



**POLITECNICO
DI MILANO**

Politecnico di Milano



www.campus-sostenibile.polimi.it

ISCN-GULF Sustainable Campus Charter Report 2011

Milano, April 14 2012

Introduction to the project

Città Studi Campus Sostenibile is a project promoted by the Politecnico di Milano (POLIMI) and Università degli Studi di Milano (UNIMI). The project aims at transforming the whole campus neighborhood into an urban area which can serve as an urban model in Milan with respect to life quality and environmental sustainability. The project is open to the participation and support of researchers, students and all campus citizens.

The goals of the project are the following: to test innovations developed by scientific research; to promote life style transformation and more livable spaces; to become a positive example for the entire city; to cope with the international network of sustainable campuses.

More on the Politecnico di Milano

POLIMI plays a significant international role in the field of engineering and technology as well as in architecture and design. Established in 1863, the school moved to the current site of Città Studi in 1927. The sustainable campus project concerns the 'Leonardo Campus', which is the main campus of the seven of our institution distributed around the Lombardia region. Today, the 'Leonardo Campus' occupies a surface of 186,613 m² and 17,484 students are enrolled in the different programs offered by the university during this academic year (2010/2011) on our campus. In addition, 1,748 staff members (professors and personnel) work every day on the campus.

A short history of the project

January 2011 / Creation of the launch team of the project.

March 7 2011 / Launch of the project during the inauguration speech of the new Rector of POLIMI, Professor Giovanni Azzone.

Since March 2011 / Construction of the process and the on-line platform of the initiative.

June 9 2011: Participation of POLIMI at the ISCN conference in Gothenburg. POLIMI joins the ISCN network and commits to the sustainability principles of the ISCN Charter.

June 16 2011 / Internal launch of the project. The two Rectors of POLIMI and UNIMI commit for a shared sustainability program that involves the whole district of Città Studi. The POLIMI and UNIMI communities are invited to join the project.

Since June 2011 / Launch of the "Thematic Tables" where researchers and technical staff present their ideas and project proposals and define targets and strategies for a more sustainable campus.

September 21 2011 / Press conference: Official launch of the project, commitment by the presidents of POLIMI and UNIMI. Confrontation with the municipality. Strong coverage by local and national newspapers.

End of September 2011 / Opening of the first release of the dedicated web-platform www.campus-sostenibile.polimi.it.

December 16 2011 / Presentation of the first works by the Thematic Tables, in which every working group reports on the discussed initiatives and strategies.

“Città Studi Campus Sostenibile”: The construction of a process towards sustainability

The campus as a living lab: A bottom-up approach

The campus is here intended as the place where knowledge and practice can meet. The initiative is based on a strong bottom-up approach in which everyone can collaborate and propose ideas. The prerequisite for the success of the initiative is the creation of a strong awareness on the topic of sustainability within the community. For instance, this project is supported by the collaborative work of many components of both the POLIMI and UNIMI communities. The involvement is purely on a voluntary basis: for instance, people propose and share ideas, but no dedicated funding was initially provided by the institution, with the exception of the launch team.

The campus as a living lab can be achieved through the implementation of a complex web-platform, which is the place where opportunities and problems become visible and proposals are collected and shared. The design of the dedicated website was the main task for the initial launch of the project. In fact, governance of the process is fundamental for supporting and feeding a complex and long term project like the one we are proposing, and to manage a large amount of ideas and proposals by the community.

Funding

As a public institution, Politecnico di Milano is under the authority of the Italian Republic and mainly financed mainly by the Ministry of Education, Universities and Research (MIUR), its tuition fees from students attendance and by research and consultancy contracts. The primary governance body is the Administration Board (Consiglio d'Amministrazione), which has regulatory functions, and it is responsible for guiding and controlling the administrative, economic and patrimonial management. The Board carries out its functions according to the policy choices and resource utilization criteria established by the Academic Senate, which directs the development program of the University, with particular emphasis on teaching and research.

As we stated above, the initiative started with very little funding, and the latter was used to cover the expenses sustained by the launch team. The voluntary work by the research community built up the first initiatives through the website and the thematic tables. Later on, the Campus Sostenibile initiative adhered at the Periphèria CIP European Project (CIP ICT PSP Programme; Grant Agreement number 271015) and could benefit from it in terms of the ICT support (mainly by Archeometra srl Periphèria partner) and the Living Lab approach. Moreover, funding from taxpayers that decided to allocate a share of five per thousand taxes on personal income to POLIMI was dedicated in part to support projects on the sustainable campus topic for a total amount of 304,000 Euro.

In the near future, we expect to obtain funds from private sponsors, particularly the ones interested in testing innovative solutions and supporting research for onsite sustainability projects.



The 3-D Model of Città Studi with the Politecnico and the Università degli Studi (white in the picture)

Governance and Management

The Politecnico di Milano Rector, prof. Giovanni Azzone, is the promoter of the initiative. The board that launched the initiative is composed by institutional representatives from POLIMI and UNIMI communities. In particular, project leaders on POLIMI side are Alessandro Balducci (Vice Rector) and Manuela Grecchi (Rector's Delegate for Building and Properties), and Dario Casati (Vice Rector) and Alessandro Toccolini (Head of the Department) on the UNIMI side. They identified a launch team and a support structure (credits below). The management group was kept quite small in order to be as flexible as possible, and it covers interdisciplinary competences. People from the academic staff were involved part-time on the project with the objective of designing the governance and the timetable of the entire process. For the moment, we decided to not have a dedicated technical office on sustainability.

After the launch of the website and the involvement of more participants from the scientific community, we started to organize technical meetings (thematic tables); we immediately understood that a strong collaboration between innovative research expertise and technical and administrative offices was the basis for action, in accordance with the idea of experimenting our research outcomes directly on our campus. In fact, the academic community is very interested in involving the technical offices, because they are perfectly knowledgeable about campus management and the reasons for certain existing inefficiencies; on the other side, the technical staff is enthusiastic about the possibility to collaborate with academics and acquire a research

perspective for the project. For instance, students, academics and technical staff sit together at the different tables and share ideas and proposals to improve our common good.

