Building User Guide:
Introduction to the Environmental Design Elements of the CEU Campus
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Introduction

Central European University's strategy for campus redevelopment has been implemented with the aim to deliver a campus environment that reflects and responds to the needs of our diverse student and faculty body, providing as far as possible a 'home away from home', an environment that accommodates diversity and is not disadvantageous to any specific group in either educational or operational terms. The redevelopment project—which broke ground in early 2015—was oriented with the goal of maintaining a bold and welcoming public presence, open and interconnected spaces, with cutting-edge technology, flexible classrooms and collaborative student spaces encouraging open debate, public engagement and a lively, cohesive campus.

From the onset of the Campus Redevelopment Project, creating building infrastructure that fulfills the expectations of the University community, and the standards set by the University Sustainable Development Policy has been one of the primary goals. Sustainability principles have guided the preliminary design phases of the project initiated by project architects O'Donnell and Tuomey in conjunction with their environmental sub-consultant AZero. The resulting project design and revitalized campus infrastructure ensures that CEU complies with appropriate international standards and best practices for sustainable development in the construction and design of facilities and fixtures concerning energy use and other environmental conservation.

The purpose of this guide is to serve as an informative introduction to the sustainable design elements of buildings included in Phase I of the campus redevelopment project, CEU's new spaces located at Nador Street 13 and 15, while also outlining important tips for community members and future building occupants.
BREEAM Certification and Building Design Features

Central European University's new campus design has been granted “Very Good” status within BREEAM's building standards, the world's leading assessment method for sustainable buildings. CEU is the second higher education institution in continental Europe and the first in Central and Eastern Europe to receive this distinction. The Building Research Establishment Environmental Assessment Method (BREEAM), administered by Britain's Building Research Establishment (BRE), were utilized throughout the design and construction stages of the campus redevelopment project in order to ensure expert recognition of CEU's commitment to sustainability.

BREEAM is comprised of ten major categories which contain numerous credits which are awarded following proof of achievement in the design and construction stages of project. Credits are awarded in the ten categories according to performance. These credits are then added together to produce a single overall score on a scale of Pass, Good, Very Good, Excellent and Outstanding. The accreditation process following BREEAM guidelines has encouraged long term performance optimization of campus facilities while reinforcing CEU's commitment to sustainability within the greater community.
**Figure 2: BREEAM category summary and final rating for Phase I of the campus redevelopment project**

Additional information about BREEAM certification, and a detailed summary of specific project management decisions and design implementations of Phase I of the CEU Campus Redevelopment Project which were influence by the BREEAM process can be found [on the project website](#).
Campus Energy and Environment Strategy: Building User Tips

CEU’s ability to ensure prudent usage of resources while maintaining comfortable conditions for work and study on campus has been enhanced with the infrastructural and technological developments within the campus redevelopment project. The processes for maintaining a resource conscious campus are maintained by the Campus Services and Building Maintenance Group, working in collaboration with the Environmental and Sustainability Officer, and guided by the CEU Sustainable Development Policy. Reducing the environmental footprint of University activities is a collective effort of staff, students, faculty and guests, and we encourage you to prioritize responsible behavior on campus.

Energy: Climate Control, Lighting and Equipment Usage

Maintaining comfortable working conditions on campus throughout varying seasons while minimizing energy consumption is a primary goal of the building management team. Campus community members should take part in this effort by engaging in smart behavior which reduces energy consumption related to heating, cooling, lighting and the usage of electronic equipment on campus.

