlin—with a generally stable floor space—reduced its annual energy consumption by about 26 % or 42 million kilowatt-hours (kWh). After a few years of ups and downs the consumption level from 2011 was nearly achieved again in 2014. This is equivalent to €3.8 million in annual budget savings and a CO_2 reduction of 31 % from 2001, excluding area growth. Including the procured CO_2-free quality of electricity since 2010, the university's CO_2-emissions, caused by its energy consumption, were reduced by nearly 75 %. With this development, the university not only made a meaningful contribution to climate change mitigation, but also demonstrated the significant latitude that public institutions have in the area of energy efficiency.

The importance of energy use for the Freie Universität can be summarized as follows: in 2014, the FU's roughly 200 buildings comprised a square footage of 530,000 m^2 and used 123.8 million kilowatt hours (kWh) of energy for heat and electricity. In 2014, the university spent roughly €13.4 million on energy, of which more than 60 % (€8.1 million) was for electricity. The importance of energy consumption for the university's budget has risen sharply in the past few years, caused by the significant price increase in almost all energy sources (see Fig. 1).

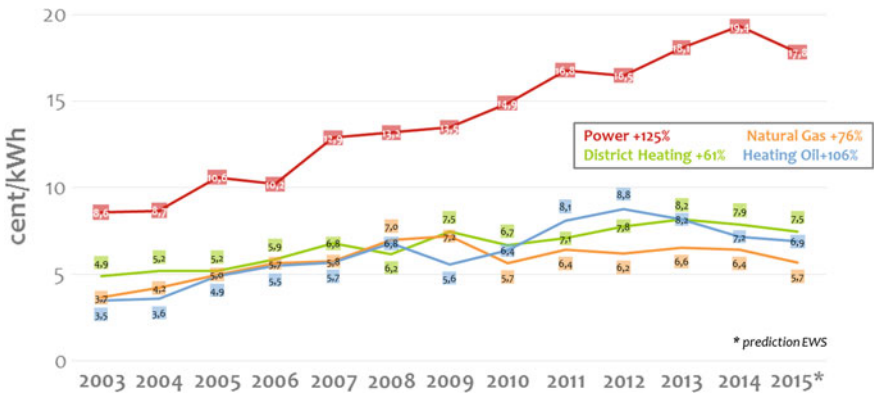

Fig. 1 Energy price development at the Freie Universität Berlin 2003–2015, cent/kWh, data retrieved from energy database of FUB 2016

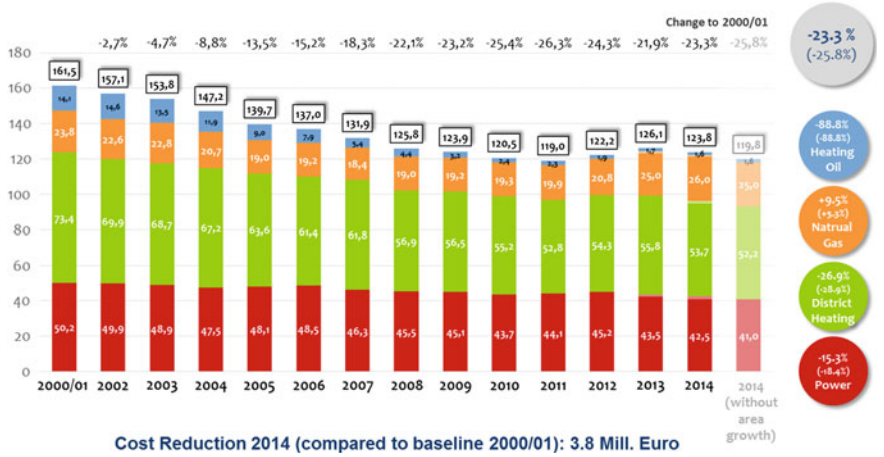

Fig. 2 Energy procurement at the Freie Universität Berlin 2000–2014 in MWh, heat adjusted for weather conditions, data retrieved from energy database of FUB, 2016

Without the efficiency strategy, the university would have spent €17.2 million on energy in 2014, that is an annual cost reduction of €3.8 million.

The cost argument is therefore the first key factor of the energy efficiency strategy adopted in 2001. This, combined with political crises in Berlin in the 1990s and 2000s following the German reunification that led to significant budget cuts for the university, are two of the most important reasons why the university management decided to invest heavily in this area. The price developments shown in Fig. 1 also make clear that this decision took place at a time when cost pressures—at the time still more closely temporally related to the liberalization of the electricity market—were more restrained (Wanke 2014).