Hence, we learn by doing and we redefine the management of the initiative at every step of the process while trying to keep the principles of the initiative in mind.

Project management team:

Project leaders Politecnico di Milano (POLIMI):
Alessandro Balducci, Vice Rector; Manuela Grecchi,
Rector's Delegate for Building and Properties.

Partners from the Università degli Studi di Milano (UNIMI):
Dario Casati, Vice Rector; Alessandro Toccolini, Head of the Dept. of Agricultural Engineering.

Launch Team (POLIMI) and coordinators of the Thematic Tables in 2011:
Andrea Arcidiacono, Grazia Concilio, Antonio Longo, Fabio Manfredini, Eugenio Morello,
Eleonora Perotto, Barbara Piga, Paola Pucci

Support Structure (POLIMI):
Laboratorio di Simulazione Urbana «Fausto Curti»
(Andrea Arcidiacono, Eugenio Morello, Barbara Piga, Valerio Signorelli)

177 people participating in the activities at the thematic tables



Currently, this project is partially funded by the European Commission under the CIP ICT PSP Programme (**Periphèria Project**: Grant Agreement number 271015).

Four themes for sustainability

The “Città Studi Campus Sostenibile” project is structured into **four main themes** or areas of interest, namely People, Energy, Environment and Accessibility. The themes are identified in order to cluster the received project proposals and initiate thematic working groups, which are called the **Thematic Tables**. They are deliberately broad in order to encourage an interdisciplinary approach, in addition to being interrelated; they may overlap and can be understood as an opportunity for interaction between working groups. The four working groups and the way the themes will evolve will structure the whole project and encourage a convergent vision for the sustainable campus. The four themes are briefly introduced below.



Pictures taken at the thematic tables

People: users, participation and identity



- active participation of all campus users (students, researchers and administrative staff) in every situation of dis/abilities
- creation of collective spaces being comfortable and livable for all
- dedicated web platform
- continuous education and communication
- strengthening of campus identity as an open but unitary place
- new accessible services for students, workers and residents (residences, sports, event locations)
- improvement of the main web services accessibility

Energy: energy efficiency and renewable energies



- energy saving (reduction of fuel consumption and dispersion)
- widespread use of renewable sources
- water management
- monitoring and energy management
- testing of innovative systems for energy control

Environment: environmental quality



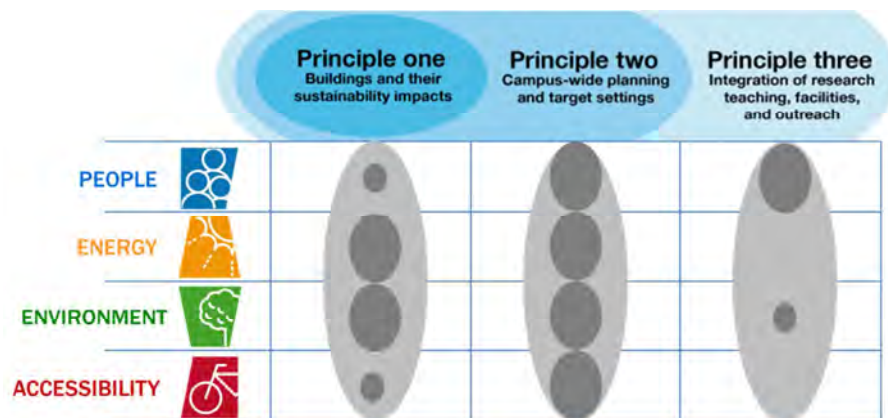
- improvement of the wellbeing of people (indoor and outdoor)
- education and lifestyle towards more sustainable behaviors
- water management (reduction of consumption, permeability, on-site disposal)
- soil and underground management (census of the tanks, prevention and management of spills)
- air (quality, emissions)
- waste management according to the principle of reusing, reducing and recycling
- strengthening of the ecological system on campus (consistency of green areas; increment of the bio-potentiality and reconnection to the ecological network; increment of the permeability)

Accessibility: Transport terms accessibility and sustainable mobility



- quality, safety and recognition of routes (bike lanes, safe pedestrian crossings, signage)
- promotion of sustainable mobility (bicycles, electric cars, car sharing, carpooling)
- permeability and reconnection of public spaces
- regulation of vehicular parking inside the Campus
- mobility credits system definition

The four themes overlap with the ISCN-Charter principles and helped in organizing the management of the whole process and structuring the ISCN-report. The scheme shows the distribution of the projects so far.



Implementation

Phase 0 Mobilization of interests (as of February 2011)

Call for participation and expressions of interest, mapping of (un)sustainability on campus, collection of documentation and information, contacts with potential donors. Reconstruction of the cartography and digital model of the campus under development.

Phase 1 Design and implementations (as of April 2011)

