



Lodz University
of Technology



LODZ UNIVERSITY
OF TECHNOLOGY
ACTION PLAN FOR
RACE TO ZERO

1. Keeping track of the carbon footprint
2. Building local energy sources
3. Improving building energy efficiency
4. Replacing conventional light fixtures with energy-efficient ones
5. Monitoring energy consumption
6. Efficient water management
7. Sustainable, low-emission transport
8. Waste sorting and recycling
9. Green campus and campus neighborhood
10. Awareness-raising activities

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Introduction

Global climate change is today one of the most serious challenges. To a large extent, it is a consequence of massive greenhouse gas emissions, especially carbon dioxide. As reported by the IPCC (Intergovernmental Panel on Climate Change), Earth's temperature has risen by 1.1°C since the beginning of the 20th century due to the release of large amounts of gases into the atmosphere, with further consequences including melting glaciers, rising sea and ocean levels, and increasingly more frequent extreme weather events, e.g., heat waves, droughts, floods, hurricanes, and fires. The responsibility for this change lies with all humankind.

More than 60% of global greenhouse gas emissions are from the combustion of fossil fuels used in heat and power generation, transport, and manufacturing. In its latest report, the IPCC warns that continued emissions of greenhouse gases at current levels will have catastrophic worldwide health, economic, and social consequences. That said, we can avert them by reducing emissions and investing in adaptation strategies. Raising public awareness of how climate change affects their lives and health is also very important.

Lodz University of Technology, as an institution long involved in innovation and technological advancement, is aware that it too has been contributing to global warming through greenhouse gas emissions from the university operation.

As an institution training future workforce, we have a moral duty to act towards the reduction of greenhouse gas emissions and sustainable development. Therefore, in 2022, by the decision of the Rector, Professor Krzysztof Józwiak, Lodz University of Technology joined Race to Zero, an initiative that required it to commit to the ambitious goal and join the ranks of institutions striving to achieve climate neutrality by 2050.

Lodz University of Technology's plan is to achieve Net-Zero Target in 2050, and Interim Target - reducing carbon footprint by 50% in 2030.

This document outlines the range of measures planned by Lodz University of Technology under Race to Zero. We wish it to be evident that sustainable development and the efforts to combat climate change are important to us as a university and are one of our highest priorities for action.

TUL SUSTAINABLE DEVELOPMENT PANEL

The Sustainable Development Panel was appointed at Lodz University of Technology in November 2020 to lead and coordinate activities concerning sustainability goals on the university's campuses. It brings together people from different disciplines of science and from different administrative offices responsible for the university's relations with business and the larger community.

The panel is chaired by prof. dr hab. inż. Paweł Strumiłło, Vice Rector for Development, and is comprised of: dr inż. Anna Klepacz-Smółka – Green Campus coordinator; dr Monika Malinowska-Olszowy, TUL professor, Teaching coordinator; dr hab. Małgorzata Koszewska, TUL professor, Research coordinator; prof. Piotr Borkowski, dr hab. inż. Sebastian Borowski, TUL professor; Julia Chojnacka, President of the TUL Student Council; dr hab. inż. Robert Cichowicz, TUL professor; dr inż. Irena Jałmużna; mgr Justyna Kopańska; mgr Adrianna Kozłowska; dr hab. inż. Paweł Mierczyński, TUL professor; dr inż. Michał Morawski, TUL professor; mgr Adam Owczarek; dr inż. Dorota Piotrowska, TUL professor; dr inż. Tomasz Siewierski; professor dr hab. inż. Ireneusz Zbiciński; dr inż. Katarzyna Znajdek

The panel is tasked with supporting actions to reduce the university's negative impact on the environment, raise environmental awareness among the academic community and take measures to reduce the carbon footprint.