A look at the university's energy balance (Fig. 2) reveals a decline in energy consumption every year from 2001 to 2011. The year 2012 was the first where energy use did not drop further, but instead grew until 2014 with little fluctuations (by 4 % including area growth, or 0.7 % without area growth). This increase can be interpreted as evidence that current efficiency measures have reached a point of diminishing returns; further reductions will thus be smaller and more difficult to achieve. Therefore, additional measures have to be tested and the instrument mix to be re-balanced.

A look at the development of individual energy sources shows clear structural effects. The use of heating oil, which is especially relevant from a climate perspective, was reduced through a concerted effort to transition to natural gas or district heating showing steady reductions from 14.1 million kWh (2000/2001) to 1.6 million kWh (2014). This reflects an overall reduction of 89 % (Fig. 2).

Heating use was reduced by nearly one-third from 2001 to 2014. The procurement of electricity is therefore "only" reduced by 15 %. It is important to note the increase in IT facilities and the subsequent need for ventilation and

air-conditioning as well as the increase in energy-intensive equipment in building furnishings and natural science laboratories, which cancelled out the savings from the energy-efficiency program to some extent. This increase in energy use from labs and IT is expected to continue, due to electricity-intensive technological developments (e.g., autoclaves, centrifuges, lasers, MRI scanners, and the increased importance of IT), and accompanies the acquisition of new professorships.

Counteracting these trends will be at the center of future university sustainability management. Before discussing the key instruments of sustainable campus management, it is important to firstly point out the particular role of participatory approaches.

3 Sustainable Campus Management and Participation

While campus management doesn't count on the core tasks of a higher education organization, it plays an important role in the credibility and self-perception of universities. Through these activities, universities—as sustainability pioneers and living labs—can demonstrate the applicability and feasibility of their academic findings.

Universities are obviously very important academic and educational institutions with a great deal of human intellectual potential existing in them. However, as one of the organizational obstacles they face their highly differentiated and segmented structure. Sustainability, however, calls for continuous interaction and integration, one of the key questions being: how can we integrate a cross-sectional task like sustainability into a segmented structure? Projects that are based on a logistic approach, focused on the whole institution, in order to bridge the various disciplines and entities of higher education organizations, is one answer to this challenge. The second and third ones are a continuous dialogue with civil societal stakeholders and a continuous improvement process.

Sustainability management is a classic cross-cutting issue, which includes a broad range of faculties, entities and responsibilities. In order to integrate them, it is necessary for example to build relationships with key university actors and their most important stakeholders. For a university with roughly 40,000 university actors this means that communication and participatory strategies play a critical role. The needs for participatory approaches result particularly from the following factors:

- Due to their complexity, solving global problems requires systematic interdisciplinary scientific collaboration and a close transdisciplinary cooperation between scientists and civil societal stakeholders.
- The different dimensions and goals of sustainability—environmental, social, economic, and cultural—need to be integrated where possible.
- Sustainability management is a cross-sectional task, which requires continuous multi-level coordination

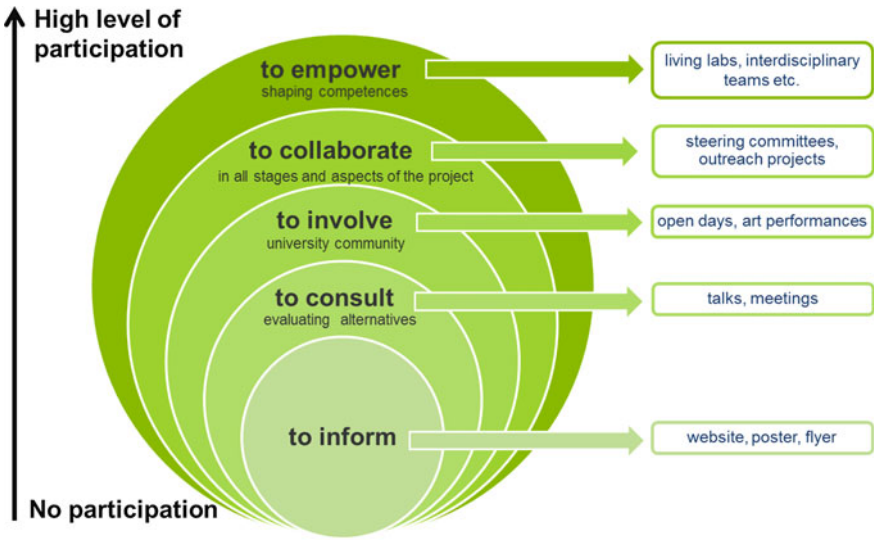

Fig. 3 Levels of participatory approaches, adapted from International Association for Public Participation (2007)