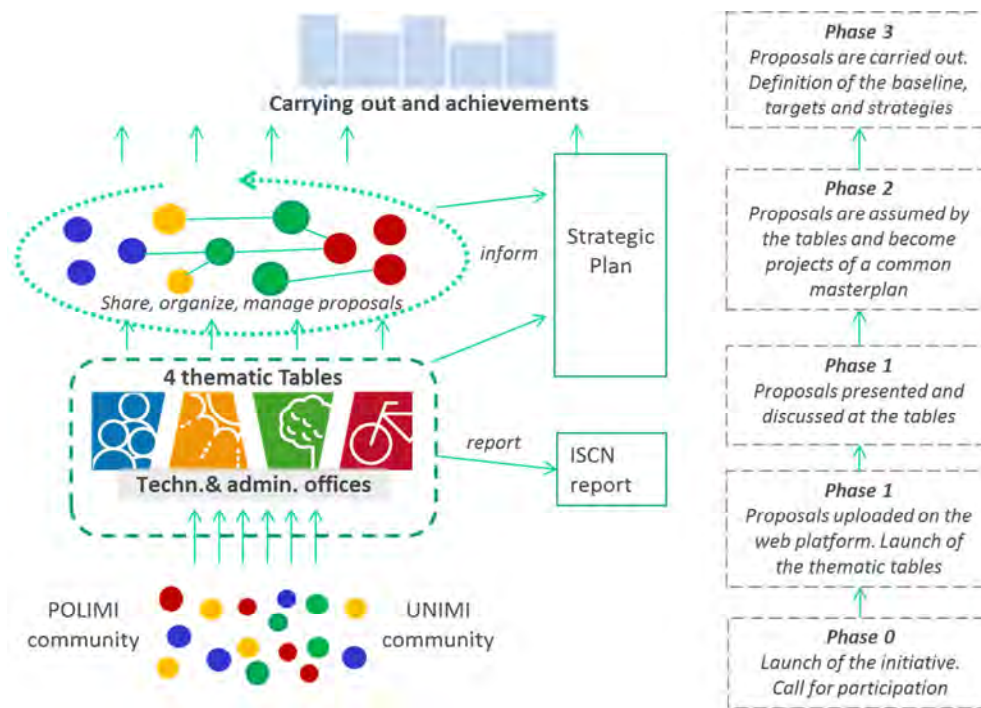
Launch of the thematic tables, design and development of the dedicated web platform, establishment of collaborations with other institutions and private partners, the physical transformation of some areas in a sustainable manner.

Phase 2 Design and implementations (as of September 2011)

Launch of the dedicated web platform, organized collection of project proposals, advancement of the thematic tables, development of ongoing projects and launch of new research projects.

Phase 3 Design and implementations (as of January 2012)

Definition of the baseline: measurements, quantifications and initial analysis on the actual situation. Setting up of project proposals for catching and redirecting the programmed refurbishments promoted by the technical offices. Launch of regular meetings with public authorities in order to share our programs.







Structure and management of the initiative: how proposals and ideas are shared, discussed and implemented by the POLIMI and UNIMI communities.

Ongoing Results

During the first months since the launch of the initiative we have mainly worked on the creation of a common baseline for measurements and the construction of project governance. For instance, sharing ideas and voluntary working were requirements for including as many people as possible and avoiding a top-down vision of the project. For instance, this requires strong and well coordinated governance. Hence, it is difficult to measure results at this point because we are still in the midst of the process. In any case, some partial results related to the three Charter Principles will be reported in the following sections; some general achievements that have been reached so far are reported below.

Involvement of the community

At this time we collected about 31 proposals and suggestions on the web-platform. We registered about 60 participants at the Thematic Tables and a mailing list of 165 followers of the initiative (details in the table below). For instance, we expect to increase the number of participants after the opening of the new version of the website in Spring 2012; this will be sustained with a new campaign in order to diffuse the initiative among the students.

		PARTICIPANTS		PROJECTS	
		Mailing List	Average # of participants to the meetings	Uploaded	Discussed at the table
PEOPLE		62	12	11	5
ENERGY		26	20	5	3
ENVIRONMENT		79	13	11	7
ACCESSIBILITY		20	16	4	12

Some facts about the Thematic Tables: participants, projects presented and discussed as of April 2012

Strengthening of internal collaborations

Since the beginning, this project revealed itself to be a great opportunity for strengthening collaborations and interdisciplinary research inside our scientific community. The trans-disciplinary work promoted through the launch of the Thematic Tables was already a significant achievement: building bridges between different competencies and departments and working together from different perspectives towards the common goal of sustainability enabled a great exchange of knowledge, allowing us to discover more about ongoing research and available skills at our institution. In particular, it is the first time that the collaboration of complementary knowhow from POLIMI and UNIMI were made possible under the umbrella of an official and joint initiative.

Allocated Human Resources

A number of staff members dedicated to the project from the technical staff (Ufficio Comunicazione, ATE, AGIS) were involved in the process. The institutional position of the Sustainability Manager will be introduced soon.

Construction of the baseline: measurements to monitor our actions

Creating awareness on the topic of sustainability among the technical and administrative offices of our institution was an opportunity to start feeling the need for a more efficient management of resources. In particular, construction of the baseline as a reference starting point was the crucial step for consolidating the analysis on the topic of sustainability and to measure the effects of our actions. In fact, we have promoted a series of activities and produced the following results:

- We have been working on the reconstruction of a digital campus model, which will serve as the support center where we will collect incoming data and the basis for the new masterplan.
- We have defined the protocols for measurements and surveys and acquired new technical equipment for monitoring energy consumption and environmental comfort (indoor and outdoor) on campus.
- We have reconstructed historical energy consumptions in collaboration with the energy provider. Now, we can make use of a digital online interface to monitor energy consumptions of the building stock.



Some proposed actions on the Campus

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Principle 1 – 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).

Management Approach to Principle 1 Topics

Buildings are owned, managed and maintained by the institution. The initiatives promoted in the Thematic Tables aim at overlapping with the maintenance work plan and potentially redirecting and improving design choices. The initial stage of the work was mostly dedicated to create a baseline for measurements and the quantification of indicators. A list of objectives is shown below.

