Sustainable Development Strategy

MY GREEN UNIVERSITY

by a team appointed pursuant
to Regulation no. 36/2022 of the Rector
of Bialystok University of Technology
of 31.03.2022

BIALYSTOK UNIVERSITY OF TECHNOLOGY

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1. Introduction

In 2015, representatives of 193 countries adopted the Sustainable Development Goals at the United Nations General Assembly. In the resolution "Transforming our world: the 2030 Agenda for Sustainable Development", 17 global goals and 169 related tasks of key importance for humanity were published, taking into account the balance between economic, social and environmental development, focusing on 5 groups of issues: people, planet, prosperity, peace, partnership and implementation (Fig. 1). The objectives are to be achieved with the cooperation of governments and non-governmental organizations, international organizations, science and business as well as citizens.

Universities and scientific units, whose task is education and scientific progress aimed at solving social, technical and environmental challenges, as well as exemplary reduction of the environmental footprint of their activities, have a special role in shaping and implementing the sustainable development goals.

Fig. (1).Sustainable Development Goals:
Source: https://www.un.org.pl/

Global climate change, air, soil and water pollution, the progressive depletion of natural resources and the loss of biodiversity are the greatest challenges facing the modern world. Nature is the foundation of human existence, and our daily decisions and choices must take into account all the goods and benefits we derive from it. Effective environmental protection requires redefining the way we perceive the world around us and use its resources.

We need to rethink our consumer nature and faith in the effectiveness of existing solutions in overcoming environmental problems.

In view of the above, the University authorities together with members of the academic community of Bialystok University of Technology decided to prepare and start implementing the "My Green University" sustainable development strategy, covering the period from today to 2035. The objectives and activities for the sustainable development of the University, described in this document, are closely related to the main strategic objectives set out in the 'Development Strategy of Bialystok University of Technology for 2021-2024 (with a perspective of extension to 2030)', adopted by the Senate of Bialystok University of Technology on 19 November 2020:

- leading scientific centre (including strengthening innovative and interdisciplinary lines of research);
- modern didactic unit (including shaping a modern, diverse, interdisciplinary didactic offer in accordance with the expectations of the socio-economic environment);
- effective management and friendly organisation (including improvement of the technical condition of buildings and premises and improvement of the organisation, aesthetics and safety on the campus);
- beneficial relations with the environment (including increasing the role of the University as a centre of knowledge and a place where innovative solutions for the economic and social environment are developed).

The challenge facing Bialystok University of Technology is to accelerate the transformation of the University towards the education of programming and future-creating staff and the technological and logical development taking place within the limits of the ecosystem capacity, protecting the climate in which a good quality environment ensures a high standard of living and the well-being of society.

At Bialystok University of Technology, we should teach care for the environment, natural resources and even more strongly shape the ecological awareness of members of the academic community. The direction of the University's development and the formation of future generations of young engineers, co-creating new, resource-efficient and environmentally friendly future of our country, will depend on our choices.

'My Green University' will not only be the place where new initiatives are born. By sharing ideas and experiences, the University's model campus will become a supra-regional model for society and other organisations starting their transformation towards sustainable development.

2. Diagnosis of the state and potential of Bialystok University of Technology in the context of sustainable development challenges by 2035

2.1. University

Bialystok University of Technology is the largest technical university in the north-east of Poland. It is a regional leader in scientific, research and development and didactic activities in the discipline of engineering and technical sciences, closely related to the socio-economic environment. The academic staff consists of 623 scientists and teachers, who educate nearly 7,000 students at six faculties and in 28 fields of study. The University has 66 students scientific clubs and organisations, as well as the Career Development and Alumni Relations Office. Staff and students benefit from the Erasmus+ international exchange programme with 280 academic centres around the world. The university runs 20 double diploma programmes, together with universities in China, Belarus, Denmark, France, Spain, Kazakhstan, Kyrgyzstan, Portugal, Russia, Ukraine and Uzbekistan. Bialystok University of Technology is one of the largest employers in the region, employing nearly 1,400 employees.

2.2. Campus

The main campus of Bialystok University of Technology is located at Wiejska Street in Białystok. The following faculties are located here: Civil Engineering and Environmental Sciences, Electrical Engineering, Computer Science and Mechanical Engineering, as well as the Academic Sports Centre, Student Residence Halls and the Centre for Modern Education. At Oskar Sosnowski Street in Białystok there is the seat of the Faculty of Architecture. In the nearby and well-connected with Białystok Kleosin, there is a campus of the Faculty of Engineering Management. Outside the Bialystok agglomeration, the university maintains a Science and Research Centre in Hajnówka, which houses the laboratories and workshops of the Institute of Forest Sciences. The total area of the campus of Bialystok University of Technology is nearly 40 ha (Fig. 2).

All academic facilities located in Białystok are very well connected to the rest of the agglomeration by bus and a well-developed network of bicycle routes. Bicycle paths in the city cover 36% of all public roads and are about 160 km long. There are over 1,100 parking spaces on the Białystok campus, most of them paved.

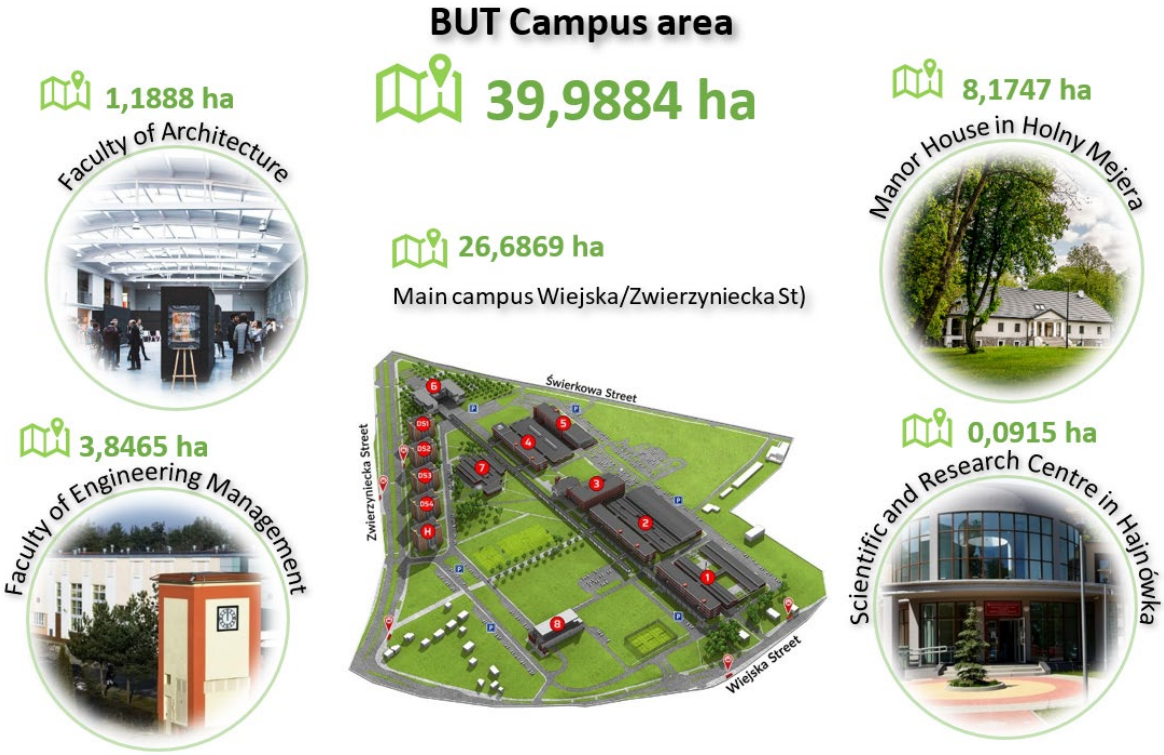

Fig. 2.Campus of Bialystok University of Technology:
1 - Rector's Office, Faculty of Computer Science, 2 - Faculty of Mechanical Engineering, 3 - Faculty of Electrical Engineering,
4 - Faculty of Civil Engineering and Environmental Sciences, 5 - INNO-EKO-TECH, 6 - Centre for Modern Education, Library, 7 - Incubator of Entrepreneurship, Gwint Club, Research and Experimental Centre (CBD) of the Faculty of Electrical Engineering, 8 - Academic Sports Centre, DS – Students' Residence Halls, H - Assistants' Hostel

The size and structure of the campus natural system can be a strength and a good starting point in the planning and implementation of activities for the University's sustainable development. Unfortunately, despite the significant share of biologically active areas in the total land area (37% - 60%; Table 1), the condition of the so-called green areas is mostly bad.