- aiming at a continuous involvement of internal stakeholders and entities
- balancing environmental, social, cultural and economic targets
- taking into account the different interests and perceptions of stakeholders
- encouraging behavioural change
- looking for systematic win-win situations
- making choices (trade-offs) between alternatives and conflicting targets

All these points demand participatory approaches (see Fig. 3), which aim to involve different disciplines, levels and entities of the university, to focuse on decision-making, empowerment and implementation processes and to foster living lab projects as well as a whole-institution approach. In sum, sustainable campus management should be viewed as part of organizational development as well as transformative and social learning—aiming to define new roles, competences, responsibilities, multi-level commitments and improvement processes.

The particular importance of participatory approaches are reflected, if you consider the instruments and activities Freie Universität has implemented since 2001. Most of them are based on successful participation processes. Only a few instruments could be classified as exceptionally technological or management-driven.

4 Instruments in a Chronological Order

This section describes the most important instruments of sustainable campus management at Freie Universität Berlin. The key instruments are listed subsequently in chronological order (Wanke 2014; FUB 2016) (Fig. 4):

2001 Establishment of an **energy and environmental management unit** as part of the facility management department. Foundation of a **steering committee**, led by the head of finance and administration. Members of the committee were the administration directors of the energy intensive faculties, the head of the facility management department, a representative of the staff council and the coordinator for energy and environmental management. The steering committee worked in this composition for the first 6 years, and then it was extended by all faculty directors. Due to the fact that sustainability management needs a more holistic and cross-cutting composition of the steering committee, it was replaced by a new sustainability steering committee in 2016, combined with different working groups.

2002 Step-by-step establishment of an **energy controlling system** by closing existing metering gaps, introducing an energy database and evaluating the energy consumption of the university buildings. Each building of Freie Universität is equipped with at least one electricity meter and one heating meter. The energy consumption of the bigger buildings and laboratory buildings are metered in a more differentiated way. The data are collected, analyzed and evaluated by an energy controlling system, which is in charge of the Unit for Sustainability and Energy Management. Simultaneously, energy audits in collaboration with external consultants were implemented.

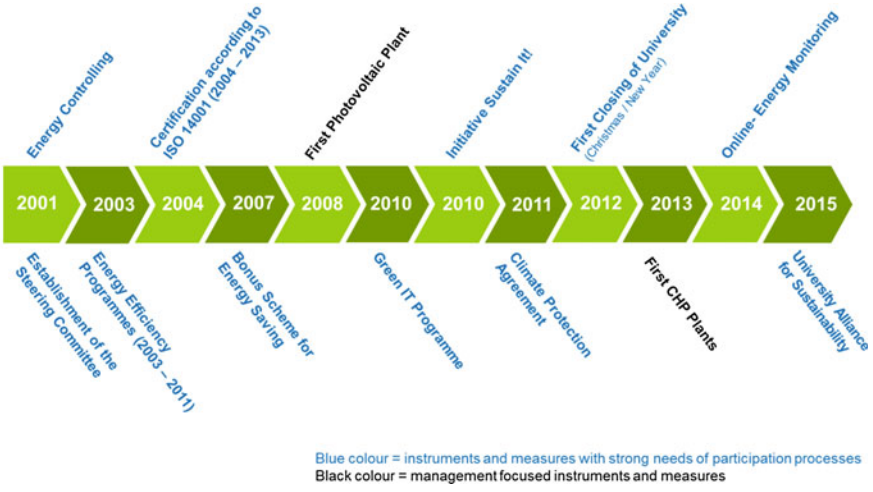

Fig. 4 Instruments of sustainable campus management in chronological order

In 2010 the university started the installation of an online system as testbed in a lab building. Since 2014 the university began to install remote readable online meters in almost all buildings. The whole university will be integrated in the online system in 2017.

2003 Implementation of the first **annual energy efficiency program**. The main focus of the programs was on energy saving measures in the engineering sector, especially the modernisation of heating and ventilation systems combined with updating ventilation and air-conditioning control technologies. These optimisation measures were combined with the insulation of flat roofs and upper story ceilings. In sum the university spent 1.2–2.5 million Euros annually until 2011 for the programs. The reductions in heating were between 15 and 50 %—averaged at 31 %. Many buildings saw reductions of 40 % or more. Today, 90 % of the university's building area is heated by modernised, energy-efficient heating systems. This sector had—according to findings from initial building analysis—comparatively high energy-saving potential with attractive payback times. The measures could thus be considered as win-win solutions. Building-based efficiency measures such as roof insulation were also integrated to some extent, which decreased return on capital, but within an economically attractive package of measures. These efforts were supplemented through organizational improvements such as shutting down central hot water supply or adapting operating times to actual use. Figure 5 shows chosen modernization measures along with key statistics related to three selected projects. All measures have reaped economic and environmental benefits above their initial cost to the university many times over and thus provide a significant contribution to the ecological modernization of the Freie Universität`s campus.