- The first challenge is a strong **commitment to reduce the energy consumption of buildings**. For instance, the campus is composed of old buildings (most of them are from the 20ies of the last century, some of the 60ies and only few were constructed in recent years); we are undergoing the **refurbishment** of our real estate and this should happen in the respect of the historical and architectural value of the buildings (some of them represent significant samples of the Italian modern architecture, designed by well-known architects).
How: from now on, the **refurbishment program should be implemented with the contribution of academic expertise**; this might be the occasion to experiment innovative solutions or to propose a more conscious, environmental-friendly and inclusive design: the campus is intended as **the place where we can test our research ideas and products**, and offer them to the district and the city.
- A second aim is to improve the **energy efficiency** of the campus. The **first operation involves measuring** the performance of buildings in order to better understand and evaluate the livability and efficiency of our buildings. It will be crucial to identify the campus areas with low performance, i.e. higher consumptions, through the implementation of a monitoring system.
- A third scope will consider the potential production of energy on site through **renewables**.

Main initiatives and results

Energy

- **Data on Electricity, Natural Gas and Water consumption** were collected, then made visible on a map at the POLIMI campus level and organized in an online application, so that researchers and the technical staff can monitor the trends of consumption. The latter application revealed itself to be very useful in detecting anomalies and unexpected peaks of consumptions. For the moment the data is aggregated into groups of buildings according to the existing 43 counters (namely: 8 for electricity, 26 for water, 9 for gas) distributed throughout the campus, but we are working on refining some data at the building level.
- A **survey about the main characteristics of the 3700 building spaces** was conducted in 2007. The resulting database contains more than 100 fields for each zone, describing main characteristics of orientation, lighting layout and activation, heating and cooling devices, windows, shading devices, etc. A queries system has been implemented using MS-Excel macros for evaluating scenarios on the adoption of different control systems to zones, in order to easily find the most promising interventions, in terms of retrofit and building automation, for reducing wastes of energy. A proposal for the improvement of the existing dynamic-database will enable to preview the reduction of energy wastes deriving from the adoption of different control devices.
- Policies for the **reduction of artificial lighting** were already implemented in the past: photocells were installed in the restrooms and currently most of them are covered by this control system.
- **Guidelines for directing retrofiting interventions**, which take into account the different building typologies and ages of our real estate.
- Increase of energy production through **renewables** is under investigation. A PV plant on the roof of the main building of our Architecture School is already in place since more than a decade, and the use of more roof surfaces might increase our productivity.

Environment

- Two buildings ("Nave" and "Aule Nord") that will soon undergo heavy refurbishment are being monitored in terms of **heating and cooling demand** and **environmental comfort**: the goal of the surveys is to avoid the equipment of rooms with air conditioning (not present today in those buildings) and to propose more efficient and energy-saving solutions that initially explore the redesign of the building envelope. In particular, a BIM model and environmental simulations along with comfort surveys in the summer and winter, and the monitoring of consumption data are used to inform the design of innovative solutions.
- **EU green procurements** are mandatory for the acquisition of materials and products. The environmental product certification (ISO 14020) and environmental management system (ISO 14001, EMAS) are preferential prerequisites for procurements.
- **Differentiated waste collection** of paper and plastics is already in place in the classrooms and common spaces, as well in all the departments and offices. An overall reorganization of the waste management is under development. Hazardous waste collection in departments working with chemical products is mandatory (managed by the Office "Servizio Prevenzione e Protezione" together with the responsible for the waste management).
- In order to reach a right differentiated waste collection in the different buildings and departments, a series of **instructions** (posters) have been prepared to be put on the white garbage collectors for paper and on the green ones for the glass collection.
- A **census of the differentiated waste collection** will be organized in order to evaluate the status of the as-is (how many garbage collectors are new, how many are to be changed

etc.) and to evaluate if the number of waste collectors are enough to sustain the current garbage production for each single building and if they are compatible with the frequency of the garbage collection carried out by the municipal waste management provider (AMSA).

- A **pilot university residence** was chosen for introducing an improved waste management, in particular waste and water management, oil collection, increasing recycling with specific containers, along with awareness and training of the users.
- The experimentation of **green roofs and hydroponic walls** technologies are under evaluation through the installation of sample solutions on selected campus buildings.

Accessibility

- Quite all the buildings and rooms are already **accessible to people with disabilities** (the accessibility audit of the paths through all the buildings was verified). From 2004 the **refurbishment program** has to develop inclusive design approach and the Multi Chance Poli Team provided to special needs of accessibility personalization. From now on, **refurbishment buildings program** has to develop accessibility customization of different locations, services and activities.

People

- In order to crowd source activities and commitment towards Campus Sostenibile goals, Challenges have been identified starting from themes having a wider collective value. Among these challenges one is named "**polinclusive**"; it aims at collecting ideas or project proposals on possible transformations or services to be carried out or supplied in order to guarantee a comprehensive human approach to people, considering their different disabilities and abilities to access the campus life.