Table 1. Area and percentage of greenery at Bialystok University of Technology

No.	Type of surface	lain Campus (Wiejska/ Zwierzyniecka St)		of Architecture (Sosnowskiego St)		Faculty of Engineering ement (Kleosin)		Total	
		ha	%	ha	%	ha	%	ha	%
1.	Total area	26.69	100.0	1.18	100.0	3.85	100.0	**31,72**	**100.0**
2.	Development area	4.29	16.1	0.32	26.9	0.75	19.6	**5.36**	**16.9**
3	Paved surface (impervious)	6.35	23.8	0.42	35.7	1.08	28.1	**7.86**	**24.8**
4.	Green area	16.04	60.1	0.44	37.4	2.01	52.3	**18.50**	**58.3**

A well-maintained tree stand is only in the vicinity of the Świerkowa street, Wiejska street and in the main entrance avenue to the building of the Faculty of Mechanical Engineering.

Despite the benefits of a well-preserved natural system and a properly composed layout of open spaces, the need for their development and use has not been reflected in the University's development policy to date. Open spaces are under pressure from investments resulting in a change of land functions, fragmentation of green areas and interruption of their communication with the environment. Functional links between natural and recreational facilities are poorly emphasised; green spaces are insufficiently provided for teaching and recreation. There are no systemic solutions for rainwater storage and infiltration at the University.

2.3. Energy and water consumption, waste management

Bialystok University of Technology is a large consumer of energy. The annual consumption of electricity is over 5 GWh and heat – 11.6 GWh (data for 2021). The purchase of electricity and heat consumes over PLN 10 million per year and this amount should be expected to increase to PLN 15-20 million by 2025.

The buildings of the Faculty of Mechanical Engineering (882 MWh) and the Faculty of Civil Engineering and Environmental Sciences (543 MWh) consume the most electricity. The remaining facilities consume an average of about 400 MWh/year. Per usable area, the average demand of the University's facilities for electricity is about 41 kWh/^{m2}/year. In comparison, the buildings of the Faculty of Architecture stand out particularly unfavourably – 82 kWh/^{m2}/year and the Faculty of Mechanical Engineering – 67 kWh/^{m2}/year (Table 2). Approximately 30% of facilities have greater efficiency in the use of electricity in relation to the surface of the facility (Fig. 3).

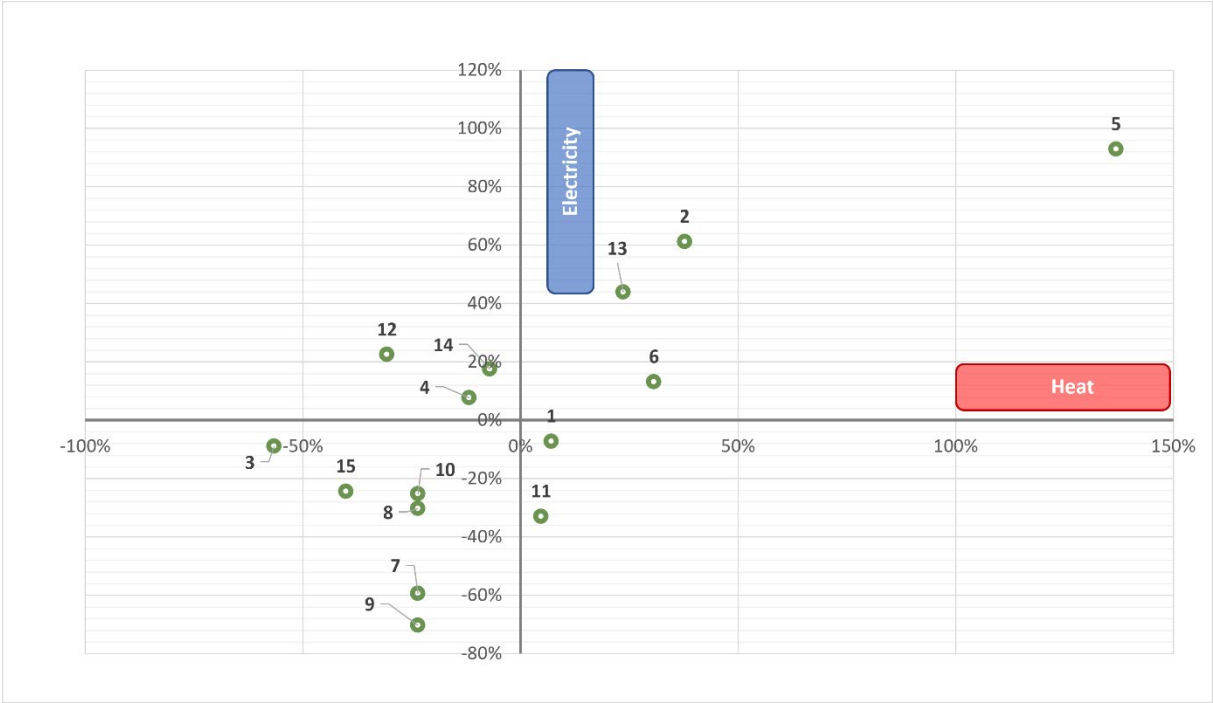

Fig. 3.Electricity consumption and heat demand in 2021 related to to the average value

1 – Wiejska 45A – Rector's Office, 2 – Wiejska 45C – Faculty of Mechanical Engineering, 3 – Wiejska 45E – Faculty of Civil Engineering and Environmental Sciences, 4 – Wiejska 45D – Faculty of Electrical Engineering + CBD, 5 – Faculty of Architecture, 6 – Faculty of Engineering Management – Kleosin, 7 – Student Residence Hall DS. 1, 8 – Student Residence Hall DS. 2, 9 – Student Residence Hall DS. 3, 10 – Student Residence Hall DS. 4, 11 – Assistants' Hostel, 12 - Sports hall, 13 - CNK, 14 - INNO-EKO-TECH, 15 - Science and Research Centre in Hajnówka

Some buildings have insufficient thermal protection; the requirements of the heat transfer coefficient ($U_{max} \leq 0.90$ W/$^{m^2}$K) are not met by the vast majority of windows (Tab. 2). The buildings of the Faculty of Architecture, the Faculty of Mechanical Engineering and the Faculty of Engineering Management are characterised by the highest energy consumption per unit of usable area (tab. 2 and 3). The University is carrying out successive modernisation works - the buildings of the Faculty of Mechanical Engineering and the Rectorate. The completion of works is planned for mid-2023.

Table 2. Consumption of heat and electricity at Bialystok University of Technology in 2019 - 2021

No.	Facility	Area	Heat energy			Electricity		
			2019	2020	2021	2019	2020	2021
		m2	kWh/m2	kWh/m2	kWh/m2	kWh/m2	kWh/m2	kWh/m2
1	Wiejska 45A - Rector's Office	13457	108.33	105.56	111,11	40,64	30.98	34.72
2	Wiejska 45C - Faculty of Mechanical Engineering	13147	108.33	130.56	147.22	50,54	59.45	67.05
3	Wiejska 45E - Faculty of Civil Engineering and Environmental Studies	15986	16:30	27.78	34 11.	39.74	11:30	33.95
4	Wiejska 45D - Faculty of Electrical Engineering CBD	9913	108.33	11.	88,89	49.48	36,71	41.81
5	Faculty of Architecture	1576	291.67	272.22	263.89	86.58	65.97	82.00
6	Faculty of Engineering Management - Kleosin	6940	113.89	100.00	138.89	52.72	38.04	44,36
7	Students' Residence Hall 1	8427	105.56	97.22	75.00	29.63	21,06	10.08
8	Students' Residence Hall 2	8427	105.56	97.22	75.00	30.96	21.25	23.83
9	Students' Residence Hall 3	8427	105.56	97.22	75.00	29.42	15.40	4.99
10	Students' Residence Hall 4	8427	105.56	97.22	75.00	30.49	63.99	26.23
11	Assistants' Hostel	8427	125,00	127.78	108.33	23,43	21,85	22.58
12	Sports Hall	3888	63.89	61.11	66.67	57.08	44.09	48.76
13	CNK	8067	147.22	113.89	130.56	71,68	52.12	58,89
14	INNO-EKO-TECH	8210	97.22	100.00	94.45	54.29	40,48	46.38
15	Science and Research Centre in Hajnówka	1043	55.56	55.56	55.56	37.59	57.37	26,64
16	Hołny Mejera (oil boiler)	1291	-	-	-	30.96	35.59	29.86

Table 3. Summary of penetration coefficients of external partitions of individual facilities