2004 Start of **environmental certification according to ISO 14001**, combined with the formation of environmental teams in all scientific departments. The certification process has several positive outcomes, particularly in the fields of communication, in-house training and in the system for authorized persons. However, it was stopped in 2013 due to a too strong focus on legal compliance aspects, as well as in order to get time resources for the establishment of a sustainability management system and to establish a new governance structure.

2007 After a phase of improvements involving the modernisation of the university buildings, technical improvements had to be supplemented by organizational and behaviour-focused energy savings. The university launched **the bonus system for energy conservation in 2007**, which enables the faculties to earn money by saving energy. The bonus scheme is based on a defined baseline consumption. The incentive program is structured as follows: departments and research faculties can earn an annual bonus from the central budget if energy use in their facilities is less than the

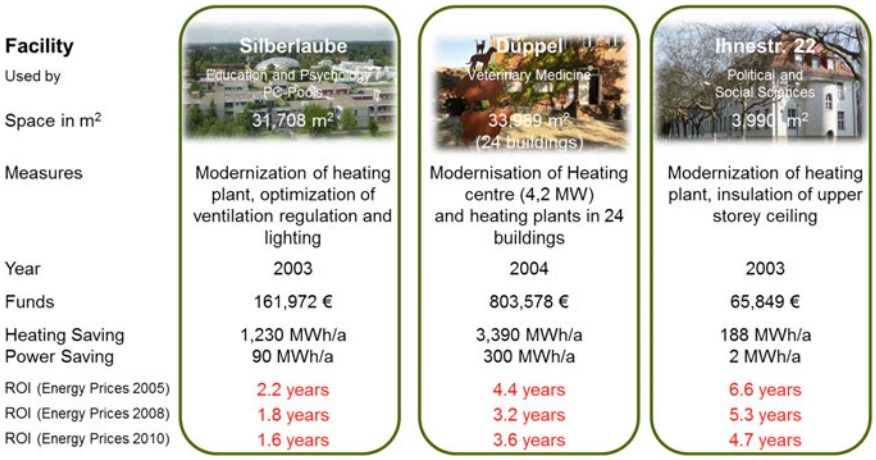

Fig. 5 Energy efficiency measures and key figures from selected projects, data retrieved from energy database of FUB, 2016

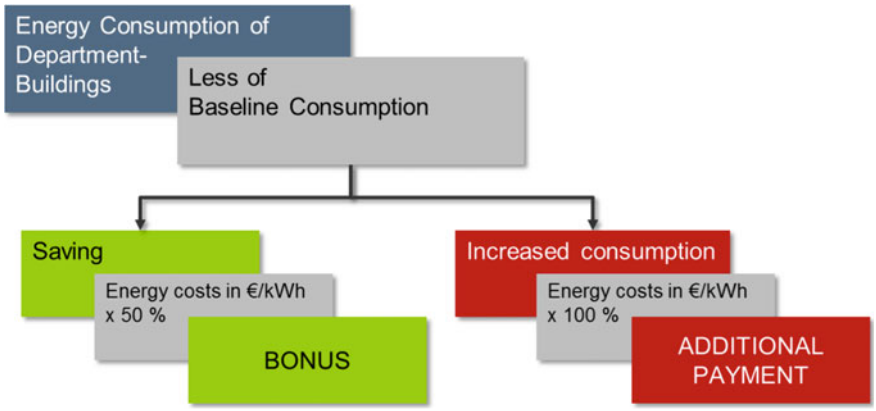

Fig. 6 Principles of the bonus scheme for energy conservation

previous year's baseline. The size of the bonus is half of that year's calculated cost savings. However, energy use above the baseline must be covered in full by the institute itself (see Fig. 6).A look at the results of the incentive program shows that almost all faculties earned bonuses in the last six years (see Fig. 7). Especially striking is the development in the energy-intensive scientific department of biology, chemistry and pharmacy, which had to pay a fine of €47,000 in the first year, but earned bonuses of up to €270,000 in subsequent years. The incentive scheme has been successful and enhanced energy-saving activities as well as instigating learning processes in the departments. Most took new or additional action