Overview of Organization's Principle1 Goals

Theme	Topics	Related Indicators	Goals and Initiatives	
	Priority Topics		Objectives and Targets	Key Initiatives
The themes identified by the Città Studi Campus Sostenibile project		GRI and STARS indicators, indicators proposed by POLIMI	for reporting year, for the following year, and/or beyond	in reporting year, and /or planned for the following and beyond
Principle 1 <i>To demonstrate respect for nature and society, sustainability considerations should be an integral part of planning, construction, renovation, and operation of buildings on campus.</i>				
	Resource use			
ENERGY	Energy use direct energy consumption		Monitoring and reducing consumption	Installing new sensors for monitoring buildings' performances and for building automation
ENE / PEO / ENV	Energy use indirect energy consumption		Working on improving lifestyle	Handbook of good practices under construction
ENERGY	Energy use energy saved by conservation			
ENE / ENV	Embedded (grey) building energy			
ENE / ENV	Water use		Reducing consumption	Collection of data about water consumption on campus (26 counters)
ENVIRONMENT	Wastewater	Residences: number of interventions/month	Reducing interventions on the sinks	Handbook of good practices for students living in the dormitories
ENE / ENV	Periodic maintenance on the building		Energy saving , waste reduction and non-compliance management	Creation of control registers in use of S.P.P. for the ordinary monitoring; in case of emergency a specialized company will be called
ENERGY	Energy and water costs, and savings achieved		Reducing consumption and investing the savings	Working on light solution (first), i.e. lifestyle
ENVIRONMENT	Overall purchased products/materials (Auto emissions and green cleaning product requirements)		Improving the amount and the environmental quality of purchased products on campus	EU green procurements are mandatory for the acquisition of materials and products
	Waste, recycling, local emissions, and non-compliance			
ENVIRONMENT	Solid waste	- Volume of different types of waste collected on campus For residences: - For all the categories of solid waste: number of containers/retire; - For oils: liters/month; liters/month/student. - To monitor the progresses of the collection of oils and organic waste: number of interventions on the kitchen sinks/month.	Monitoring and management of differentiated waste collection in the buildings/departments	- Census and posters - Census of garbage quantity produced at POLIMI (indoor and outdoor) - Re-organization of the ecological garbage collection area and optimization of the right waste collection and disposal
ENV / PEO	Recycling		Already in place in the buildings, needs to be improved	Collective writing of the "Guidelines for Sustainable Behavior"
ENVIRONMENT	Re-use		Increasing the life cycle of materials by re-using waste materials	Study for the reuse of materials from construction or waste for the making of new products
ENVIRONMENT	Waste costs, and savings achieved	For residences: number of fines/year	Improving the education and commitment for waste collection in the community	Handbook of good practices for students living in the dormitories
ENE / ENV	Emissions contributing to local air pollution			
	Research/IT facilities and sustainability			
ENVIRONMENT	Energy use in laboratory/IT facilities			
ENVIRONMENT	Chemicals consumed			
ENVIRONMENT	Hazardous waste from research/IT facilities			

	Users			
ACCESSIBILITY	Handicap access			
PEOPLE	Stakeholder participation in planning (integrated design)	- Number of external stakeholders - Number of additional meetings - Number of shared initiatives	To engage stakeholders out of the standard academic life in the envisioning and co-design activities	Activating a fifth non-academic work table
ENVIRONMENT	How present conditions affect users behaviour	Monitoring users' behaviour / built environment performances according to established Post Occupancy Evaluation (POE) criteria	Defining users' behaviour / built environment relationship patterns in order to support rehabilitation design strategies	Post Occupancy Evaluation (POE) techniques
	Indoor Environmental Quality			
ENVIRONMENT	Indoor Air quality		To reach high IAQ levels	1. Adopt an IAQ management policy 2. Improve IAQ by considering it in design, operations and maintenance policies 3. Introduce a mechanism for occupants to register complaints
			No toxic chemicals	Reduce the use of dangerous chemicals products
ENVIRONMENT	Indoor Thermal Comfort		To reach adequate comfort levels	General condition assessment
ENVIRONMENT	Indoor Lighting Comfort		To reach adequate comfort levels	To apply sustainable solutions
ENVIRONMENT	Increasing natural light performance	Interior design and fitting adequacy	Adaptive reuse to improve interior quality	Natural light performance evaluation and monitoring ; observation of users' behaviour related to natural light
ENVIRONMENT	Indoor Acoustic Comfort		To reach adequate comfort levels	To verify sustainability results
	Building design aspects			
ENE / ENV	Sustainable building standards applied and explored		To purify air by absorbing carbon dioxide, keeping biodiversity, improving thermic insulation	To adopt energy performance solutions (green walls, green roofs)
ENE / ENV	Sustainable building standards applied and explored		Energy efficiency and environmental impact reduction	To adopt energy performance solutions
ENVIRONMENT	Long-term use flexibility			
ENVIRONMENT	Life-cycle assessment (LCA)		To reduce building environmental impact: 1. To evaluate buildings LCA 2. To propose LCA reduction policies	
ENVIRONMENT	Life-cycle costing (LCC)		To reduce life-cycle costs: 1. To evaluate actual life-cycle costs 2. To propose LCC reduction policies	
ENVIRONMENT	Evaluation of design consequence on people well-being and on efficient use of space	Performance based technical and spatial evaluation according to established POE criteria	Adaptive reuse design guidelines to improve aspcce efficiency and quality	Actual use-condition monitoring (surveys, observation of users' behaviour related to use of space)
ENVIRONMENT	Landscape integration of building design			

Legend:

POLIMI Proposed topics beyond ISCN
Topics not discussed yet, but to be included as future work

Principle 2 – 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.

Management Approach to Principle 2 Topics

The scale of the campus is the one that best leads to the aggregation and alignment of all the proposed initiatives. It is also the dimension that best embraces all the competencies activated in the Thematic Tables, thereby representing the contact point, in many cases, between the tables.

For instance, the projects uploaded on the web-platform together with the proposals discussed at the Thematic Tables are the raw materials for the design of the whole **Campus Masterplan**. The main goal is to make all the projects overlap and converge in a unique, comprehensive and coherent scheme. Energy and environmental aspects, together with social and cultural issues have to find a common ground and agreement through the physical design of the masterplan.

We focus significantly on the **environmental quality of open spaces**. In fact, open areas are crucial for the overall usability and image of the campus, but are underestimated and underused by the POLIMI community. Hence, the sustainable campus project is a great opportunity to redesign outdoor spaces.

Main initiatives and results

Energy

- A **survey** that photographs the today's condition and the last four years in terms of energy, water and gas consumption.
- The replacement of the centralized heating system with an innovative **co/trigeneration plant** with high efficiency and low emissions was proposed. Investment costs are quite high, but the payback makes the proposal practicable: the feasibility of the project is under investigation.