Among the actions taken by the panel are:

- ▶ **PLANNING AND COORDINATING ACTIONS TOWARD SUSTAINABLE DEVELOPMENT AT LODZ UNIVERSITY OF TECHNOLOGY.**
- ▶ **ANALYZING THE UNIVERSITY'S CARBON FOOTPRINT AND PROPOSING ACTIONS TO REDUCE IT,**
- ▶ **ADVANCING PROJECTS RELATED TO SUSTAINABLE DEVELOPMENT AS WELL AS CARRYING OUT TASKS WITHIN THE SCOPE OF THESE PROJECTS,**
- ▶ **COLLABORATING WITH INSTITUTIONS AND ORGANIZATIONS INVOLVED IN SUSTAINABLE DEVELOPMENT TO SHARE EXPERIENCES AND ESTABLISH PARTNERSHIPS,**
- ▶ **INFORMING AND RAISING AWARENESS AMONG THE ACADEMIC COMMUNITY, OF SUSTAINABILITY AND THE UNIVERSITY'S EFFORTS IN THIS AREA,**
- ▶ **PROMOTING ACTIVITIES RELATED TO LOW-EMISSION TRANSPORT AT THE UNIVERSITY, FOR EXAMPLE, BY DEVELOPING BICYCLE AND ELECTROMOBILITY INFRASTRUCTURE,**
- ▶ **CARRYING OUT ACTIVITIES TO PROTECT BIODIVERSITY AND IMPROVE AIR AND WATER QUALITY ON THE UNIVERSITY CAMPUS,**
- ▶ **INTRODUCING STEPS TO SAVE ENERGY AND TAKE ADVANTAGE OF RENEWABLE ENERGY SOURCES.**

The Sustainable Development Panel initiates actions and implementation of TUL action plans for sustainable development, as well as reviews and follows up on their impact. The panel acts as an enabler of change to advance the university's sustainability agenda.



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1.

KEEPING TRACK
OF THE CARBON
FOOTPRINT

CO₂

1. KEEPING TRACK OF THE CARBON FOOTPRINT

The prerequisite to reducing the carbon footprint is first of all to be able to take stock of it. Due to the size and scale of Lodz University of Technology's operations, the task is a challenging one.

Systematic monitoring of the carbon footprint will help raise awareness among the staff and students and disseminate information about the carbon footprint. Identification and verification of greenhouse gas emissions at the university will enable, among other things, the assessment of the share of the different sources of greenhouse gas emissions generated by the university, as well as other activities for which the carbon dioxide equivalent (CO₂e) is calculated.

Carbon footprint is one the methods of quantifying carbon dioxide and other greenhouse gas emissions. It can be applied to materials, services, technological processes, as well as the activity of manufacturers, other business organizations as well as entire sectors of the economy. Carbon footprint takes into account not only the emissions directly generated by a product or activity, but also those associated with each phase in their life cycle (Life Cycle Assessment). Carbon footprint of an organization is usually calculated on an annual basis and expressed in carbon dioxide equivalents in kilograms or tons (kg/Mg CO₂eq). Higher education sector also contributes to greenhouse gas emissions. The Greenhouse Gas Protocol (GHG Protocol), the standard by which organizations calculate their carbon footprint, groups emissions into three scopes (according to ISO 14067):

Scope 1 – direct greenhouse gas emissions from stationary and mobile combustion of fuels, or from ongoing technological processes, and fugitive emissions (refrigeration, air conditioning);

Scope 2 – indirect emissions from the consumption of imported (purchased or externally supplied) electricity, heat, and steam;

Scope 3 – all other indirect emissions in the organization's value chain, i.e. greenhouse gas emissions which the organization can have an influence over but which it does not control. Emissions related to, for example, transportation of purchased goods, waste disposal, business travel, staff/student commuting by vehicles not owned by the organization. This is often the largest scope and also the most difficult to quantify.

Tracking carbon footprint will soon become not only a legal requirement for many businesses, but also a condition of maintaining a competitive edge. Universities will have the opportunity to bolster and evolve their public image. The obligation to assess GHG (greenhouse gas) emissions shall apply to emitters as soon as 2023, whereas all large companies, including private ones, employing more than 250 employees, will soon have to account for them in their non-financial reporting (sustainability reporting regulations will come into force on January 1, 2024).