No.	Facility:	Heat transfer coefficient U [W/(m2K)]		
		external walls	roof	windows/ doors
1.	**CNK**	0.21	0.22	1.42/1 .1
2.	**Sports Hall**	0.45	0.30	1,60 / ---
3.	**Faculty of Civil Engineering and Environmental Sciences,**			
	Building A	0.30	0.25	1.80 / 2.60 after thermal modernisation 1.5/1.5
	Building B part "B1"			
	Building B part "B"			
	IET	0.28 / 0.31	0.22	1.8/2 .0
4.	**The Faculty of Architecture**			

	Main building	0.35	0.17	1.8
	Laboratory and research building	0.13	0.11	0.75
5.	**Faculty of Electrical Engineering**			
	Main building	0.19	0.2	1.8/2 .0
	Assembly hall	1.6 / 0.29	0.15	1.1/1.1
	CBD	0.2/0 .33	0.19 / 0.29	1.8/2 .6
6.	**Faculty of Engineering Management**			
	Dean's Office	0.21	0,291	1.8/2 .0
	"berlin"	0.2	0.15	0.9/1 .3
	"montreal"	0.33	0.2	1,7-2,0
	"filadelfia"	0.25	0.31	2.0
	"szanghaj"	1.0	0.36	2.0
7.	**Students' Residence Halls (4 buildings)**	0.34	0.34	0.9/1 .3

Bialystok University of Technology has competences and experience in planning energy and resource management. In the University the following solutions are used: ground heat pumps, hot water solar collectors, micro-wind power plants as well as conventional and hybrid photovoltaic systems. Researchers of Bialystok University of Technology have carried out many scientific and development works on RES, they also have significant practical achievements in the design of systems using RES and performing energy audits. The university is prepared to implement solutions limiting energy demand, including the installation of energy systems with the power supporting the functioning of the campus infrastructure.

The University is supplied with water for domestic and economic needs entirely from the municipal water supply network, and the resulting sewage is discharged to the sanitary sewage network and the Municipal Sewage Treatment Plant. The annual water consumption in the University's facilities has been about 160,000 m^3 in recent years. Students' Residence Halls and the Assistant's Hostel use the most water - 76-80%, while faculty buildings and the Centre for Modern Education account for only 14-17% of consumption.

Water consumption in university buildings does not exceed the average values for this type of facilities (Fig. 4), and savings should first be sought in the Students' Residence Halls and the Assistants' Hostel, where consumption rates exceed almost 2 times the normal values. Excessive water consumption in the academic settlement results primarily from losses in the installation ("leaking" flush, etc.) and a small share of water-saving fittings (automatic shower valves, etc.).

[1] Regulation of the Minister of Infrastructure of 14 January 2002 on determining average standards of water consumption (Journal Of Laws No. 72, item 747).

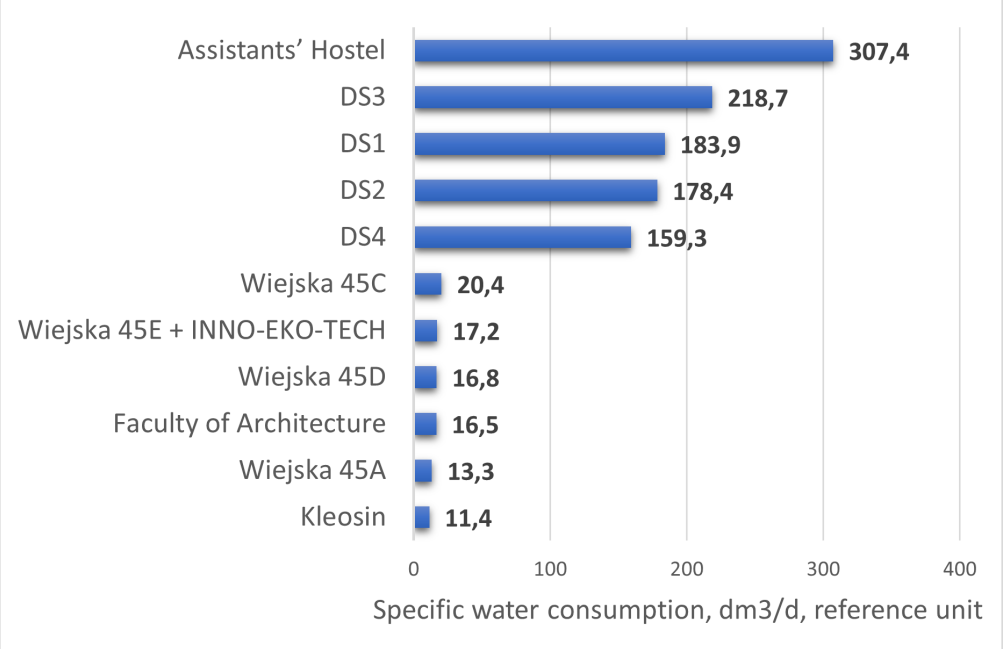

Fig. 4.Water consumption [^{dm3}/day, reference unit)] in selected facilities of Bialystok University of Technology in 2019.

Waste management in Bialystok University of Technology is carried out in accordance with the "Waste Management Instructions..." (Regulation No. 111/2021 of the Rector of BUT). The University has a Plenipotentiary of the Rector of Bialystok University of Technology for Waste Management, whose tasks include consulting, cooperation with organisational units, organisation of trainings and consultations in the field of waste management, as well as keeping records, reporting and ensuring proper conditions for storing waste at the University.

Organic and inorganic municipal waste generated at the University is covered in its entirety by a selective collection system. Waste other than municipal waste, including toxic waste, is collected at the places where it is generated and transferred to specialised companies on the basis of agreements concluded by the University.

2.4. Sustainability in the awareness of the academic community

A study of the knowledge, attitudes and behaviours of students, doctoral students, academic teachers, administration and service employees of Bialystok University of Technology on the environmental aspects of the University's activities[2] indicates that the biggest problem of environmental protection in Poland, perceived by the University's academic community, is waste management, air pollution and low environmental awareness of the society. Respondents are aware of the need to protect the environment, and the main reason for involvement in its protection is care for health and care for future generations.

[2] CAWI (Computer Assisted Web Interview) technique using the portal https://limes.uci.pb.edu.pl/; number of correctly completed surveys n = 355

The survey was conducted in the period from 21 April to 5 June 2022 among students, doctoral students, academic teachers, administrative staff and technical staff of Bialystok University of Technology. In the study, 355 correctly completed questionnaires were obtained, which contained 17 questions and a metric enabling the characteristics of the respondents. The respondents were dominated by a group of students (approx. 40% of correctly completed questionnaires) and academic teachers (approx. 32% of questionnaires) and administrative staff (approx. 22%). Among the teachers, the largest group were employees of the Faculty of Civil Engineering and Environmental Sciences (approx. 35.4%) and the Faculty of Engineering Management (approx. 34.5% of correctly completed questionnaires). The largest groups of surveyed students and doctoral students study at the following faculties: Engineering Management (approx. 43%), Computer Science (approx. 19%) and Mechanical Engineering (approx. 18% of surveys).

According to the respondents, the state of the environment is most influenced by the activity of each person, and then its quality depends on those governing, on politicians and entrepreneurs. The formation of pro-ecological attitudes and behaviours of the society should be primarily taken care of by the central authorities and the government, as well as local and provincial authorities.

The current state of the natural environment in Poland is assessed as satisfactory by the University's academic community. Slightly better, because of a 'sufficient plus' grade, the condition of the campus of Bialystok University of Technology and its surroundings was assessed. The 'sustainability' of the way Bialystok University of Technology currently functions was determined to be sufficient. In the respondents' opinion, the areas of BUT activity that contribute the most to environmental and climate protection are: science and research, education and campus development, including its greenery, and increasing biodiversity. An underdeveloped aspect of the University's campus operation is rainwater retention.

Students and employees of Bialystok University of Technology exhibit a number of pro-ecological behaviours. First of all, they pay attention to reducing water consumption, as well as turning off unnecessary energy receivers both at home and at the University. They also take care of waste segregation. Unfortunately, their involvement in social activities for the protection of the environment is still insufficient. Only a few respondents take part in pro-ecological campaigns and events or participate in cleaning up the world or the area. Only about 1/5 of respondents participate in trainings, seminars or environmental actions.

Environmental activity depends on the wealth of the respondents. Less than half of the respondents decide on pro-ecological solutions if they involve the need to incur additional costs. Respondents have trouble cleaning up after others, such as picking up rubbish from the sidewalk and throwing it in the trash.