Environment

- **Increasing outdoor thermal comfort:** Following the general goal to improve liveability conditions at the Campus Leonardo, a methodology has been proposed which begins with environmental analysis of the open spaces and aims to provide design specifications and strategies to improve microclimate and comfort conditions.
- First of all, the definition of the **protocol for comfort measurements and surveys** was carried out in order to map the occurrence of critical situations. A quick field survey was conducted to “test” the method inside the Campus in July 2011. Three activities were implemented during the three time periods of the survey (morning, lunch time and afternoon): first of all, microclimatic parameters were measured (air temperature, relative humidity, globe temperature, air velocity) allowing the calculation of comfort indices (PMV, PET, Thermal Balance, etc.). Secondly, and at the same time, thermal perception of users were collected through a questionnaire. The obtained answers were compared with the “answers” of the instruments. According to this comparison a new score scale has been defined in order to “calibrate” the measurements with the people of the University area. Thirdly, open space users’ behaviors were observed (kind of paths, travelling times, activities, clothes, etc.) in order to understand critical elements as well as the capability of specific spaces.
- **Green areas:** Surveys and mapping of the vegetation on the POLIMI and UNIMI campuses (what we call the Green Cadaster) which will be useful for the management and design of new green spaces (we will propose the municipality to adopt this tool) and for the following issue.
- **The strengthening of the ecological system.** The goal is twofold: increase of bio-potentiality and reconnection of our district to the regional ecological network (we are close to some ecological corridors at the edge of the city); secondly, the increase of the overall permeability of the campus.
- **Waste management outdoors.** A more efficient management of waste collection in the open spaces is under investigation. The introduction of differentiated waste collection outdoors is one of the main goals.
 - o A **census of garbage quantity** (volume) produced on campus (indoor and outdoor) is ongoing. The data collected in the census derive either from the number of garbage bags that have been counted during the academic year or from statistical data that represent the garbage production per capita. This investigation should help in the reorganization for a more rational waste collection.
 - o Moreover, **new compactors** for the quantification of waste (dry waste, paper and cartons) were purchased.
 - o The monitoring of plastic consumption was scheduled in the near future.
 - o The re-organization of the **ecological garbage collection area** was carried out recently. In particular: the overall layout has been changed and new containers, front loaders etc. have been introduced; a map has been designed with present, past and future layout, procedures, rules and registers have been introduced for the area management; adequate posters have been introduced to simplify the correct waste collection management.
 - o Application of the **“Wastenergy Project”** developed in order to introduce specific garbage containers equipped with a new patented system for volume and weight measurement, in real time, transmitted to a receiver, to the trucks and to the Control Center of the collection system.
 - o Re-organization of **green areas equipped for students’ life:** maps with project proposals on garbage bins, benches, tables , wi-fi access will be prepared.

- Study for the **reuse of materials** from construction or waste (mainly paper, plastic and glass) for the making of new products (for example concrete).
- **Permeability and drainage** at the campus scale aiming at decreasing the rate of rainwater collected into sewer.
- **GHG emissions and Transportation.** If the GHG emissions are calculated (organization-wide), it is possible to fix which is the best target of emission reduction compared to the baseline, that can be applied to decrease the environmental impact .The GHG emissions can be let down by replacing traditional vehicles, powered by fossil fuel, with green transportation. Many different projects are being studied to join this objective such as: “Green move project” and “bike sharing”. Encouraging the staff to use public transport is another way to reduce pollution. A ticket discount has already been applied in some public transports, but only for few passenger classes. The aim will be to extend it to every kind of categories and type of public transport. Improving system efficiency and using renewable energy (for example photovoltaic), will reduce total account of greenhouse gas emissions.

Accessibility

- **Surveys on mobility and mobility services** were conducted in October 2010 and concerned 2,624 workers and 12,919 students of POLIMI and UNIMI. The surveys were finalized to implement the commuting plan (home/work) needed to improve and to support sustainable mobility practices.
- **Cycling:** survey on the bicycles available for departments and administrative staff to improve the organization and to increase the use of bicycles to move inside and outside the campus; mapping of bicycles paths and “friendly roads” to identify a networks for cycling on a urban scale; offer of an itinerant bike-repair shop service (from October 2009 to March 2011, funded by the Cariplo Foundation).
- **Parking:** Survey on the time and the use of parking lots inside the campus and proposal of scenarios finalized to reorganize the internal parking lots to create new public spaces. The goal is to open a web-debate on the re-use of parking lots through a comparison of different scenarios and an assessment of the satisfactoriness.
- **Carpooling:** creation of the web portal www.carpooling.polimi.it where it is possible to enter travel requests. The software, according to the user preferences, will create automatically the crews. The goal is to improve the university accessibility through the provision of a car pooling service available to students, professors and administrative staff of POLIMI and UNIMI.
- **Electric Car Sharing;** Green Move project (www.greenmove.polimi.it): Proposal for a ZEV vehicle-sharing system based on an open and dynamic logic. The goal is to provide access within the service, both as consumers and as sharers of vehicles. Funded by the Regione Lombardia, involving eight departments and research centers of the POLIMI, has developed analysis of existing literature and best international practices; definition of parameters describing a system of sharing vehicles; organization of several workshops; identifying the most appropriate vehicles for experimentations. The project includes: design and implementation of service management platform; design of the device using the service; testing of a field test involving also the “Città Studi” area; estimated demand and potential supply; analysis of all the main stakeholders potentially affected by the service.
- **Usability of the offered services:** orientation and signposting design for an easier use of the main services in the campus, also by the inhabitants of the neighbourhood.
- **Rehabilitation of traffic and paths** in the district of Città Studi: preliminary masterplan to reorganize the road system (with traffic calming measures, securing the crossroads, new pedestrian and bike paths, etc.); the aim is to examine in a technical committee, together with the Municipality of Milan and the Board of the district, the design contents of the

masterplan to reorganize the security and the liveability of the road net, with the support of traffic modelling tools.