In order to keep track of the carbon footprint, analyses of emission sources related to the university's operations are carried out at Lodz University of Technology. These analyses include data on electricity, heat, and fuel consumption, the volume of waste generated, use of paper, as well as the supply chain and transport related to the staff, students, and shipments.

Once we understand our carbon footprint, we as a university will be able to manage our emission levels more effectively, decarbonize our processes, and consequently reduce the cost of university operations.



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2.

BUILDING LOCAL ENERGY SOURCES



2. BUILDING LOCAL ENERGY SOURCES

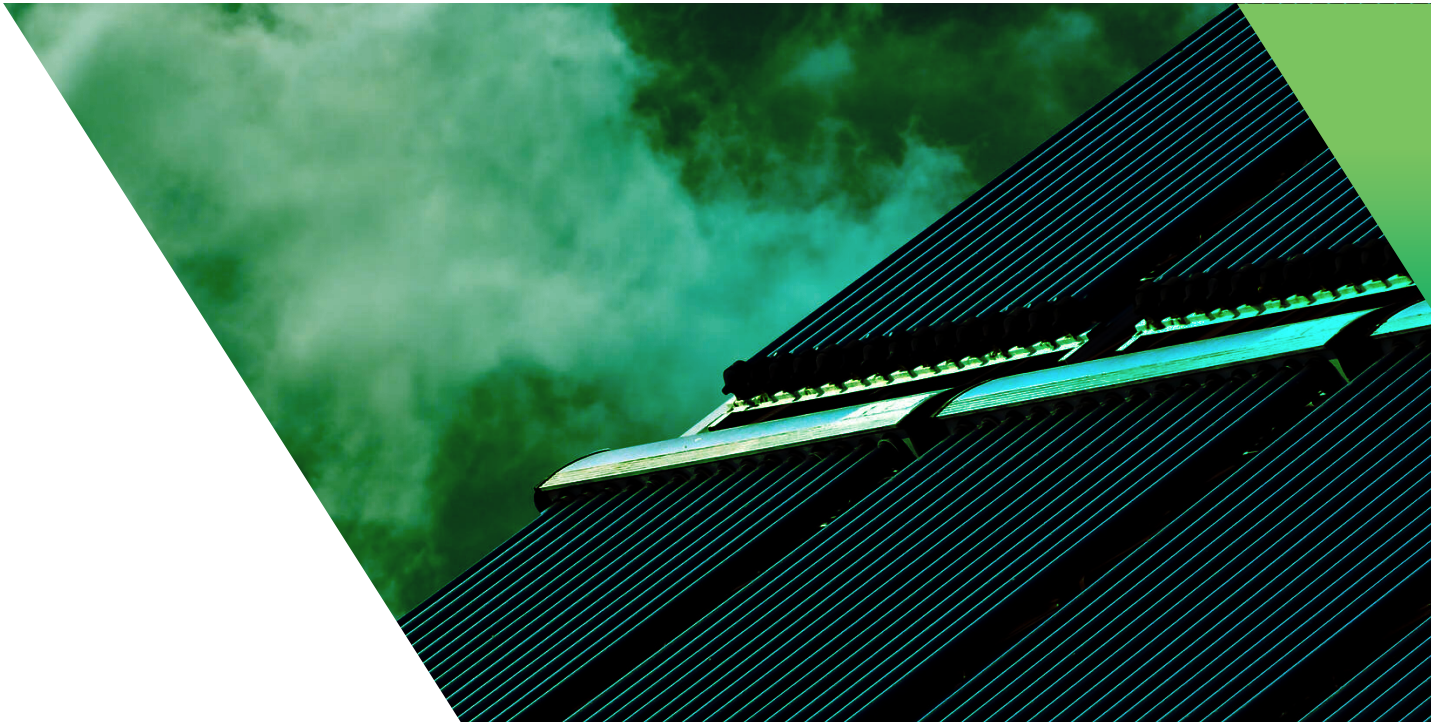
Lodz University of Technology plans to further develop and establish new local energy sources since to do so is a key step in reducing its carbon footprint under the Race to Zero campaign. Today, it is impossible to do without energy consumption, but energy from fossil fuel combustion, which is a major source of greenhouse gas emissions, leads global warming and climate change.