Most of the respondents use modern technologies, devices and services contributing to the protection of the environment and climate, above all energy-saving devices and reducing water consumption as well as heating devices with low air pollutant emissions. Respondents are eager to use online applications that allow them to deal with official matters, purchase electronic tickets and make payments. Few respondents use devices enabling the generation of energy from renewable sources, hybrid or electric cars, devices and applications supporting waste segregation or recycling, and tracking media consumption at home. Almost half of the respondents do not use and do not plan to use systems that allow sharing a bike, scooter or car in the future.

The academic community is of the opinion that all its members: both authorities and administration employees, students and doctoral students, as well as academic teachers should take care of environmental protection at Bialystok University of Technology and the sustainable development of the University. At Bialystok University of Technology, a number of actions should be taken for sustainable development, with the most important being: reducing energy consumption and increasing the share of energy from renewable sources in total energy consumption, as well as reducing water consumption and reducing the generation of municipal waste. Unfortunately, only one in ten respondents showed willingness to join in activities for an environmentally friendly and caring about the climate Bialystok University of Technology, and every twentieth would like to co-decide on this type of activity. Approximately 70% of the respondents would be satisfied with receiving information about the activities undertaken by the University.

3. SWOT[3] Analysis

SWOT analysis is a tool enabling a synthetic presentation of the diagnosis of the state of implementation of the 'My Green University' concept at Bialystok University of Technology. According to the assumptions, the SWOT analysis is to enable the identification of strengths and weaknesses (internal factors) as well as opportunities and threats, over which the University has limited influence.

[3] The SWOT analysis is carried out according to the scheme: S – strengths: assets, advantages; W – weaknesses: barriers, defects, deficiencies; O - opportunities – the chance of a favourable change; T – threats, danger of adverse change.

EDUCATION AND RESEARCH

Strengths	Weaknesses
○ Innovative teaching content related to sustainable development, e.g. RES systems, sustainable construction ○ Taking into account the issue of sustainable development in publishing activities related to virtually all evaluated disciplines ○ National and international recognition of the University in research on sustainable development ○ Organization of scientific, popular-scientific and didactic initiatives aimed at building social awareness of sustainable development, addressed to diverse groups of stakeholders ○ Functioning of student organisations (scientific circles) working for sustainable development ○ The Xylopolis brand recognizable and associated with the University as a vision of a sustainable city ○ Commercialisation of the research results and creating startups in the area of sustainable development ○ Close cooperation of the University with National Parks and environmental protection institutions ○ Awareness and a high level of understanding in the academic community of sustainability issues and its own role in the implementation of its principles ○ Willingness to increase the involvement of employees and BUT students in activities for sustainable development	○ Insufficient representation of modules related to sustainable development ○ There is no University website related to to the issue of sustainable development ○ Insufficient number of emblems, distinguishing marks, logos indicating the University's focus on sustainable development (e.g. notes on the lack of the need to print out e-mails and attachments due to the protection of forest resources, etc.) ○ Lack of accreditations confirming the 'green' character of selected areas of the University's activity ○ There is no recognisable annual scientific and cultural event targeted on promoting the principles of sustainable development among employees, students and doctoral students as well as external stakeholders ○ Insufficient involvement of the academic community in environmental initiatives ○ Limited own funds for financing sustainable development of the University ○ Lack of a flagship field of study in the field of sustainable development and transformation to a circular economy ○ No Sustainability Report of the University ○ Insufficient number of sustainability projects implemented with the participation of students ○ A small number of implementations of scientific research results focused on environmental protection and sustainable development aspects ○ Insufficient dynamics of changes in educational programmes and too slow adaptation to technological progress and the requirements of the socio-economic environment
Opportunities	**Risks**
○ Possibility to apply for external funds for research and development and didactic initiatives in the area of sustainable development. ○ The location of the University enabling the approach to unique research topics related to sustainable development	○ Difficulties in obtaining financial resources for projects in the field of sustainable development, in the context of other socio-economic needs ○ Dominance of economic over ecological criteria when making decisions in the field of resource management, procurement, etc.

○ European Union research policy aimed at implementing the concept of sustainable development ○ Cooperation of the University with other institutions from Poland and abroad on the exchange of benefits and good practices in the implementation of sustainable development o Benefits of promoting 'My Green University' brand o Growing societal expectations for the implementation of the principles of sustainable development	

CAMPUS

Strengths	Weaknesses
○ A large share of biologically active space on the main campus ○ The immediate vicinity of the forest and nature reserve ○ Convenient location allowing for the use of public transport ○ Availability of space for RES installations on the University's campus ○ Well-prepared academic staff, scientifically and organisationally active specialists, fields of research and studies directly and indirectly related to the blue-green infrastructure	○ Insufficient development and dysfunctionality of a significant part of green areas; little natural diversity and negligible forested area of the campus ○ A large share of impermeable surfaces on existing car parks and communication routes o Limited possibilities for improving the development of the University's area outside the main campus (applies to the Faculty of Architecture, the Faculty of Engineering Management and the Scientific and Research Centre in Hajnówka) ○ Insufficient pedestrian and bicycle infrastructure ○ Insufficient infrastructure for the disabled and persons with special needs ○ Lack of systemic solutions for storing and infiltration of rainwater
Opportunities	**Risks**
○ High potential for functional shaping of green areas and blue infrastructure on the campus ○ Possibility to apply for external funds ○ Common strategic objectives of the University, region and the city of Białystok ○ Improving the image of the University as an innovative institution in the field of blue-green infrastructure	○ Technical difficulties and high costs of maintaining green areas and blue infrastructure ○ Lack of funds to cover the costs of maintaining green areas ○ Low acceptance by the academic community and students of modifications to the transport system (e.g. elimination of parking spaces)

ENERGY AND RESOURCE MANAGEMENT

Strengths	Weaknesses
○ High scientific potential in the field of RES, efficiency and energy, water and waste management ○ Educational offer taking into account the issues of energy and resources management ○ Well-developed cooperation with domestic and foreign centres ○ Availability of space for RES installations on the University's campus	○ Lack of RES installation despite the available space and needs of the University ○ Lack of modern solutions and infrastructure for water and wastewater management (quite old water supply systems in the BUT facilities) ○ Lack of main (central) storage of waste (other than municipal) ○ Lack of energy and utilities management system ○ Lack of integrated building management system (BMS)
Opportunities	**Risks**
○ Possibility to build a model infrastructure that allows intensification of the implementation of good practices and technology in the economy ○ Possibility of achieving significant self-sufficiency in the supply of electricity and heat/cold	○ Inability to finance planned operational activities from the University funds ○ Ambiguous formal and legal status in the field of reuse of used water (sewage) for economic needs

The SWOT analysis allows the development of recommendations to guide an organisation working on a development or exit strategy. The recommended activity and actions taken are aimed at: reducing threats and taking advantage of opportunities, as well as eliminating weaknesses and reinforcing strengths. The path to achieving strategic goals is described in three scenarios:

- **Defensive actions** - in a situation of predominance of weaknesses and threats;
- **Active impact (competitive behaviours)** – in the case of a relative balance of weaknesses and strengths, but with the presence of opportunities in the environment of an organisation;
- **Aggressive strategy -** when strengths prevail, and in the organisation's environment opportunities outweigh the risks.

The SWOT analysis pointed to the existence of many weaknesses and threats to the implementation of the 'My Green University' strategy, but at the same time identified a large number of strengths and opportunities. Therefore, defensive and aggressive development scenarios are unlikely. The number of identified opportunities (12) is greater than the threats (7), which indicates that the socio-political and economic environment creates development potential, which, given the relative importance of strengths and weaknesses, suggests the likelihood of an 'active counteraction' scenario.

It assumes that the University will actively limit its weaknesses and counteract threats by implementing appropriate objectives and courses of action:

- the participation of issues related to sustainable development in teaching modules and scientific research will increase; the involvement of the academic community in environmental protection initiatives will increase while increasing funds for financing the sustainable development of the University, which will result in the education of staff prepared for the challenges of the future;
- the cooperation of the academic community will result in the development and implementation of the concept of a sustainable and safe campus with high biodiversity and significant value of ecosystem services;
- the efficiency of energy and resource management will increase, and consciously initiated investments will build the foundation of the University's energy self-sufficiency, its financial stability, improve working conditions and competitiveness on the science and education market.