People

- With the same goal described in the previous paragraph, another target has been identified: it is named “urban experiments” and aims at collecting and acquiring ideas to use the **Campus as an urban experimentation lab** to test sustainable, creative and innovative urban solutions, modes, lifestyles. The main goal of this challenge is to transform the urban area around the campus, and the campus itself, **into an integrated urban space**.
- Several services are under development to increase **accessibility for people with disabilities** (among others: multi-modal communication for internal and external users, design for everyone and multisensory design of open and indoor spaces; accessibility and customizability of services and places).

Overview of Organization's Principle 2 Goals

Theme	Topics	Related Indicators	Goals and Initiatives	
	Priority Topics		Objectives and Targets	Key Initiatives
The themes identified by the Città Studi Campus Sostenibile project		GRI and STARS indicators, indicators proposed by POLIMI	for reporting year, for the following year, and/or beyond	in reporting year, and /or planned for the following and beyond
Principle 2 <i>To ensure long-term sustainable campus development, campus-wide master planning and target-setting should include environmental and social goals.</i>				
	Institution-wide carbon targets and related achievements			
ENVIRONMENT	Carbon emissions (organization-wide)			
	Master planning			
ALL	Coverage of campus area (in %) by masterplanning initiatives			
	Transportation			
ACCESSIBILITY	Frequency of traffic surveys		Understanding and implementing strategies for sustainable mobility	2010, 2007, 2001. The survey is finalized to implement the commuting plan (home/work)
ACCESSIBILITY	bicycle/ebike and pedestrian access		Identifying a networks for cycling on a urban scale; offer of a mobile byke-repair shop service , improve the bicycle fleet available to departments and administrative staff	- Mapping of bicycles paths and "friendly roads" - Survey on the bicycles available to departments and administrative staff
ACCESSIBILITY	Estimated commute distance or commute energy use per person	Average travel time		
ACCESSIBILITY	Internal parking lots		Reorganizing the internal parking lots in order to create new public spaces	Surveys on the time and the usage of parking spaces inside the campus and proposal of transformation scenarios
ACCESSIBILITY	Facilities and promotions in favour of public transport	% Reduction for public transport tickets	Increasing the use of public transport by the community on campus	
ACCESSIBILITY	Mobility Management		- Management of the main mobility projects and programs - Commuting plan (home/work) useful to improve and support sustainable mobility practices	Activities promoted at the Table concerning the discussion of plans, programs and scenarios
ACCESSIBILITY	Rehabilitation of traffic system and paths within the district of Città Studi		Improving the overall accessibility to the campus from an urban design perspective	Preliminary masterplan to reorganize the road system in the district of Città Studi (with traffic calming measures, securing the crossroads, new pedestrian and byke paths)
ACCESSIBILITY	Urban mobility Electric car sharing		Implementing an efficient and environmental-friendly urban mobility	Proposal for a ZEV vehicle-sharing system based on an open and dynamic logic.
ACCESSIBILITY	Urban mobility Car pooling		Implementing an efficient and environmental-friendly urban mobility	Online service (carpooling.polimi.it) where it is possible enter travel requests to automatically generate the crews
	Food			
PEO / ENV / ACC	Food supply chain and environmental impacts (e.g. carbon intensity)			
PEO / ENV / ACC	Fair trade food sourcing			

	Social Inclusion and protection			
PEOPLE	Diversity (faculty, staff, and students)	- % of faculty members/staff/students on the total number of involved people - % of gender participation	To keep the kind of participants at an appropriate mixed level	
PEOPLE	Incidents of discrimination			Policies already in place by the institution beyond the sustainable campus initiative
PEOPLE	Access to education (in case of substantial fees)			Policies already in place by the institution beyond the sustainable campus initiative
PEOPLE	Open access spaces for interaction			Policies already in place by the institution beyond the sustainable campus initiative
ACCESSIBILITY	Access to services and commerce			
PEOPLE	Participative campus planning integrating users and neighbors	- number of co-design workshops - percentage of external participants on the total	To activate a wide external (non-academic) participation	Co-design Workshops and participation meetings
PEOPLE	Working conditions, including minimum wages, collective bargaining, and health and safety			Policies already in place by the institution beyond the sustainable campus initiative
Land use and biodiversity				
ENVIRONMENT	Land and building reuse (brownfield development, adaptive renovations)		-	-
ENVIRONMENT	Garbage area collection optimization		Improvement of garbage collection	Changing layout, introducing procedures, rules, registers and posters
ENVIRONMENT	Landscaping impacts and biodiversity			
ENVIRONMENT	Increment of green areas		Reorganization of green areas by including facilities for the POLIMI community	
Outdoor Environmental Quality				
ENVIRONMENT	Outdoor Air quality		Monitoring air quality	Regional Agency for Environmental Protection (ARPA) contributor and collaboration for air control through central measurement station
ENVIRONMENT	Outdoor Thermal Comfort		Establishing a methodology to evaluate outdoor thermal comfort and conducting on field surveys (both microclimatic measurements and people interviews) in order to get a sensation map. The goal for the next year is to conclude the field survey with new microclimatic instruments and realize some sensation maps of some significant areas	- Acquisition of equipment for measurements - The proposed methodology to evaluate outdoor comfort was established and tested. Some critical elements were pointed out. The aim for the next year is to solve the critical issues and complete the field survey in 4-6 areas of the Campus in two different seasons (spring and summer)
ENVIRONMENT	Outdoor Lighting Comfort			
ENVIRONMENT	Outdoor Acoustic Comfort			

Legend:

POLIMI Proposed topics beyond ISCN
Topics not discussed yet, but to be included as future work

Principle 3 – 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.

Management Approach to Principle 3 Topics

The whole People strategy has been developed within a **Living Lab approach** also in coherence with the Periphèria European Project; i.e. it is aimed at looking at the Campus as an open innovation environment where collaborative design learning and assessment are fed by scientific knowledge rooted in the campus activities. One of the main characters of a living lab approach is the creation of **private-public-people (PPP) partnerships** that can guarantee diverse knowledge be involved, diverse interests, diverse approaches to collaboration and innovation.