By developing local sources of electric power and heat, we can produce energy in a more sustainable and environmentally friendly way. Lodz University of Technology plans to use a variety of technologies in the course of this process, focusing in particular on renewable sources of energy.

The anticipated technological solutions include:

- ▶ **DEVELOPMENT OF PHOTOVOLTAIC SOURCES,**
- ▶ **DEPLOYMENT OF HEAT PUMPS AND WASTE HEAT,**
- ▶ **GEOHERMAL DRILLING,**
- ▶ **IN THE LONGER TERM, GETTING LODZ UNIVERSITY OF TECHNOLOGY READY FOR THE TRANSITION TO A HYDROGEN ECONOMY.**

Local power and heat generation offer many advantages. First and foremost, they are a way to cut greenhouse gas emissions, which is crucial in tackling climate change. Further, local energy production reduces the cost of energy transmission and decreases dependence on conventional energy sources, which can bring financial benefits and provide greater stability in power supply. Local energy sources may also bolster Lodz University of Technology resilience to power supply disruptions.





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3.

IMPROVING
BUILDING
ENERGY
EFFICIENCY



3. IMPROVING BUILDING ENERGY EFFICIENCY

Improving the energy efficiency of buildings on Lodz University of Technology campuses is critical to reducing its carbon footprint. Buildings are among the largest consumers of energy and a source of greenhouse gas emissions, which is why improving their energy efficiency is important for reducing emissions.

The university also plans to have an energy audit conducted on the buildings, which should provide a thorough analysis of their technical and functional condition. As a result, areas for improvements or modifications to boost energy efficiency will be identified. The energy audit will also allow us to determine potential cost savings and consider investment in retrofitting or replacing systems and equipment to reduce energy consumption and CO₂ emissions.

Lodz University of Technology will implement measures such as thermal insulation, window replacement, retrofitting ventilation and heating systems, and installing intelligent energy management systems. These steps will result in significant energy and cost savings, as well as a reduction in greenhouse gas emissions.

Improving the energy efficiency of buildings will bring many benefits to the staff, students and the environment. Lodz University of Technology employees and students will enjoy improved conditions, working and learning in more comfortable and energy-efficient buildings. With up-to-date ventilation and heating systems, the temperature in the rooms will be better controlled, which will improve the comfort of work and study.





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4.

REPLACING
CONVENTIONAL
LIGHT FIXTURES WITH
ENERGY-EFFICIENT
ONES

4. REPLACING CONVENTIONAL LIGHT FIXTURES WITH ENERGY-EFFICIENT ONES

Upgrading lighting systems is one of the interventions that Lodz University of Technology has been gradually carrying out in the effort to reduce its carbon footprint. The decision to modernize was preceded by an analysis of how much energy is used for lighting and the possibilities and benefits of introducing energy-efficient light sources. Based on the its findings, it was decided that the lighting retrofit should be carried out throughout the university.

The retrofit will not only reduce energy consumption and costs, but will also contribute to decarbonization, in line with sustainability goals.

In the course of the process, Lodz University of Technology intends to replace traditional, inefficient light sources with modern LEDs, which typically consume significantly less energy and last longer compared to traditional incandescent, fluorescent or halogen bulbs. The introduction of energy-efficient lighting shall also improve the comfort of building users. LED lighting will help reduce the lighting power consumption by about 60-70% and will thus reduce greenhouse gas emissions.

Aside from replacing the light bulbs, the university will also take steps to expand and further develop intelligent lighting management systems to allow lighting to be easily controlled based on the needs and context. This will help to further optimize energy consumption while ensuring optimal lighting at specific locations.





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5.

MONITORING ENERGY CONSUMPTION



5. MONITORING ENERGY CONSUMPTION

Upgrading the system for monitoring, measuring, and settling electricity and heat consumption is highly relevant to reducing the carbon footprint of Lodz University of Technology.