4. Objectives and courses of action for the sustainable development of the University

The University, acting as a champion of sustainable development, creates innovations, shares knowledge and implements ideas to meet the great challenges of our time, reflected in the goals of sustainable development of the UN General Assembly of 2015. By educating future leaders and specialists, Bialystok University of Technology will implement the tasks of a fair transformation towards a society developing **within the limits of the capacity of the ecosystem, protecting the climate in which a good quality of life ensures a high standard of living and social well-being.**

The strategic goal of sustainable development of Bialystok University of Technology is to transform the University into a model space for research and didactics, in which we will teach young people to care for the environment, natural resources and even more strongly build ecological awareness of members of the academic community. The University's sustainable development strategy defines how we intend to face the current and future challenges of civilizational development and what role we will play in creating a more sustainable 'green' future for the University, the region and the country. We want to achieve our goals by acting in the following priority areas:

1. **Education** - preparing future engineers, managers and leaders of economic and social life for the challenges of sustainable development; increasing the participation of sustainable development issues in the didactic process at all levels of academic education;
2. **Research** - increasing the quantity and quality of research and innovation related to sustainable development of society; cooperation with other research centre, partners

from industry, government and local government to meet the challenges of a changing world;

3. **Organisation and Management** – achieving a zero environmental footprint of the University's campus: sustainable use of resources and protection of biodiversity, reducing the negative impact of our activities, consumption, travel and supply chain on the environment and biodiversity; developing policies, structures for the implementation of green development and monitoring its progress.

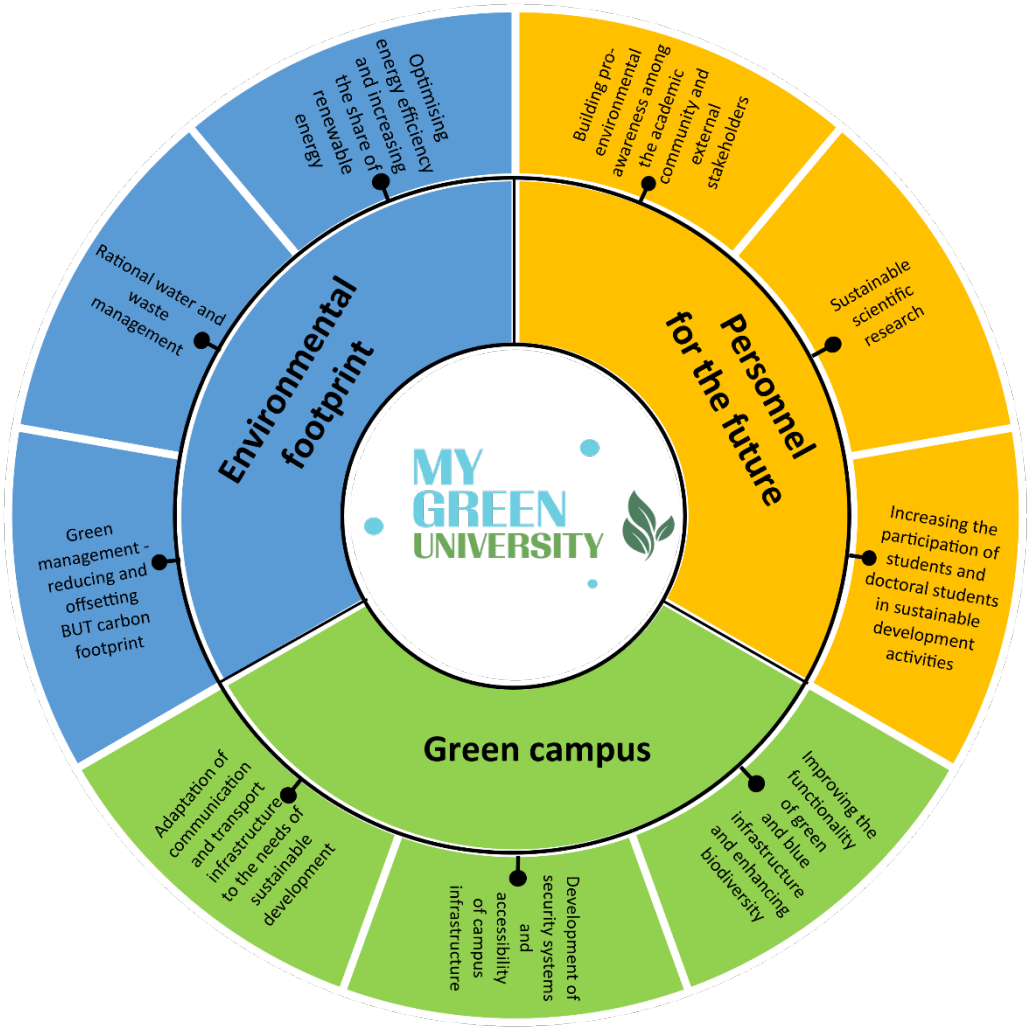

Fig. 5. Objectives and courses of action for the sustainable development of the University

4.1. Operational objectives

The University's sustainable development strategy will be implemented by striving to achieve three operational objectives:

1. Personnel for the future
2. Green Campus
3. Environmental Footprint

1. Operational objective: Personnel for the future

Courses of action necessary to achieve the operational goal

1.1. Increasing the participation of students and doctoral students in sustainable development activities
1.2. Sustainable scientific research
1.3. Building pro-environmental awareness of the academic community and external stakeholders.
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The activity and involvement of the academic community are essential for the implementation of the University's ambitious goals for counteracting and adapting to climate change and counteracting other environmental challenges. Changes in behaviour and acceptance of sustainability patterns can occur through education, awareness-raising and civic engagement. The university should be a national leader in the field of environmental research and innovation. Particular emphasis should be placed on strengthening the ecological awareness of students. The youth can become ambassadors for climate action, sustainability and the environment by sharing their knowledge, experience and commitment with their families, local communities, public and private decision-makers, as well as through communication and the use of social media. Education should be combined with demonstration activities in the field of ecological engineering, biodiversity protection, waste management, sustainable production and energy consumption, etc. The activity of the academic community should also be manifested in the promotion of solutions in the field of sustainable development outside the University, in particular by presenting pro-ecological solutions to entrepreneurs and other external stakeholders.

2. Operational objective: Green Campus

Courses of action necessary to achieve the operational goal

2.1. Adaptation of communication and transport infrastructure to the needs of sustainable development.
2.2. Development of security systems and accessibility of campus infrastructure.
2.3. Improving the functionality of green and blue infrastructure and enhancing biodiversity.

The green areas of the campus should become an effectively managed safe and friendly space with high biodiversity, performing a number of ecosystem functions. Green space should not only provide opportunities for recreation and education, but also mitigate the risks related to weather and climate to a greater extent and support the adaptation of urban space to the effects of climate change. The implementation of the objective will require strengthening the protection of biologically active areas against investment pressure, their pro-environmental development and reconstruction, including, above all, increasing the possibility of rainwater retention.

3. Operational objective: Environmental footprint

Courses of action necessary to achieve the operational goal

3.1. Optimising energy efficiency and increasing the share of renewable energy.
3.2. Rational water and waste management.
3.3. Green management – reducing and offsetting BUT carbon footprint.

A key element of the University's development policy should be to ensure energy security, increase energy efficiency and decarbonization. Education and research use natural and social resources. In the strategic development plan, the University will define goals, policies and measures to reduce the environmental footprint, greenhouse gas emissions, improve energy efficiency and increase the share of renewable energy in total energy consumption. The policy of the authorities must encourage the academic community to change their behaviour and habits regarding energy, water and waste management.