Department	Bonus 2007	Bonus 2008	Bonus 2009	Bonus 2010	Bonus 2011	Bonus 2012 (Baseline: -2%)	Bonus 2013*) (Baseline: -4%)
Biology, Chemistry, Pharmacy	-47,464 €	101,583 €	211,961 €	220.983 €	270,162 €	212,288 €	176,876 €
Physics	5,670 €	20,199 €	13,333 €	25.049 €	59,206 €	31,602 €	44,481 €
Political and Social Sciences	13,620 €	8,837 €	12,191 €	9.945 €	4,461 €	4,882 €	3,584 €
History / Cultural Studies	5,740 €	8,700 €	12,427 €	13.877 €	14,806 €	15,278 €	3,781 €
Business & Economics	4,058 €	7,070 €	8,144 €	8,736 €	11,765 €	11,575 €	9,304 €
Laws	1,412 €	6,597 €	14.138 €	13,505 €	6,602 €	7,940 €	7,115 €
Philosophy & Humanisties	4,345 €	5,522 €	4.513 €	7,079 €	16,328 €	11,410 €	6,581 €
Education & Psychology	-5,918 €	2,601 €	5.837 €	5,452 €	8,218 €	2,495 €	1,141 €
Mathematics & Computer Sciences	-2,553 €	2,591 €	5.419 €	4,609 €	4,107 €	3,187 €	5,486 €
Earth Sciences	5,909 €	1,537 €	4.451 €	4,307 €	4,573 €	536 €	k.A.
ZI East European Studies	1,994 €	3,141 €	4.498 €	3,498 €	1,684 €	2,234 €	2,313 €
ZI Latin Anmerican Studies	361 €	1,179 €	971 €	764 €	1,365 €	1,482 €	738 €
ZI John F.- Kennedy Institute	486 €	0 €	0 €	684 €	247 €	883 €	- 629 €

Fig. 7 Monetary results of the energy saving incentive program, 2007–2013, data retrieved from energy database, FUB 2016

to reduce their energy use, such as by naming energy representatives, engaging caretakers in energy-efficiency measures, or regularly communicating energy-saving tips. Some institutes used part of their bonus to fund further energy-efficiency measures such as exchange programs for old monitors and inefficient refrigerators. At the same time, building audits continued to show additional energy-saving potential in behavioral areas. In order to increase motivation in the scientific departments, university leadership decided to reduce the baseline an additional 2 % annually in 2012 and 2013, and 3 % in 2014 and 2015.

2008 Since 2008, the Freie Universität has leased the roof space of several buildings for **photovoltaic (PV) plants**. Long-term use contracts were signed with various investors based on the German Renewable Act. Electricity generated by the solar PV plants is fed into the electricity network of the Freie Universität, in agreement with the local electricity grid operator. Of particular interest is one PV plant, which entered operation in 2009 and was financed by the student initiative UniSolar. At the end of 2013, installed PV units had a combined capacity of 676 kW, able to generate 600,000 kWh of clean electricity annually.

2010 Foundation of the **sustainability initiative Sustain It!**, which was created by students, the Environmental Policy Research Centre (FFU) and the Unit for Sustainability and Energy Management. The various events held by this initiative, from sustainability campus days, a lecture series “From knowledge

to action," to various project courses and urban gardening activities have increased visibility for sustainability issues and play an important role in stimulating dialogue within the university and with external stakeholders. Launch of a **Green IT programme**, which aims to reduce IT-related power consumption. An effective IT system is one of the most important infrastructure requirements for successful research, teaching, and administration. IT development requires not only substantial financial resources for procurement but also entails rising operational costs for IT use and related cooling. Electricity use at the Freie Universität's main computing center, ZEDAT, increased by a factor of 3.4 from 2003 to 2012. Electricity costs for ZEDAT during this time more than quadrupled. This development is typical for the fast-growing IT sector and affects virtually all IT-intensive institutions. In order to combat this trend, the university launched a special project for Green IT in 2009 that included a comprehensive survey of IT structures and technology.In 2010, the university created an IT action plan based on this survey, which included efficiency measures for all IT-related areas, from structural changes in procurement and accelerated centralization of servers to adjustments in power and data management.

2011 **Commitment on a joint Climate Protection Agreement** with the state of Berlin, defining measures, which aimed to reduce the university's energy consumption by a further ten percent until 2015, and to realize sustainability measures in the teaching and outreach sector.