We advise you to follow these basic tips for reducing energy consumption on campus:

- Turn off lights in unoccupied offices, classrooms and workspaces
- When exiting smart classrooms press the “preset x/all off” button to power down all electronic equipment
- Turn off and/or unplug electronic equipment when not in usage
- Use campus and personal electronic equipment in a resource conscious manner; print documents only when necessary using settings which reduce paper and ink usage
- When seeking a comfortable working environment, take advantage of natural lighting and in offices and work spaces, use task lighting
- Maintain baseline temperature settings for campus space throughout all seasons, dressing in a seasonally appropriate manner in heating and cooling seasons
- Choose to take the stairs instead of using elevators for transport throughout the campus

Interior Climate Management and User Controls

Each room and workspace on campus is equipped with a user interface device which can adjust interior temperature, lighting, and the circulation of fresh air. Certain rooms contain automatic and hand controlled shading elements to adjust the amount of natural light entering the room. User guides for controlling interior climate and lighting conditions are located in each room. We encourage you to become familiar with the user interface points in workspaces, and direct any questions about interior climate control to extension 2222 or to Building_Support@ceu.edu
Waste: Avoidance and Selective Waste Management
Waste avoidance and reduction, and efficient selective waste management is a primary goal at CEU. Selective waste bins for separated collection of recyclable paper, plastic and metal waste are distributed in common areas and in kitchens on every floor in order to make smart waste management convenient for all users. Used batteries can be deposited in the specially marked green bin near the ATM in the Oktogon Area of the Monument Building.

We advise you to follow these general tips for avoiding waste production on campus:

- **Hydrate smart**: use a refillable bottle for hydration purposes on campus instead of bottled water
- **Reduce personal printing** as much as possible, and use paper and ink saving settings when printing
- **Utilize reusable bags, bottles, utensils and other daily necessities in lieu of disposable products**
- **Keep waste reduction and management in mind when organizing on campus events**
- **Contact the building maintenance team or the sustainability officer with questions regarding waste collection and recycling on campus** (Building_Support@ceu.edu or sustainability@ceu.edu)
Campus Events and Waste Reduction

Conferences and large events result in a significant contribution to waste production at CEU. We encourage event organizers to keep waste avoidance and reduction in mind when organizing events in campus, with specific focus on reducing the amount of waste associated with the printing of event materials and catering services associated with event receptions. Please contact the sustainability officer with any questions regarding waste reduction strategies for events: sustainability@ceu.edu
Water: Smart Hydration and Water Conservation

We encourage community members and guests to hydrate smart on campus by taking advantage of the high quality, free, and environmentally friendly source of drinking water supplied directly to our campus. Water fountains are located on every floor of the Nador 13 and 15 buildings, and distributed in common areas in other campus buildings. Utilizing tap water for hydration purposes has significant environmental, health, and economic benefits.

Currently filtered and chilled drinking water fountains can be found in the following locations:

- **Nador 13 and 15 Buildings**: Common areas near the entrances of restrooms or kitchens on each floor
- **Monument Building**: Laptop Area
- **Monument Building**: Mezzanine Area outside of Library
- **Faculty Tower**: 4th Floor Hallway
- **Nador 11 Building**: Reception Area
- **Oktober 6 Street Building**: First Floor Hallway

![CEU Hydration Station](image-url)

*Figure 5: Environmental benefits of drinking tap and fountain water infographic*
The Campus Services and Building Maintenance Group work together to monitor systems in the building which utilize a supply of fresh water in order to ensure that as a campus, we reduce water consumption as much as possible. Low flow toilets and sinks have been included in all restroom areas and kitchens within the Nador 15 and Nador 13 buildings. The entire rooftop area of the Nador 15 and 13 buildings serves as a collection basin for rainwater which is used to feed the irrigation system on for the rooftop garden, attempting to minimize the usage of potable water for irrigation as much as possible. The building management system monitors water consumption on a floor by floor basis to aid in identifying when maintenance is required on a wet block element. In addition to this equipment, the cleaning staff at the University has been instructed to maintain efficient water saving practices for cleaning purposes on campus.

Travel and Transport

Most CEU community members utilize public transportation to commute to and from the University. Our centrally located campus is surrounded by access points to Budapest’s wide array of public transport options, and regional and international train connections. CEU also encourages the use of bicycles as a sustainable, healthy and environmentally friendly form of transportation. In recent years bicycle culture has been growing in Budapest, the CEU community has many dedicated bikers who commute throughout the year. Since 2013, the CEU Bike Share program has allowed University community members to utilize bikes for short term borrowing periods.