Increasing the observability of energy carrier usage on an hourly basis for individual buildings and administrative offices will facilitate effective monitoring and management of energy consumption and identification of the areas where power savings might be possible.

The upgraded monitoring system will allow us to accurately determine energy consumption in the different buildings at Lodz University of Technology. With more power meters, we will be able to pinpoint the exact locations where the highest energy consumption occurs, and thus identify the zones where a significant reduction in energy consumption can be achieved.

The upgrade of the metering and settling system for power and heat consumption will also make it possible to establish the precise costs of energy consumption for individual units. Switching from a flat-rate billing system for energy consumption across the university's units to one based on the building cubic capacity will result in improved accuracy of the settlements in relation to the actual energy consumption. Transparent billing system will take actual energy consumption into account and will be an incentive to energy saving.

Modernizing the system of monitoring, measuring and settling electricity and heat consumption is therefore essential for Lodz University of Technology in order for it to be effective in its efforts to reduce its carbon footprint and achieve its Race to Zero goals. It will help identify areas where modifications can be introduced, conduct cost-benefit analyses of different approaches, and incentivize its employees and students to save energy.





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6.

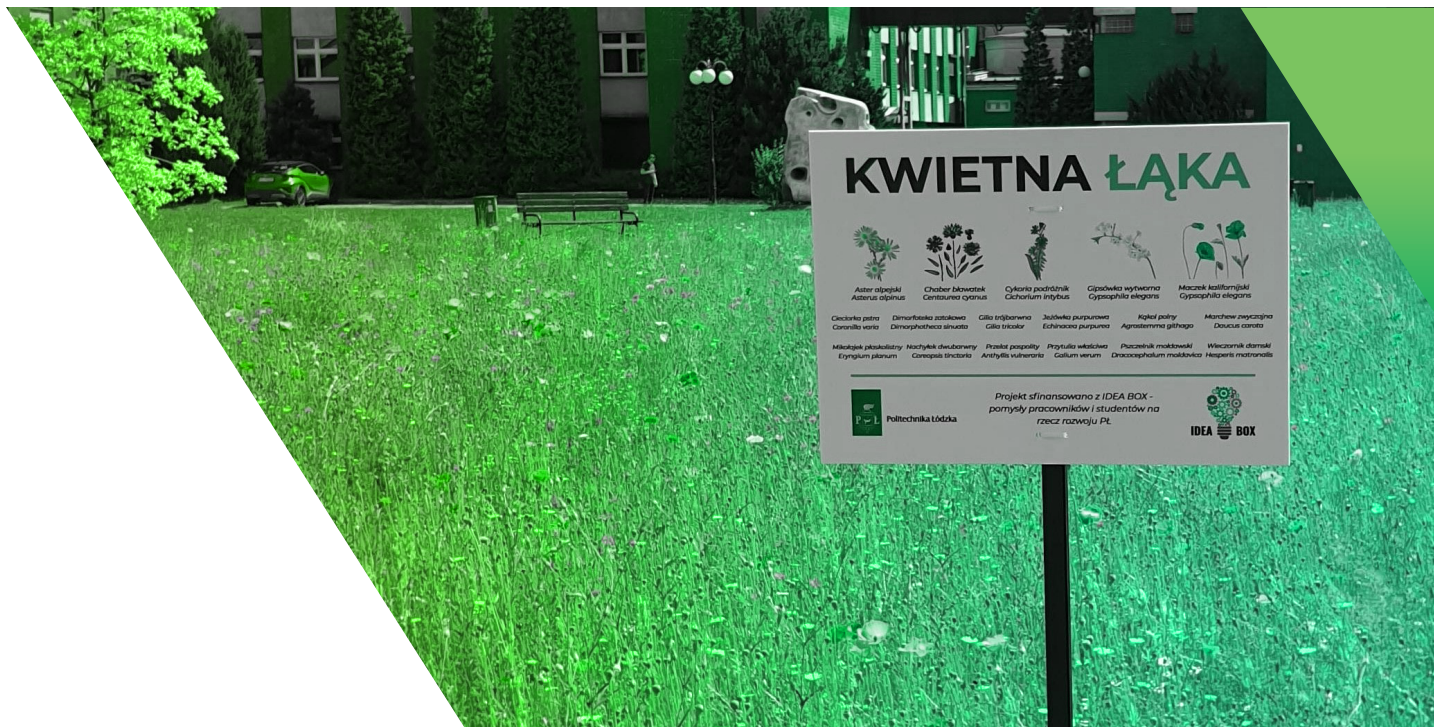
EFFICIENT
WATER
MANAGEMENT



6. EFFICIENT WATER MANAGEMENT

Responsible use of water at Lodz University of Technology is directly related to curbing its carbon footprint. The process of water treatment and supply to the campus requires energy, including that from fossil fuels, which adds to greenhouse gas emissions and a larger carbon footprint.

As part of its efforts to reduce water consumption, Lodz University of Technology will work toward the installation of water-saving devices such as faucets with limited water flow or aerators, installation of rainwater harvesting systems and use of rainwater for lawn watering, and planting vegetation with lower water requirements in its green spaces. At the same time, measures will be taken to encourage behavioral changes in water consumption habits and responsible use of water.





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7.

SUSTAINABLE, LOW-EMISSION TRANSPORT



7. SUSTAINABLE, LOW-EMISSION TRANSPORT