2012 First university **closing for a period of two weeks** during the academic holidays between Christmas and New Year. In this time the temperature in the university buildings—except buildings with animals and plants—are reduced to a level of 12–14 °C. The measure aims to improve both work efficiency and energy conservation. The closing procedures are based on a close collaboration between operational staff, caretakers and external cleaning services. Meanwhile the closing days are also used for additional energy audits. The annual financial outcomes of the closing periods were between €320,000 and €360,000.

2013 Installation of the first two combined heating and power plants with an overall capacity of 520 kW_{el}. Today four CHP plants with a capacity of 710 kW are working, which make with an annual generation of ca. 4.5 million kWh a relevant contribution to substitute more than 10 % of the former electricity procurement, simultaneously reducing CO_2-emissions. One CHP-plant, located in the Botanical Garden, is based on biogas.

2014 Launch of an **online energy monitoring system**: Energy monitoring and controlling are among the most important prerequisites for a successful operational energy management based on reliable analysis and the optimization strategies developed from this. The construction of an energy database and collection of critical data became the first major task of the energy and environmental unit when it was created in 2001. Since then, heat and electricity usage have been monitored at least at the building

level. Until 2014, meters were read at least monthly by operations personnel, except in one pilot property. Since then, the university has begun a project to establish a university-wide online monitoring system. This should be completed by the end of 2016.The significantly improved analytical capacity of an online system, along with targeted team and communications work, should enable the university's energy use to be reduced by at least an additional 5–10 %.Generating optimisation possibilities will be successful, if the online monitoring is not only comprehended as a controlling tool but also as a communication and participatory tool, involving the faculty administration heads of the faculties, operational staff, caretakers, IT staff and students, as well as academics. The latter are responsible for setting the needs of ventilation or the procurement and operation of IT and lab equipment.

2014 Freie Universität becomes a member of three **international sustainability networks**: the International Sustainable Campus Network (ISCN), the UNICA Green Network and the Green Alliance for Sustainable Future (GAUSF), founded by the Peking University.

2015 In 2014 the executive board of the Freie Universität had already decided to build a more **comprehensive sustainability management**, which includes the establishment of a new steering committee, a more centralized coordination office and the drafting of a sustainability report as next steps. The former energy and environmental management unit is now assigned directly to the executive board and is reconceived in the more comprehensive discourse of sustainability and updated accordingly. Academic teaching and inter- and transdisciplinary educational approaches for sustainable development are moving to the fore.Together with its four strategic partner universities (University of British Columbia, Canada; Hebrew University of Jerusalem, Israel, St. Petersburg State University, Russiy and Peking University, China), Freie Universität founds the **University Alliance for Sustainability**. The universities' network aims to intensify the partners' efforts in researching, teaching, and managing sustainable campuses, to exchange good practice and create a network of both established and emerging researchers and practitioners in various fields of sustainability that spans disciplies, institutions and entities. The so-called 'whole institution approach' is the guiding principle of the international network, which is funded by the German Academic Exchange Service (DAAD). The project runs until 2018. Its key instruments are a mobility program for senior researchers, junior researchers, students and administrative staff, as well as annual conferences including management and teaching incubators.

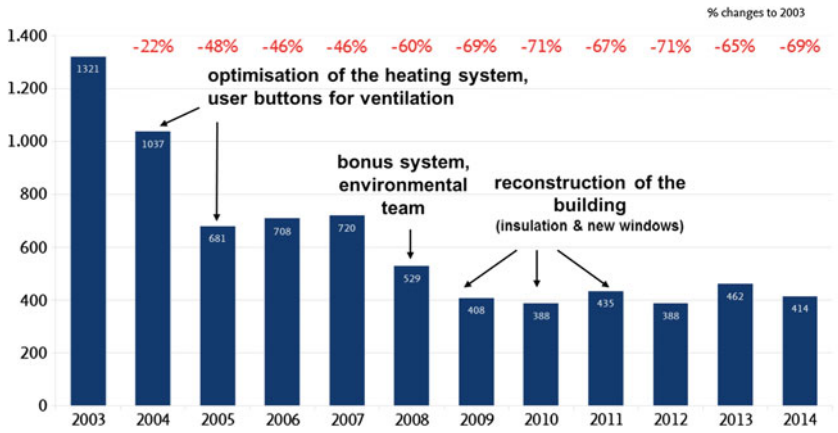

Fig. 8 Heating use change in the main building of scientific department of laws, data provided by energy databank of FUB 2016

A few buildings at Freie Universität allow a differentiated view on the outcomes of the implemented measures, caused by technological, organizational, and building improvements. The main building of laws, for instance, has seen a heating reduction of 70 % since 2003. The modernization of the heating and ventilation systems cut the building's heat requirements in half in 2004 and 2005. Purely organizational measures—namely the building of the environmental team in combination with the bous scheme—reduced the building's energy use in 2008/09 by an additional quarter. Renovations of the building's envelope reduced energy usage to the 40–45 kWh/m^2 (see Fig. 8). This building is therefore an example of the potential of energy-efficient building renovations and shows the important role of organizational measures.