CEU community members who commute by bicycle can utilize the Oktober 6 Street Number 7 building courtyard for daily parking purposes. The courtyard is located on the entrance level of the Oktober 6 Street Number 7 building, where the School of Public Policy
and several CEU offices are located. To access the bicycle courtyard, please enter through the main entrance of the Oktober 6 Number 7 building, and proceed to the back of the entrance floor, where you will find a door which you can use to access the parking area on the right side of the back wall. Please look for signs which indicate where the bike parking area is located.

Due to size restrictions of the courtyard, bikes should not be left in the courtyard for extended periods. Bikes which show signs of being locked in the same place for more than one month will be tagged to encourage removal, and after a two-week observation period, removed. CEU does not take responsibility for stolen bicycles, or damage to bicycles parked in the courtyard. For more information please consult the full CEU Bicycle Guidelines document.

Please take note that in a continuing effort to support the usage of bicycle travel within our campus community, Phase II of the campus redevelopment project will include the installation of an interior bicycle parking garage with over 150 spaces, showering and changing facilities and storage lockers for community members.

Parking on Campus

There are no general parking facilities available. In the Nador 13 building garage, catering contractors can be provided with limited parking access for delivery. This access must be coordinated by the Space, Planning and Operations Team (spo@ceu.edu), who will liaise with the Security Guards/Building Management Group.
Campus Redevelopment Phase I: Sustainable Building Design Elements Summary

By pursuing the environmental accreditation of a major campus building project, CEU has aimed to demonstrate that institutions of higher education in Central Europe and beyond can initiate capital projects which demonstrate commitments to sustainability and building communities which consist of environmentally conscious individuals.

Sustainability relates to the intelligent and effective use of resources, not only in the construction of a building, but also in its operation, throughout its lifecycle. A core idea throughout the design phase was that efficiencies should be embedded within the building. Strategies such as daylighting, natural ventilation or solar control are built in part of the architecture of the campus and mean that the mechanical, and electrical services do not need to work as hard to provide a comfortable environment within. Below is a summary of the major sustainable design elements included in Phase I of the campus redevelopment project, in the Nador 13 and 15 buildings.

Energy Efficient Design and Building Management

The consumption of energy required to maintain comfortable working conditions on campus contributes the most to CEU's environmental footprint throughout the working lifespan of our campus buildings. Significant focus during the design stage of the project prioritized energy efficiency and a reduced reliance on mechanical heating, cooling, ventilation and lighting systems in the new campus.

Specific design elements included to ensure an energy and resource efficient future CEU campus include:

- Increasing the robustness of the exterior fabric of the building and all windows to ensure more efficient insulation of the building during all weather conditions
- Utilizing exposed concrete structural elements to benefit from thermal massing properties which reduce the necessity of mechanical heating and cooling
- Including courtyards covered with glass atriums to provide functional space in all seasons while aiding in circulating fresh air throughout the building
- Linking all HVAC, lighting, and water circulation systems with building management system (BMS) software to ensure efficiency of operation while increasing the ability to accurately monitor resource consumption, and provide greater control over systems which impact interior conditions throughout the year
- Including energy efficient elevators which have power regeneration capacity and low consumption standby modes
- Incorporating high efficiency and low consumption artificial lighting sources which are also linked to the BMS system
High Frequency Lighting and Natural Light

Natural and artificial lighting play an important role in ensuring a comfortable work and study atmosphere on campus, while also contributing to the environmental footprint of campus activity. A complex daylight projection strategy was carried out by the design team to ensure that all spaces of work and study would take advantage of maximum available natural light, while also being fitted with high efficiency lighting fixtures to ensure a comfortable working environment during overcast days and dark periods. Spaces of study and activity have been oriented to maximize the ability to allow natural light to enter spaces, while also being fitted with high frequency ballasts to ensure energy efficient artificial light.