4.2. Courses of action and indicators

<table>
<tr><th colspan="3">1. Operational objective: Personnel for the future</th></tr>
<tr><th colspan="3">Course of action 1.1</th></tr>
<tr><td colspan="3">Increasing the activity of students and doctoral students in the field of sustainable development</td></tr>
<tr><td colspan="2">Justification for intervention

1. The need to adapt education programmes to contemporary educational trends at the level of higher education
2. Implementation of elements of the University's social responsibility – the best possible preparation of graduates for the basic challenges facing modern society
3. Preparing the University's graduates to solve problems occurring in future professional work (including taking into account the problems of sustainable development in engineering activities, applying for funds for tasks related to sustainable development, etc.)</td><td>Consequences of lack of engagement

1. Low level of knowledge and skills of graduates of the University, worsening their competitiveness on the labour market</td></tr>
<tr><th>Action</th><th>Expected results</th><th>Measures</th></tr>
<tr><td>1. Development of a diverse, covering all forms of education and learning competitive, didactic offer, taking into account the principles of sustainable development (e.g. curricula, post-graduate study programmes, courses)
2. Development of rules and organisation of a competition for the best</td><td>1. Increasing the number of modules in individual fields of study related to sustainable development
2. Holding a competition for the best diploma theses and doctoral dissertations on sustainable development
3. Increasing the number of University employees involved in didactic projects in the field of</td><td>1. Number of courses implemented, with the content on sustainable development, in relation to the total number of subjects in the study plan for individual fields of study
2. Number of diploma theses and doctoral dissertations on sustainable development</td></tr>
</table>

research and doctoral theses in line with the principles of sustainable development 3. Development of a system motivating and supporting University employees involved in various projects dedicated to students and doctoral students in the field of sustainable development, e.g. a competition for the best teacher undertaking the subject of sustainable development Best Green Staff/Teacher) 4. Holding a competition for a scientific article/scientific monograph on the results of research related to sustainable development by students or doctoral students 5. Development of a system of support in the application and implementation of projects contributing to the principles of sustainable services and/or with the participation of students and doctoral students	sustainable development. 4. Holding a cyclical competition for the best scientific article on the results of research related to sustainable development, by students or doctoral students 5. Increasing the number of projects submitted and accepted for implementation, which are in line with the principles of sustainable development – with the participation of students	3. Number of employees involved in didactic initiatives in the field of sustainable development 4. Number of initiatives undertaken for students and/or doctoral students in the field of sustainable development 5. Number of scientific articles presenting the results of research related to sustainable development by students or doctoral students 6. Number of students or doctoral students – authors of articles on sustainable development 7. Number of projects that are in line with the principles of sustainable development, carried out with the participation of students or doctoral students 8. Number of students or doctoral students implementing projects in the field of sustainable development 9. Number of student organisations dealing with sustainable development 10. Number of startups related to sustainable development

Course of action 1.2

Sustainable scientific research

Justification for intervention	Consequences of lack of engagement
1. A relatively small number of research topics and funds allocated at the University to scientific research on sustainable development 2. The growing importance of research on sustainable development problems in the activities of leading research centres 3. Constantly increasing financial, domestic and foreign expenditures, intended for research on sustainable development issues	1. Reducing scientific cooperation with other research centres/institutions 2. University's decreasing effectiveness in obtaining funds for scientific research 3. Deteriorating opportunities for scientific and research development of part of the University's scientific and research staff

Action	Expected results	Measures
1. Active and effective applications for funds	1. Increase in funds for scientific research in the field of sustainable development	1. The resources allocated for scientific research on sustainable development

on research on sustainable development 2. Applying for accreditation/certification of laboratories/services for the purpose of providing 'green' services, 'green laboratories', etc. 3. Development of cooperation with other scientific centres/ institutions in the area of sustainable development 4. Developing principles for rewarding University employees for achievements related to the issues of sustainable development	2. Increase in accredited/certified laboratories/services for the provision of 'green' services and 'green laboratories' 3. Strengthening scientific cooperation with other scientific centres/ institutions in the field of sustainable development 4. Increasing the number of employees with scientific achievements related to the issues of sustainable development	2. Number of accreditations obtained by laboratories 3. Number of active cooperation agreements with scientific, didactic units and enterprises, including foreign entities 4. Number of sustainable development projects undertaken jointly with partners outside the University 5. Number of employees with scientific achievements (publications, projects and patents) related to the issue of sustainable development 6. Number of publications in the field of sustainable development
Course of action 1.3		
Building pro-environmental awareness among the academic community and external stakeholders regarding sustainable development		
Justification for intervention 1. An unsatisfactory number of initiatives for sustainable development undertaken by the University's academic community 2. The need to build a positive image of the University in the area of sustainable development and identification of members of the BUT academic community with the goals of sustainable development 3. An important link between the University community awareness and other activities (education, research, etc.) for sustainable development	**Consequences of lack of engagement** 1. Low activity of employees and students in taking up the subject of sustainable development in scientific research and the education process 2. Insufficient recognition of Bialystok University of Technology as a leader in activities for sustainable development 3. Limiting the motivation and possibilities of cooperation of the University with the socio-economic environment	
Action	**Expected results**	**Measures**
1. Development of the Internet site promoting sustainable actions of the academic community of Bialystok University of Technology 2. Development of a visual identification system 'My Green University' and its promotion 3. Development of operating rules and implementation of the 'Green Office' at,	1. 'Green marking' system 2. A functioning and continuously updated website 3. Functioning 'Green Office' 4. Active, conscious participation of employees, students and doctoral students in activities for the sustainable development of the University, including events promoting sustainable attitudes 5. Current report on sustainability of the University	1. Development of a programme to increase the environmental (climatic) awareness in the socio-economic environment of the University 2. Number of news posted on the website of the university, and related to issues of sustainable development 3. Number of employees using the 'green office' 4. Number of cases handled by the 'Green Office'

BUT including 'sustainable' tender procedures 4. Participation in cyclical events promoting sustainable attitudes among the academic community (e.g. Car Free Day, Clean Up the World, Sustainable Consumption – Promoting Healthy Diet, Sustainability Week, etc.) 5. Regularly prepare and make public a report on sustainability at the university on the website		5. Number of initiatives and events promoting sustainable attitudes among the academic community 6. Participation of members of the academic community in initiatives promoting sustainable development [% of academic community]. 7. Ratio of segregated to non-segregated waste at the University [%]. 8. Share ratio of the total number of zero-emission vehicles in relation to the total campus population [pcs./ person or %] 9. Participation of members of the academic community commuting to the University by public transport, bicycle, on foot [%] 10. Number of report downloads

2. Operational objective: Green Campus	
Course of action 2.1	
Adaptation of communication and transport infrastructure to the needs of sustainable development	
Justification for intervention	**Consequences of lack of engagement**
1. Favourable location of the campus in the network of communication connections, conducive to the implementation of pro-ecological transport solutions 2. Large proportion of biologically active areas in the campus area and significant potential for redevelopment of the campus to make best use of the ecosystem services of the open spaces 3. Excessive vehicular traffic, no parking spaces 4. Increasing penetration of campus space by unauthorized persons and vehicles 5. No rainwater retention system; aging water and sewage infrastructure; periodic problems with rainwater drainage 6. Progressive degradation and development of green areas	1. Growing spatial chaos, deteriorating comfort and security in the use of campus space 2. Deteriorating resistance to climate change; intensification of negative hydro-meteorological phenomena resulting from the intensity of development 3. Deterioration of recreational and didactic value of open spaces of the campus

Action	Expected results	Measures
1. Development of a sustainability report; preparation of a map of existing initiatives and calculation of the carbon footprint of the campus 2. Improvement of transport infrastructure for pedestrians, bicycles, etc. and integrating it into the urban transport system 3. Introduction of facilitations for zero-emission vehicles: parking privileges, chargers for vehicles, etc. 4. Reducing the number of impervious surfaces in car parks and communication routes	1. Increasing the biologically active area on the campus of the University 2. Reducing the number of private vehicles parked on campus 3. Increasing the share of walking within the campus 4. Creation of technical infrastructure facilitating the movement of zero-emission vehicles 5. Conducting new university investments in accordance with pro-ecological assumptions and requirements	1. Percentage share of open (green) areas in the total campus area [%] 2. Percentage of car park area located at ground level to total campus area [%]. 3. Number of vehicles used by the University 4. Average number of vehicles (cars and motorcycles) entering the University per day 5. The average number of zero-emission vehicles (e.g. electric cars, bicycles) entering the University per day 6. Measures to reduce the number of private vehicles parked on campus and parking areas 7. Length of pedestrian routes on the campus [LM] 8. Ratio of total number of vehicles (cars and motorbikes) to total campus population [pcs/person or %]. 9. Ratio of the total number of zero-emission vehicles to the total campus population [pcs/person or %]. 10. Percentage share of permeable surfaces in the total communication area (parking lots, communication routes) [%] 11. Number of public information system initiatives on energy consumption/production, air emissions, air quality, etc.