Taking all instruments together, it is important to keep in mind that—with exception of only three instruments—all these activities are connected to participatory approaches and team building processes. For example, the path to ISO 14001[1] environmental certification—begun in 2004—includes the establishment of 11 decentralised environmental teams. The members of a steering group, created in 2002, and the roughly 120 members of the interdepartmental environmental team represent the key social infrastructure of sustainable campus management and are the base for transformational and social learning processes. The implementation of the annual energy efficiency programs were not possible without the systematic involvement of the operational staff and the building users. Similarly, the

[1]The international environmental management standard DIN EN ISO 14001 defines internationally valid requirements for environmental management systems and belongs to the group of standards developed by the International Organization for Standardization (ISO).

implementation of the Green IT program, particularly the optimization of power management as well as the modernization of IT procurement, was only possible in teams working between different administration entities of the university. Last but not least, the energy controlling system can only generate successful outcomes if it is used as a communication instrument by involving different internal stakeholders. The effectiveness of international networks essentially results from the active participation of their members.

5 Success Factors and Conclusions

The Freie Universität has demonstrated with the outlined activities that public institutions are in a position to reduce their energy use significantly and reap economic benefits through their own actions.

The university has also shown that energy efficiency, which has long been a relatively underrepresented aspect of the energy policy in German, has meaningful potential. Before discussing the key success factors, it is important to realize that energy efficiency measures, such as those implemented here, are subject to very specific—and often restrictive—particularities (e.g. German Bundestag 2015, document 18/6782). These include:

- heterogeneous building structures and installed technical systems
- the small-scale nature of many energy-efficiency measures (both technically and organizationally)
- lack of visibility for success stories
- below-average interest in technical measures
- high communication requirements
- systematic interdependencies between technical, organizational and behavioral measures

How has the Freie Universität managed to develop and implement an energy efficiency strategy despite the restrictions listed above? What are the most important success factors from the perspective of the practitioners who managed this process?

Large parts of the answer can be found in the first motifs as well as in the instruments listed above and particularly in the quality of their implementation. The quality of every single project is a general success factor. It is also obvious that the continuous modernization of infrastructural sectors plays an important role in sustainability management. Technical and economic aspects or feasibility questions are often highlighted in studies and internal discussions. These insights are not really surprising, but sustainability strategies should pay particular attention to these factors, especially in the early phase.

5.1 Cost Arguments, Experience of Crises and Institutional Modernization

Looking into success factors raises the issue of key motives. The cost argument was mentioned above as an important initial motive. The university's energy costs are only a bit more than 3 % of the total budget. However, they are seen by university's top management as comparatively variable and open to influence. Crises in the 1990s and 2000s caused by budget cuts and political uncertainty after German reunification related to future budget planning played a critical background role here.

It is also important to note that cost arguments for a university need to be related to other claims. Nonmonetary motives, such as raising the university's profile as an institution with a holistic sustainability orientation that goes beyond research and teaching to include the university's own actions, gained meaning and played an important complementary role. These motives were relevant both within the university and externally from the beginning (Wanke 2014).

Another important motivation was a separation from the contract model. As early as the 1990s, the Freie Universität gained experience with external contracting models and determined that traditional money-saving measures had more impact when implemented under the university's own responsibility. Internal implementation has the benefit of keeping cost savings within the institution and building in-house competencies. Beyond this, regulation costs can be reduced or constructed more pragmatically than would be possible with external solutions. Internal implementation does not mean, however, forgoing external expertise. The Freie Universität has worked together with specialized engineering offices on its annual energy-efficiency programs and contracted building analysis and planning of concrete measures with them. These cooperations can be considered an important success factor.

5.2 The Role of Leadership

Sustainability management is a classic cross-cutting task, whose goals must be integrated into decision-making and daily routines of various line functions. Resulting goal and competence conflicts are best resolved when top management is informed and supporting it. This observation is true in all phases, but particularly decisive for overcoming problems in the start-up phase. University leadership filled this role in early years through its active and decisive role in the energy and environment steering group created in 2002, but also through strategic decisions such as the introduction of environmental certification based on ISO 14001 (2004), introduction of the incentive system for energy savings (2007) and establishment of the Green IT program (2010).