Solar control is provided through a combination of building massing, external louvers and high performance solar control glass. Day-light levels were carefully monitored through this design development through digital simulation to ensure a visually comfortable environment. Efficiencies in electrical systems such as daylight linking, and energy efficient lights ensure that this ‘embedded’ efficiency yields measurable energy savings.
Sensors and Monitoring: Motion, Air Quality and Temperature and Data Collection with Building Management System Software

The ability to control heating, cooling, lighting and the circulation of air based on the usage of campus space is a key to prudent usage of energy resources. Over 860 sensors in classrooms, offices and workspaces in the Nador 13 and 15 buildings are utilized to ensure that we are maintaining optimal environmental conditions in spaces based on their usage and occupancy. Motion sensors in common areas and works spaces detect usage, and are linked to HVAC systems to ensure that unoccupied spaces are not being heated, cooled or light at an unnecessary level. The conditions in common areas and circulation spaces on campus are set and maintained at efficient levels by the building management system (BMS), while the conditions in offices and classrooms can be controlled by users when occupied through interactive thermostats. After a short period of inactivity, a lack of occupancy is detected and the interior conditions in campus spaces are reset to a default efficiency mode controlled by building management system technology.

The BMS system also tracks standard usage of campus space, while also maintaining pre-heating/cooling settings in the building, and also initiating a return to default climate efficiency mode when the building is unoccupied in the evenings and during holidays.
The BMS data recording system will allow us to track and record electricity, water and energy consumption on a floor by floor basis in each building, allowing us to find more efficient ways of maintaining comfortable working conditions on campus. The pre-conditioning and night time conditioning settings will allow us to ensure we are only consuming energy to control the conditions on campus when and where the building is occupied.

Figure 10: Sensor equipment linked to BMS software in new campus buildings
Shading: Built In and User Controlled

Microshading, within the glass structure of courtyards and a few key windows within the façade of the new building, exterior shading devices on the building façade, and user controlled shading in rooms permit the ability to reduce the effect of heat concentration through thermal radiation during hot and sunny periods. Microshading and exterior shading elements represent a low, or zero energy consuming means of maintaining cooler interior conditions when the exterior temperature is high. The orientation of structural shading, and the glass windows equipped with microshading technology will allow natural light to enter the building while reducing the radiant heating effects during warm and sunny periods.

Figure 11: Automatic blinds synched with campus BMS systems, and close up view of windows with embedded microshading
Radiant Heating and Cooling and Thermal Massing

Concrete slabs in the Nador 15 building have the capacity to provide heating and cooling through embedded water circulation tubing. The activated concrete slabs provide radiant heating and cooling and capitalize on the thermal massing and conductance properties of concrete to spread heating and cooling throughout surfaces while assisting in maintaining a constant, even temperature throughout the building. Thermal massing is a means of heating and cooling large masses of concrete, taking advantage of the natural properties of the material to retain heat or cooling over long periods of time. Water pipes were embedded in the rebar frames of ceilings and floors during the construction phase through which hot and chilled water can be circulated based on exterior climate conditions to effectively heat or cool the concrete slab elements. The process is more energy efficient than heating air alone in large, open spaces. Thermal massing supports a comfortable interior working environment which relies less on higher energy consuming mechanical heating and cooling systems.
Covered Courtyards

The open courtyard design is a mainstay in the traditional architectural identity of Budapest. The choice to place glass atriums over the courtyards of Nador 13 and 15 buildings was a purposeful decision from a mechanical and functional design perspective. The covering of the courtyards with atriums make them large, open and fully usable spaces throughout all seasons, as opposed to open courtyards which are often neglected spaces in the hottest and coldest parts of the season. In addition to the useful open space, the courtyards also functionally contribute by naturally circulating fresh air throughout the campus. Openings in courtyards, and also the advanced built-in microshading within the glass will help up capitalize on thermodynamic properties of the open space and air circulating within, to flush fresh air throughout the building while relying less on fans, thus reducing the energy footprint of the air circulation system. In the spring and autumn, natural air circulation will also help cool the open areas on campus on hot days.