This approach was possible thanks to the implementation of the **web platform**, which helped in creating awareness of the initiative and enabled the management of a large number of people in the initiative. For the moment, the portal is open to the POLIMI and UNIMI communities, and whose members can propose ideas and projects; nevertheless, everyone can visualize the uploaded comments and proposals. We are confident to open the portal to everyone (in particular citizens) soon, due to the new release of the website.

In addition to the above, surveys to map the **sustainability curriculum** of our university were started. In particular, we focused our attention on the following aspects of our green curriculum:

- mapping the education curriculum for sustainability (programmes, courses, workshops, etc.) offered to students. The intention is to map the future evolution of green classes offered by the school. In the year 2010/11, 126 classes – out of a total offer of 3117 activated courses at the POLIMI – can be labeled as “green courses”, dealing with environmental topics.
- Monitoring of projects started by classes and courses specifically dedicated on the Sustainable Campus project since fall 2011. For now, about 6 classes in the Architecture programmes use the campus as the design area.
- Mapping research groups on sustainability and attempting to involve them to be part of the initiative.

Main initiatives and results

People

- Design, implementation and launch of the **web-platform** www.campus-sostenibile.polimi.it. The site will be improved through the design of the new release that will be launched in the spring of 2012.
- **Activation of initial partnerships**: with UNIMI and with the City of Milano. Both institutions were presenting the Campus Sostenibile Initiative together with POLIMI when it was launched at a Press Conference in September 2011. Memoranda of understanding have already been signed with these two institutions.
- Launch of **challenges**. Challenges (two of which are described above) have two main goals: 1) to crowd source initiatives, ideas, perspectives and projects towards the sustainability perspective of the campus; 2) to activate PPP partnerships while specifying into a project and rooting some of the emerged ideas/solutions within the campus initiatives. They are considered powerful socio-relational activation means, characterized by widely shared goals and loose-coupled design perspectives.
- **Opening of the initiative to civil society** and to the district community with the aim of sharing our projects; in fact, citizens are interested in knowing more about our initiatives and could give us some positive feedback and suggestions. We plan to launch regular meetings with the representatives of the municipality as well as the citizens of the district and the city. At the moment three meetings have already been carried out involving local inhabitants and public agencies.

Environment

- In collaboration with the Table People we plan on developing **guidelines for sustainable behavior** which will be delivered to the community (both students and staff) in order to promote the spread of more environmental-friendly actions on campus (under development). In particular, guidelines for students living at the POLIMI dormitories is under development and will be tested at the pilot dormitory.

Accessibility

- **Opening of a web debate on the re-use of parking area** inside the campus through a comparison of different scenarios and the assessment of the acceptability.

Overview of Organization's Principle 3 Goals:

Theme	Topics	Related Indicators	Goals and Initiatives	
	Priority Topics		Objectives and Targets	Key Initiatives
The themes identified by the Città Studi Campus Sostenibile project		GRI and STARS indicators, indicators proposed by POLIMI	for reporting year, for the following year, and/or beyond	in reporting year, and /or planned for the following and beyond

Principle 3 <i>To align the organization's core mission with sustainable development, facilities, research, and education should be linked to create a "living laboratory" for sustainability.</i>				
	Topical integration			
PEOPLE	Programs and projects that connect facilities, research, and education		Improving the integration between academic research and students	Possibilities for students to do an internal internship in collaboration with the university research laboratories on the topic of sustainability
PEOPLE	Labeling and number of courses that have an integrated perspective on sustainability as a key component	Number of green courses	Increasing the number of courses that deal with the theme of sustainability	A census of the green courses started
PEOPLE	Courses and/or research that transcends disciplines			
	Social integration			
PEOPLE	Programs and projects that connect campus users with industry, government, and/or civil society		Have a deeper influence and integration of the university research on sustainability and the society	Agreement of the initiative with different POLIMI offices devoted to enhance the connection between the campus and the external resources: Fondazione Politecnico, Career Service, the Press
PEOPLE	Programs to further student interaction and social cohesion on campus	Number of projects, theses by students involved in the project	To involve more students on the activated Sustainable Campus initiatives	A number of theses and projects that have the Sustainable Campus as topic were proposed; some are already concluded and inform the discussion at the tables.
PEOPLE	Courses that use participatory and project based teaching	Number of courses officially active on the Campus Sostenibile initiative	To enlarge the number of courses having practical involvement in the Campus Sostenibile initiative	Diffusing the initiative among the staff through the Thematic Tables
PEO / ENV	Behavioral programs aiming at more sustainable actions by students, staff, or external community members	- Number of people involved in the writing of the Sustainable Behaviour Guidelines - Number of uploads in response to the challenge	To engage people in developing sustainable behavioural rules and in behaviours transformation	- Collective writing of the "Guidelines for Sustainable behaviour" - Launch of the Behave!Challenge
	Research and education projects on laboratory/IT facilities and sustainability			
PEOPLE	Research and education on mitigating energy use in laboratories/IT facilities			
PEOPLE	Research and education on mitigating hazardous waste from research/IT facilities			
	Commitments and resources for campus sustainability			
PEOPLE	Existence of an organization-wide sustainability policy that integrates academic with operational issues?			
PEOPLE	Commitment to external sustainability principles and initiatives (this Charter and other)		External commitment to sustainability of our University	- ISCN reporting - Green Ranking
PEOPLE	Dedicated resources (processes, human and financial resources) for campus sustainability	-Number of people involved -Number of activated/funded projects -External money raised	Incremental increase of the dedicated resources for campus sustainability	- Dedicated research funds for projects on the campus (304,000 Euro from taxpayers donations) - Establishment of the sustainability manager position

Legend:

POLIMI Proposed topics beyond ISCN
Topics not discussed yet, but to be included as future work



www.campus-sostenibile.polimi.it

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