Developing sustainable and low-carbon transport are part of the plan for reducing the carbon footprint of Lodz University of Technology. The academic community of Lodz University of Technology has been increasingly involved in caring for the environment and committed to taking action to protect it.

The university develops user-friendly infrastructure for bikes, scooters, and electric vehicles to reduce emissions of chemical compounds and air pollutants, for instance, bike racks and bike repair stations.

As part of its ongoing efforts, the university keeps upgrading its transport infrastructure, including the allocation of parking spaces equipped with charging stations for electric cars. The university also initiates efforts to better adapt the campus-adjacent streets to bicycle traffic and to have municipal bike rental stations located directly next to the campuses. To promote cycling, the university provides bicycles for both its staff and students who wish to move around the campus in a green way. Lodz University of Technology strives for the best possible public transport connections between the university's campuses and the rest of Lodz by, among other things, having additional stops located near its campuses.

According to the university plans, campaigns to encourage public transport use will be carried out at the university. Not only does this effort represent an important step towards environmental protection, but it also helps to raise environmental awareness among the university community.





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8.

WASTE SORTING AND RECYCLING



8. WASTE SORTING AND RECYCLING

Waste segregation and reduction is one of the measures Lodz University of Technology has planned to take toward decarbonization. Waste that has not been properly segregated may end up in landfills and produce harmful greenhouse gas - methane. It is therefore important, to reduce and properly sort waste.

A crucial step toward waste reduction and segregation is through education and awareness-raising among the staff and students. The university plans to intensify information and awareness-raising campaigns on the advantages of proper waste segregation, specifying what kind of waste is to be segregated and what rules should be followed for this purpose.

Another planned effort is to reduce waste by applying the principles of sustainability and minimization of waste generation. Lodz University of Technology is committed to cutting down its use of paper through digitizing documents, and recommends replacing single-use tableware with biodegradable or reusable products to foodservice providers operating on the university premises.