5.3 Integration of Infrastructural Aspects

The cooperation with building, facility, and IT decision-making processes was shown in early years to have clear benefits. Technical and building infrastructure decisions have a particularly long-term character and because of this were seen as important from the beginning. In order to link decisions to the allocation of financial resources and ensure that building processes took into account the complex constellation of regulatory requirements, a close cooperation with building and facilities management was necessary. How to structure this cooperation, however—whether through procedural agreements or clear organizational integration—has no simple answer. The importance of building measures in the energy-efficiency program's early stages made integration with the energy and environment unit the obvious choice. This facilitated close involvement in building-related decision-making processes and strengthened the unit's initiating function. However, a restrictive side effect was that the unit's activities were seen by university actors as primarily technical and part of facility management.

5.4 Different Participatory Approaches

Sustainability management is not only a leadership responsibility but requires the acceptance and cooperation of everyone involved at the university. This is true for almost all key instruments, the implemented technical measures, the bonus system for energy conservation, as well as the full spectrum of organizational and behavioral energy-efficiency potentials. Being broadly embedded into the university organization through participatory measures is critical. At FUB, this was accomplished at the leadership level through the creation of the steering committee and the establishment of decentralized energy and environmental teams as part of the ISO 14001 process and creation of targeted communications efforts. In addition, the sustainability initiative Sustain It! has taken on a valuable trend-setter role on these issues. The positive outcomes of participatory processes mainly concerned the social engagement for sustainability at different levels and entities. That is a crucial factor for almost all other instruments and action programs. The outcomes can be described as follows:

- enhanced understanding of sustainability issues and demands
- improved collaboration and networks of individuals and entities
- reliable consensus on key issues, responsibilities, institutional roles and actions
- strengthened commitments of top and middle management for sustainability targets.

5.5 Instrument Mix and Holistic Perspective

In presenting the individual activities it has become clear that sustainable campus management needs to include technical, organizational and behavioral components. These should be reflected in a diverse selection of instruments and a holistic perspective that takes these various components into account. Technical and building measures are most successful when implementation is complemented by a communication strategy that engages different stakeholders. On the other hand, it is impossible to expect the university community to engage in energy-saving behaviors when buildings are in an antiquated state or cannot be adapted to meet users' needs. The success of the energy-efficiency incentive system established in 2007 is based in large part on this principle.

5.6 Conclusions

In summary, during the last 15 years at Freie Universität it has become significantly clearer that governance factors and participatory strategies are having a strong influence on the success of sustainability management on campus. Some of the implemented instruments, for instance the bonus scheme, parts of the annual energy efficiency programs, the certification of the environmental management system, and closing the university during the academic holidays can generally transferred to other universities. However, even if not each single instrument is transferable to other universities, the structural factors such as the above listed governance aspects and the realized modus of participation (cross sectional teams) can be relevant for other universities all over the world.

What is meant by this? Sustainability management requires more than classical management instruments, such as controlling and evaluation tools or the initiating of technical and infrastructural improvements. It is just as important to have the clear, strong and resilient commitment of the top management as it is to have an authentic collaboration with the most relevant management levels and entities. Therefore, it is crucial to involve the stakeholders, having a key role, systematically, to embed the processes as widely as possible within the organization both by forming relevant teams and establishing a proactive orientation. Participatory approaches assume a leading role, due to the cross sectional character of sustainability management and the segmented organization of universities. Operational qestions as how to select the right team members, how to empower them with the needed team skills, how to choose the suitable participatory methods, how to define the professional tasks and social roles of the team members as well as how to synchronize them with the key organization of the university play then a more relevant role.

In effect, universities should pay more attention to these aspects, which can be seen as part of organizational and personnel development. However, there are a lot of open scientific and qualitative questions in these areas which are based on a

micro-level approach. Practitioners have to find answers to these questions in their daily work. Against this background, it is certainly a good idea to integrate them systematically in future research projects which can be organized as living labs.

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Andreas Wanke born in 1961, worked from 1990 to 2001 as a political scientist at the Environmental Research Centre (Forschungszentrum für Umweltpolitik) at the Department of Political and Social Sciences of Freie Universität Berlin focusing on consultation projects in the field of energy and environmental management. Since 2001 he has been in charge of the coordination of the energy and environmental management in the university administration. Today he is the director of the Sustainability and Energy Unit, which implements the university´s commitment to sustainability and energy efficiency by developing and steering different instruments as well as activities and by offering corresponding services in the field of coordination and consultancy. The unit is assigned directly to the executive board of Freie Universität Berlin.