Course of action 2.2

Development of security systems and accessibility of campus infrastructure

Justification for intervention	Consequences of lack of engagement
1. Increasing penetration of campus space by unauthorized persons and vehicles 2. Progressive degradation and development of green areas 3. The need to improve accessibility of the campus area for persons with disabilities and special needs	1. Deterioration of functionality and safety in the use of campus space 2. Deterioration of recreational and didactic value of open spaces of the campus

Action	Expected results	Measures
1. Restriction of unauthorized entry to the campus 2. Upgrading and maintaining the patency of evacuation routes, ensuring optimum access to hydrants and improving signage at evacuation assembly points 3. Reduction of degradation and chaotic development of green areas 4. Improving accessibility of the campus area for persons with disabilities and special needs 5. Improving the well-being of the academic community (e.g. improving air quality in buildings, increasing access to daylight, more plants in buildings) 6. 'Active campus' - ensuring access to diverse sports infrastructure for employees and students	1. Campus fencing 2. Reorganisation of the internal CCTV system 3. Development of infrastructure for people with disabilities and special needs. 4. Development of health care infrastructure for the well-being of the academic community. 5. Introduction of universal design solutions 6. Increasing the security of the academic community, including by limiting the presence of outsiders 7. Improving the functioning of the academic community 8. Spatial arrangement of the campus	1. Length of secured campus boundary [LM] 2. Number of safety and security initiatives/facilities 3. Percentage share of the surface covered by the internal CCTV system [%] 4. Number of universal design solutions 5. Facilities for people with disabilities, with special needs or providing maternity care 6. Availability of health and well-being infrastructure (for students, academic and administrative staff)

Course of action 2.3	
Improving the functionality of green and blue infrastructure. Increasing biological diversity	
Justification for intervention	**Consequences of lack of engagement**
1. A large share of biologically active areas in the campus area and significant potential for campus redevelopment in order to optimise the use of ecosystem services of open spaces 2. No rainwater retention system; aging water and sewage infrastructure; periodic problems with rainwater drainage 3. Progressive degradation and development of green areas	1. Growing spatial chaos, deteriorating comfort and security in the use of campus space 2. Deteriorating resistance to climate change; intensification of negative hydro-meteorological phenomena resulting from the intensity of development 3. Deterioration of recreational and didactic value of open spaces of the campus

Action	Expected results	Measures
1. Valorisation of the ecosystem services of the 'campus natural system' as a basis for spatial management 2. Linking rainwater management with spatial planning, architecture, landscape architecture, design of transport infrastructure 3. Reorganisation and shaping of green areas, enabling optimal water management and sequestration of greenhouse gases while maintaining the key recreational and didactic function 4. An exemplary development of the campus in order to increase environmental diversity, recreational and climate functions and public education on sustainable development 5. Creating a platform for discussion and cooperation at the university; initiating research and implementation projects; joint work on adapting the education system to the challenges of sustainable development (civil engineering, landscape architecture, spatial management, forestry, eco-power engineering, etc.)	1. Protection and maintenance of highly biodiverse ecosystems and restoration of degraded ecosystems 2. Revitalisation of existing greenery, improvement of the usability of green areas and combining them into a coherent and user-friendly network 3. Increasing the area of trees, flower beds (including semi-natural ones) and increasing their species diversity and diversification of the structure 4. Revitalisation of open patios and green spaces near the CNK building; implementation of garden interiors designed jointly by employees and students (scientific clubs) 5. Introduction of model solutions in tree care, replanting and securing during construction works 6. Construction of green roofs, walls and shelters (bicycle, car park), atriums, gazebos, including greening of the roof over the pedestrian route and part of the stairs of the CNK building 7. Planting commemorative trees by graduating students and on other occasions 8. Introducing model solutions for collecting rainwater and snowmelt and not distributing them to the sewage system (‘rainwater harvesting’) 9. The introduction of semi-permeable pavements, water-harvesting communication routes, green car parks (with partially permeable or green surface) 10. Reducing the load on the urban rainwater drainage network 11. Establishment of flower meadows on the campus and establishment of a botanical garden 12. Introduction of small animal friendly solutions: drinkers, shelter areas, insect houses, bat and bird boxes, etc.	1. Percentage share of open/green surfaces in the total area of the campus 2. The total area of the campus covered with vegetation woodland [m^2] 3. The total area of the campus covered with organised/planted vegetation [m^2] 4. The total area of the campus for water absorption outside the forest and vegetation [m^2] 5. Water protection programme and its implementation 6. Number of activities for the protection and care of campus greenery 7. Number of activities aimed at revitalising the greenery and tree cover of the campus 8. Number of plant- and animal-friendly activities on campus 9. Number of activities for collecting rainwater and snowmelt on the campus 10. Percentage reduction of urban rainwater sewer load 11. Number of activities aimed at increasing biodiversity and revitalization of the campus green areas 12. Indicators of biodiversity of green areas of the campus 13. Frequency and lawn mowing area 14. The amount of pesticides used on the campus, per unit of green area

	13. Establishment of a small experimental forested area (approx. 0.25-0.5 ha, by artificial afforestation and natural forest regeneration) 14. Establishment of an apiary 15. Limiting the frequency and area of lawn mowing 16. Abandoning the use of pesticides- for (spraying with chemicals: herbicides and others)	

3. Operational objective: Environmental footprint		
Course of action 3.1		
Optimising energy efficiency and increasing the share of renewable energy		
Justification for intervention 1. Unsatisfactory indicators of energy efficiency of the University's facilities 2. Large and ever-increasing costs of purchasing electrical and thermal energy 3. The dominant share of energy sources based on fossil fuels in meeting the University's demand – inconsistent with the image of Bialystok University of Technology as a leader of activities for sustainable development	**Consequences of lack of engagement** 1. Increasing financial burden on the University's budget 2. Lack of elements of modern energy infrastructure supporting education and research and development activities 3. Increasing greenhouse gas emissions caused by low energy efficiency of the University's infrastructure	
Action	**Expected results**	**Measures**
1. Development of an energy audit and a sustainable development report; preparation of a map of existing initiatives and calculation of the University's carbon footprint 2. Energy modernisation of the buildings on the main campus of the University, the campuses of the Faculty of Architecture and the Faculty of Engineering Management 3. Increasing the share of energy from renewable sources in the total amount of energy produced and consumed at the BUT, including by increasing renewable energy production	1. Obtaining reliable information on the energy consumption of BUT campus facilities 2. Identification of strengths and weaknesses in the University's energy balance 3. Covering selected University facilities with energy monitoring 4. Planning and implementation of activities regarding the possibility of reducing energy consumption and resources 5. Reduction of electrical and thermal energy consumption for heating and lighting to the buildings 6. Increasing the share of energy from renewable sources in the University's energy balance	1. Number of energy audits of the BUT campus facilities 2. Value of total final energy consumption [GJ/person] 3. The amount of heat energy consumed yearly [GJ/year] 4. Amount of electricity consumed per year [MWh/ year] 5. Quantity and type of consumed fuels [tonnes/year] 6. Number of renewable energy sources (sun, wind, water, biomass, etc.) 7. Amount of energy obtained from individual sources of renewable energy [kWh] 8. Percentage share of energy from renewable sources in the total energy consumption

on the campus 4. Model modernisation of facilities, including the implementation of the concept of intelligent buildings, enabling the education of the society 5. The widest possible use of energy-efficient lighting devices, ventilation, air conditioning and recuperation systems with heat recovery and IT equipment certified 'Energy Star' 6. Implementation of elements of green construction (natural ventilation, daylighting, etc.)	7. Obtaining a didactic and research base, enabling education in the field of smart buildings and green buildings and the implementation of research and implementation works 8. Choosing the most effective supplier in terms of security of supply and costs of electricity and heat 9. Choosing the most efficient electricity tariffs	at the University 9. Number of installed smart building control and management systems 10. Number of implemented systems of green construction 11. Number of facilities covered by energy monitoring 12. Percentage share of energy-saving devices 13. Total area of smart buildings 14. Percentage share of smart buildings surface in the total area of the University buildings

Course of action 3.2

Rational water and waste management

Justification for intervention	Consequences of lack of engagement
1. Increasing amount of waste generated at the University – increase in waste disposal costs 2. Increasing fees for water and sewerage	1. Rising water and waste management costs – increasing the burden on the University's finances

Action	Expected results	Measures
1. Implementation of a water consumption monitoring system with the identification of conditions indicating leaks and unjustified losses of water 2. The use of technical solutions and devices reducing water consumption in the BUT facilities 3. Implementation of programmes limiting the amount of municipal waste generated at the University (especially paper and plastic) 4. Improvement of segregation and recycling programmes of waste generated at the University 5. Change in land use and landscaping enabling increased infiltration of rainwater	1. Obtaining information on water consumption and identifying places (points) with excessive water consumption 2. Widespread use of water-saving water supply fittings 3. Development of a performance study of the water recycling system in a selected campus facility (dual water and sewage system) 4. Monitoring and limiting water losses in internal installations (e.g. installation of remote meter reading and alarm signalling) 5. Decreasing water usage per person in the BUT facilities 6. Creation of elements of infrastructure and land development retaining	1. Waste separation and recycling programme 2. Programme to limit the consumption of paper and plastic 3. Degree of implementation of the water consumption reduction and recycling programme 4. Average annual water consumption [m^3/person] 5. Percentage share of water-saving devices installed at the University 6. Infrastructure Leakage Index (ILI) value 7. Percentage share of protected rainwater resources 8. Value of the surface runoff factor 9. Percentage share of the recycled water