The courtyards and roof-lights were identified as a key part of the environmental approach. The main benefits of this approach are as follows:

- Reduced floor depths to allow for daylight penetration deep into the building
- Thermal buffer in winter, with potential for passive solar gain.
- Potential for natural ventilation during mid-season / summer to internal spaces within the building block through much of the year.
At an early stage in the project, the design team examined the dynamic environment of the courtyards, and its potential energy efficient functions throughout different climatic seasons, as a means of understanding each of these conditions and developing an architectural and servicing strategy which was both flexible and energy efficient.

- **During winter:** the courtyards function as buffers to the accommodation which surrounds them. Radiant heat is provided at the ground level only so energy is not wasted on conditioning unoccupied levels. Warm air which rises to the top of the atrium is extracted mechanically, and the heat recovered (70% efficiency predicted).
- **During mid-season:** and during the times when external temperatures are comfortable (a significant amount of time in Budapest), these spaces are unconditioned with high and low level openings in the roof-lights promoting buoyancy driven natural ventilation.
- **During summer:** cooling to the courtyards is provided through radiant conditioning with dedicated mechanical units providing additional cooling for events with higher occupancy.
Materials Selection and Reuse

The reusage of structural elements of buildings during construction projects along with the responsible sourcing of construction materials, decorative items and furniture have a significant impact on the environmental footprint of building projects.

Specific design innovations which helped CEU excel in this focus area included:

- Significant reuse of the existing interior structure of the Nador 13 building
- Complete preservation of the Nador 13 building facade
- Reusage of original on-site brickwork to minimize the necessity to procure virgin building materials
- Responsible sourcing of all building materials which comply with set production, pollution control and durability standards
Preserved Brickwork as a Construction Material

The choice to reuse the original brickwork of the building was an artistic and architectural preference of the design team, but also a meaningful contribution to reducing the material footprint of the building construction and renovation. The exposed brickwork found in the new portions of campus are bricks which were preserved during the deconstruction process, and also preserved in place brickwork made visible during renovation. In all, over 440,000 reclaimed bricks were reused for construction in Phase I. The conservation of original materials results in a unique aesthetic impact, while also reducing the need to procure new building materials, and lowering the environmental impact of the reconstruction process.

Figure 15: Exposed original brickwork in the Nador 13 Building
Biodiversity and Open Air Spaces on Campus: CEU Roof Garden

The transformation of the rooftops of the Nador 15 and 13 into a communal roof garden space come rich with social benefits and functional environmental benefits as well. The rooftop will provide a large additional of outdoor space to a campus formerly limited by its urban footprint and location. Extensive garden areas comprised of planting boxes, tree planters, green walls and climbing plants have been added to the space to also make a significant contribution to the space as an important center of biodiversity on campus. Plant species were selected from a list of locally specific species found within the Carpathian Basin region, with specific selection of bird and bee friendly species which can ensure the relatively harsh environment of a rooftop garden. The entire rooftop surface area will serve as a medium for collecting rainwater, which will be used to irrigate the plant life, reducing dependence on using potable water for irrigation purposes. Embedded irrigation systems will reduce watering usage by helping avoid the evaporation of water during specifically hot and dry periods. The inclusion of plant and tree species on the rooftops of the buildings will create an important island of urban biodiversity, while also helping reduce the concentrate “heat island” effect during hot summer months.

A special area of the garden has been designated as the CEU Community Edible Garden, and will be utilized by community members to produce a micro version of an organic crop rotation, which will be maintained throughout the seasons.
Figure 17: CEU Edible Garden, featuring mixed salad greens in 2016

Figure 18: CEU community members planting flowers and herbs into the green wall of the rooftop garden
www.ceu.edu/campus/sustainable