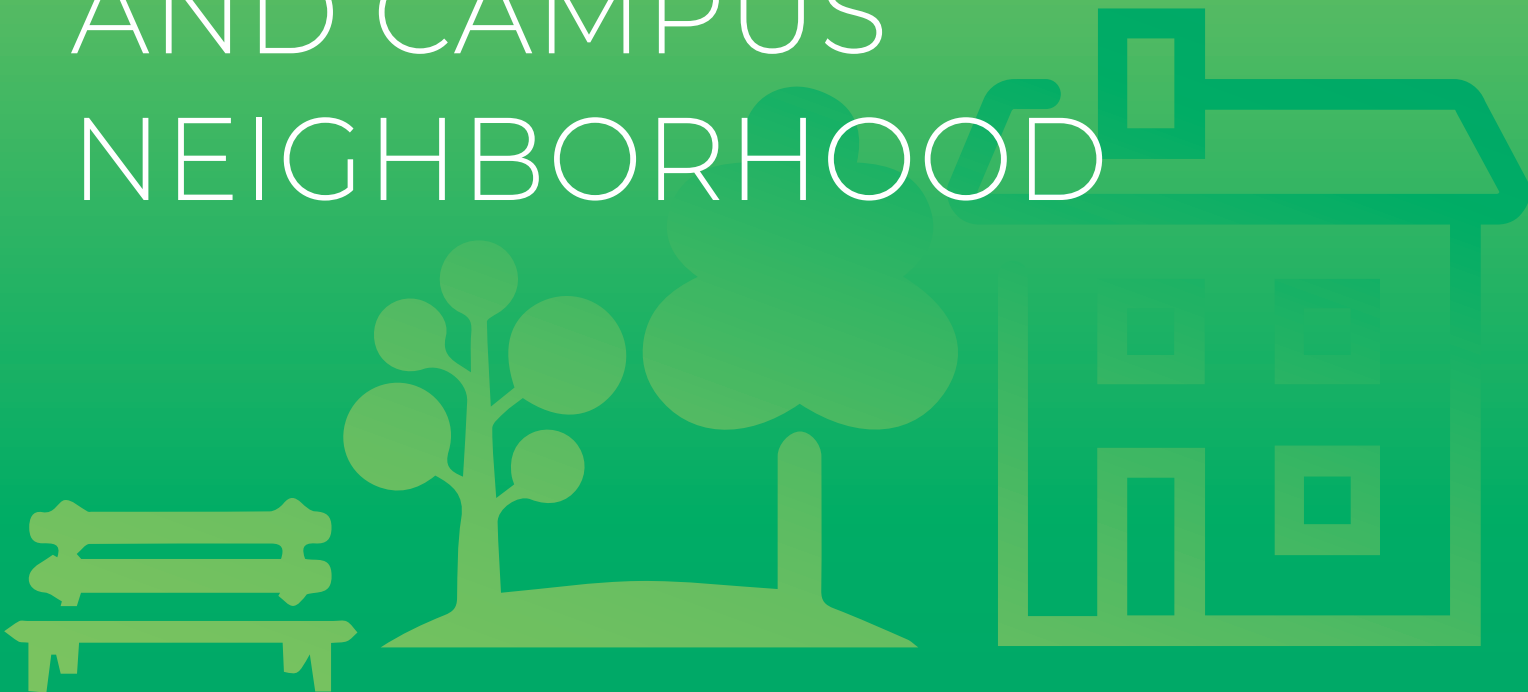




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9.

GREEN CAMPUS AND CAMPUS NEIGHBORHOOD



9. GREEN CAMPUS AND CAMPUS NEIGHBORHOOD

The 37 ha campus in the city center, modern buildings right next to along the revitalized post-industrial structures surrounded by greenery is one of the features of Lodz University of Technology that set it apart from other Polish universities. The university effectively pursues the goals of sustainable development by advancing the idea of TUL Smart Campus. Smart Campus means, among other things, on-campus systems for efficient use of energy, mobile app for reporting infrastructure malfunctions, intelligent entry system, and air quality monitoring sensor system under development, as a result of which the university's area has been included in the nationwide air quality monitoring system.

Bishop Michał Klepacz Park, which covers an area of approximately 4.5 ha, is the largest swathe of greenery on TUL campus. The park is a green oasis in the center of the city and features many different tree and shrub species. The park is where biodiversity conservation efforts are being undertaken within the framework of sustainable development initiatives. Nesting boxes for birds, houses for hedgehogs and insects, and beehives for bees are mounted in the park and its immediate vicinity.

Lodz University of Technology has also been supportive of measures to prevent adverse effects of climate change by dedicating further space, outside the park, for flower meadows. Flower meadows are an important element of the ecosystem and play a role in decarbonization, biodiversity, water retention, prevention of soil erosion, and thereby reduce greenhouse gas emissions associated with soil degradation processes.