6. Implementation of solutions in the field of 'blue' infrastructure optimising rainwater management 7. Implementation of a water recycling programme (including the use of rainwater for flushing toilets, watering plants, washing vehicles, etc.) 8. Implementation of waste management rules: prevent, reduce, reuse, recycle	rainwater on the campus 7. Improvement of water conditions on the campus 8. Obtaining reliable information on waste management and recycling 9. Selection of the most efficient and safe fuel supplier and waste receiver, in terms of security of supply and cost	10. Number of programmes aimed at reducing the amount of waste generated 11. Average annual amount of waste generated [kg/person] 12. Amount of waste recycled [kg]

Course of action 3.3	
Green management – reducing and offsetting BUT carbon footprint	
Justification for intervention	**Consequences of lack of engagement**
1. The need to reduce the University's carbon footprint 2. Failure to adapt the University's management system to the requirements of sustainable development	1. Increase in the operating costs of the University 2. Deteriorating 'structural' resilience of the University to climate change and negative hydro-meteorological phenomena

Action	**Expected results**	**Measures**
1. Assessment and reduction of the environmental footprint of buildings, procurement practices, laboratory work 2. Organisation of proceedings under the Public Procurement Law in a manner supporting the environment, human rights and working conditions as well as animal health 3. Development and implementation of a programme to reduce greenhouse gas emissions 4. Implementation of an environmentally friendly transport policy , including the replacement of the University's fleet with zero-emission vehicles 5. Purchase of equipment and apparatus of the highest energy efficiency class and extension of the service life of the equipment (e.g. through repairs of electronic equipment)	1. Reduction of CO2 emission factors, greenhouse gases and pollutants resulting from the functioning of the University 2. Extending the life cycle of the product (mainly research and teaching equipment and devices) – increasing the use of raw materials, products and waste and reducing the environmental footprint of the supply chain 3. Reducing the use of fossil fuels by the University's vehicles 4. Increasing the 'resilience' of the University's management system to unforeseen situations resulting from adverse climate change	1. Value of the CO2eq emission factor[tonnes/year] (total value and per person) 2. Average annual fuel consumption by the University's vehicles [tonnes/ year] 3. Number of energy stores 4. Number of zero-emission and hybrid vehicles 5. Number of 'critical infrastructure' facilities in terms of limiting the effects of climate change 6. Existence of a programme to reduce greenhouse gas emissions

6. Modifying the provisions of university law in order to increase the 'resilience' of the University to the occurrence of violent climatic phenomena (e.g. isolation and well-thought-out location of critical infrastructure) 7. Creation of a position of a specialist in energy efficiency, renewable energy use and management of the University's infrastructure 8. Introduction of a general information system on energy consumption/ production, air pollutant emissions, air quality		

5. Implementation of a strategy

5.1. Implementation system

In order to implement the Strategy, the University will involve both the academic community and external partners, in particular: state and local government institutions, industry organisations, enterprises and social organisations. Bialystok University of Technology will stimulate and coordinate activities for the implementation of the Strategy, as well as mobilise and integrate internal and external resources and make key decisions. The projects carried out under the Strategy will require the use of various sources of financing, mainly external sources, both public and private.

The Steering Committee appointed by Her Magnificence Rector of Bialystok University of Technology supervises and coordinates the implementation of the Strategy. The implementation of individual operational objectives is the responsibility of the Coordinators appointing the implementers of the activities.

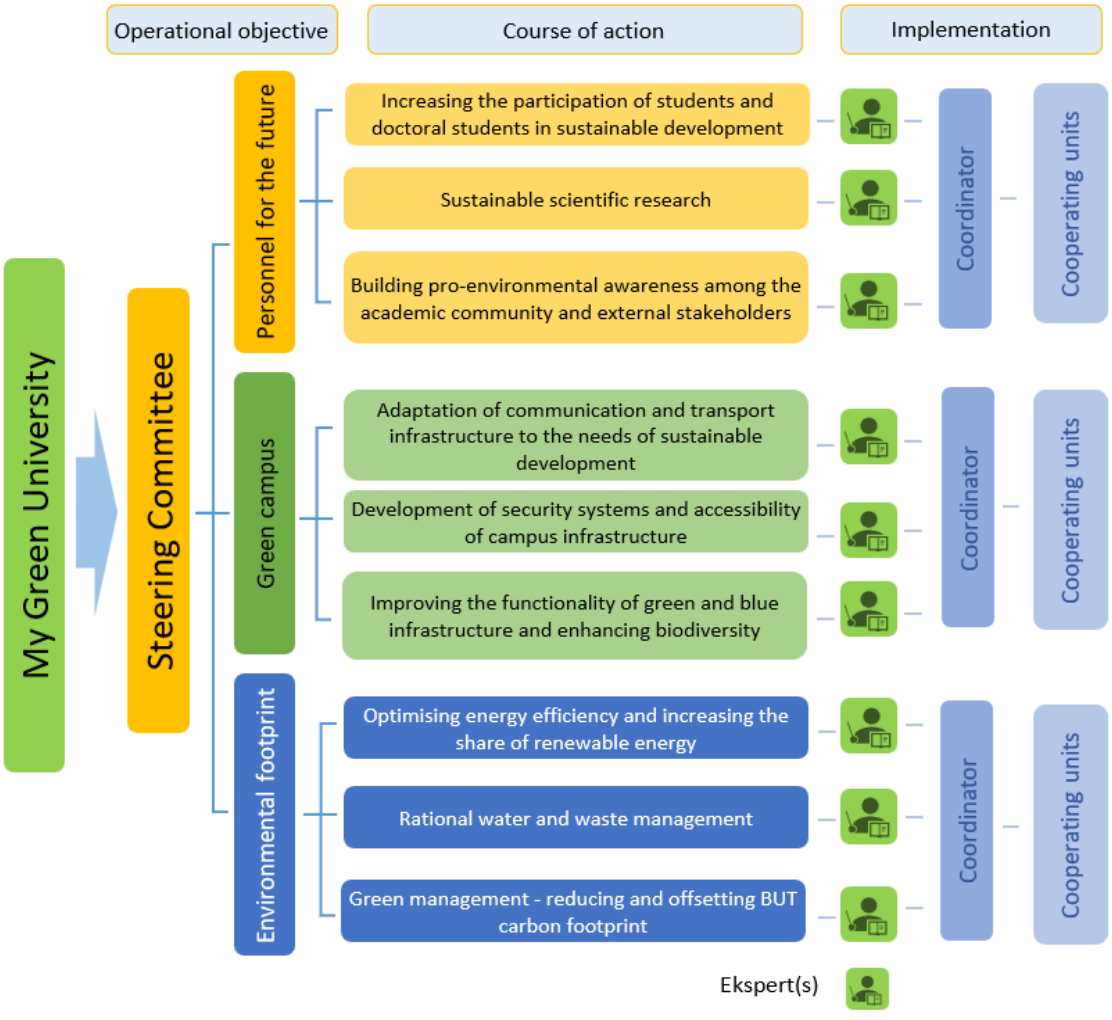

Fig. 6. Strategy implementation system

5.2. Monitoring the implementation and updating the Strategy

The basis for coordinating activities aimed at implementing the Strategy will be the progress of the work carried out and the University's ability to respond to the discrepancies between the assumptions and the results obtained. Monitoring the implementation of the Strategy will provide data for coordination. Monitoring will be based on the analysis of indicators of the implementation of the Strategy, including contextual indicators identified in the diagnosis and indicators of operational objectives. The indicator analysis will be carried out in a dynamic manner, based on information appearing in subsequent years. Therefore, it is necessary to introduce an effective data collection system to calculate the implementation indicators of the Strategy, for example indicator 1.19 of the UI GreenMetric ranking ('Percentage of university budget for sustainability efforts').

The monitoring report – prepared in a two-year cycle – should contain a summary of the implementation of the activities specified in the Strategy. The evaluation will be carried out both during the implementation of the activities (*on-going*) and after their completion (*ex-post*). Its aim will be to assess the needs, impact and effects that the Strategy was to bring. Evaluation should strengthen the quality of the intervention by increasing its adequacy and effectiveness. The *on-going* evaluation will be carried out in the middle of the implementation period of the Strategy, and the final evaluation (*ex-post*) – at the end of the implementation period of the Strategy. The update of the Strategy will be made if such a need is identified during monitoring or evaluation.