Along with other green areas on campus, the park helps reduce greenhouse gas emissions by absorbing carbon dioxide, which contributes to carbon footprint reduction. Additionally, the Klepacz park also serves as a natural water retention system, which is particularly important in the context of climate change and extreme localized precipitation. Because the area is not covered with asphalt or concrete, rainwater seeps unhindered into the soil, helping to reduce local flooding and augment the city's water resources. Therefore, the ongoing maintenance of the park and other green areas on and around the campus is important from the standpoint of carbon footprint reduction and environmental protection in Łódź.

The academic community of Lodz University of Technology is actively involved in efforts to increase the amount of green spaces in the campus neighborhood by submitting further "green" proposals under the Participatory Budget of Łódź. The proposals submitted and endorsed in the voting include increasing the number of trees and plantings on campus-adjacent streets, along with easing motorized traffic and developing cycling infrastructure. All of these measures help improve air quality and add more vegetation to the city, and they will be continued and promoted.



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10.

AWARENESS-RAISING ACTIVITIES



10. AWARENESS-RAISING ACTIVITIES

Lodz University of Technology undertakes a number of educational, research, and outreach activities for environmental protection, sustainable development, and carbon footprint reduction. The university demonstrates its extensive educational activities by conducting studies on environmental protection, sustainable development, and renewable energy. Further, TUL research staff conduct advanced research on the harnessing renewable energy sources, e.g., solar, wind, and geothermal sources of energy. The university carries out research and development of new technologies and solutions to reduce emissions of greenhouse gases and other pollutants. Researchers run projects on monitoring and assessment of the quality of air and the impact of emissions on the environment, including those making use of advanced instruments and technologies. Given all of the above, as a body of experts, the university organizes open lectures, debates, hosts podcasts and launches programs on sustainability, environmental protection, and renewable energy, with the participation of its own and invited experts.

Student projects that address limiting fossil fuel consumption and renewable energy also play an important role in building environmental awareness. These projects are often developed in collaboration with the university's research staff, and produce all sorts of new solutions to reduce the carbon footprint and protect the environment. For example, students design and build prototypes of environmental clean vehicles, design systems to generate energy from renewable sources, wind turbines, as well as green urban spaces. Lodz University of Technology provides full support for student environmental and sustainability projects. The university offers the students access to sophisticated laboratories and equipment, as well as assists in acquiring funding for the projects. Consequently, these projects are a significant resource for innovative solutions and build public awareness of environmental issues.

Certain information and communication activities concerning issues related to fostering pro-environmental attitudes, including energy conservation, will be directed, to a greater extent than in the past, directly to the staff and students of Lodz University of Technology. Examples of good practice will be disseminated to raise their awareness of sustainable lifestyles and encourage them to act to protect the environment.



Conclusion

The carbon footprint reduction plan for Lodz University of Technology is ambitious with the goal of achieving net zero by 2050. The plan includes a number of interrelated and complementary measures including monitoring the carbon footprint, developing local energy sources, increasing building energy efficiency, retrofitting lighting systems, ongoing monitoring of energy consumption, water efficiency, sustainable, low-carbon transport, waste sorting and recycling, green campus, and awareness-raising and outreach activities.

To implement this long-term plan will require, apart from the acquisition of adequate funding, the engagement of the entire academic community of Lodz University of Technology: students, research and teaching staff, and administration. Their attitudes and behaviors are crucial for the process of reducing the university's carbon footprint to be successful.

As for the environmental benefits of the plan, they include reduced greenhouse gas emissions, reduced consumption of energy, water and natural resources, increased use of renewable energy sources, improved air quality, and revitalized campus-adjacent area of the city. Minimizing the carbon footprint of Lodz University of Technology is not only responsible but also economically beneficial. By increasing energy efficiency, we can cut down our expenses.

Our personal commitment to acting everyday toward decarbonization can help raise environmental awareness among our co-workers and make a positive impact on the public perception of our organization and its relationship with the larger community. By protecting the natural environment, we show that we feel responsible for and are committed to protecting our planet.



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