Supplementary File S3 – Calculation of the values of variables, i.e., the values of decision criteria for individual variants of permissible solutions for buildings.

1) Technical criterion

All calculations of individual technical criteria were performed using an original spreadsheet created in MS Excel.

Total building completion time (T_{BLD})

Parameter	Symbol	Variant 1	Variant 2	Variant 3A	Variant 3B	Unit
[-]	[-]	[-]	[-]	[-]	[-]	[-]
Total building completion time (T_{BLD})	**$T_{BLD,i}$**	**2.5**	**3.5**	**3.0**	**3.0**	**years**
preparation stage time	$T_{PREP, i}$	0.50	0.50	0.50	0.50	years
"phase zero" execution time	$T_{ZERO, i}$	0.00	0.00	0.50	0.50	years
"pre-shell stage" execution time	$T_{PSHELL, i}$	0.25	0.75	0.50	0.50	years
"shell stage "execution time	$T_{SHELL, i}$	0.75	1.00	0.75	0.75	years
technical installations completion time	$T_{INSTAL, i}$	0.75	1.00	0.50	0.50	years
renewable energy installation completion time	$T_{RES, i}$	0.25	0.25	0.25	0.25	years

Difficulties in implementation (D_{IMP})

Parameter	Symbol	Variant 1	Variant 2	Variant 3A	Variant 3B	Unit
[-]	[-]	[-]	[-]	[-]	[-]	[-]
Difficulties in implementation (D_{IMP})	**$D_{IMP,i}$**	**7**	**9**	**3**	**3**	**pts**
difficulties in preparation stage (0-2 pts)	$D_{PREP, i}$	2	2	0	0	pts
difficulties in "phase zero" (0-1 pts)	$D_{ZERO, i}$	0	0	1	1	pts
difficulties in "pre-shell stage" (0-1 pts)	$D_{PSHELL, i}$	1	1	1	1	pts
difficulties in "shell stage" (0-1 pts)	$D_{SHELL, i}$	1	1	1	1	pts
difficulties in building technical installations (0-3 pts)	$D_{INSTAL, i}$	2	3	0	0	pts
difficulties in building renewable energy installations (0-2 pts)	$D_{RES, i}$	1	2	0	0	pts

Difficulties in implementation expressed as the sum of the difficulties of the individual stages of erecting the building, expressed on a point scale (from 1 to 10 points), being the assessment of the building designer, is a technical criterion for the selection of the solution used. The lower the value of implementation difficulties during the

construction of the facility, the better its assessment. The indicator is characterized by a decreasing preference. The assessment is made by an expert - a designer of a specific building.

2) Energy criterion

All calculations of individual energy criteria were performed using the ArCADia-TERMOCAD program and an original spreadsheet created in MS Excel.

Total primary energy consumption (PE_{TOTAL})

Parameter	Symbol	Variant 1	Variant 2	Variant 3A	Variant 3B	Unit
[-]	[-]	[-]	[-]	[-]	[-]	[-]
Total primary energy consumption (PE_{TOTAL})	**$PE_{TOTAL,i}$**	**208.21**	**211.25**	**202.05**	**118.99**	**kWh/(m^{2}year)**
PE for heating, ventilation and domestic hot water preparation	PEH+V	77.59	81.82	50.00	16.07	kWh/(m^{2}year)
PE for cooling	ΔPEC	31.20	30.00	23.08	16.00	kWh/(m^{2}year)
PE for lighting	ΔPEL	0.00	0.00	35.71	12.86	kWh/(m^{2}year)
PE for other home appliances	ΔPEA	72.00	72.00	67.20	48.00	kWh/(m^{2}year)

Total generated usable renewable energy (UE_{RES})

Parameter	Symbol	Variant 1	Variant 2	Variant 3A	Variant 3B	Unit
[-]	[-]	[-]	[-]		[-]	[-]
Total generated usable renewable energy (UE_{RES})	**$UE_{RES,i}$**	**94.27**	**91.93**	**100.44**	**102.38**	**kWh/(m^{2}year)**
generated electric usable renewable energy	$UE_{RES,ELECTR,i}$	31.42	30.64	33.48	34.13	kWh/(m^{2}year)
usable electricity generated		10998.72	10725.12	11718.00	11944.80	kWh/year
Direct self-consumption		2894.40	2822.40	3780.00	4536.00	kWh/year
Self-consumption through discount		8104.32	7902.72	7938.00	7408.80	kWh/year
Amounts of final electricity obtained		14472.00	14112.00	15120.00	15120.00	kWh/year
Peak power of the PV installation		14.40	14.40	14.40	14.40	kWp
Number of PV modules		36.00	36.00	36.00	36.00	pieces
Area occupied by PV modules		59.10	59.10	59.10	59.10	m^2

3) Exergy criterion

All calculations of individual exergy criteria were performed using an original spreadsheet created in MS Excel.

Use of natural strategies for heating, cooling and lighting (N_{ST})

Parameter	Symbol	Variant 1	Variant 2	Variant 3A	Variant 3B	Unit
[-]	[-]	[-]	[-]	[-]	[-]	[-]
Use of natural strategies for heating, cooling and lighting (N_{ST})	**$N_{ST,i}$**	**2**	**3**	**5**	**9**	**pts**
score for the use of natural strategies for heating (0-3 pts)	$N_{ST,H,i}$	1	2	2	3	pts
score for the use of natural strategies for cooling (0-3 pts)	$N_{ST,C,i}$	0	0	1	3	pts
score for the use of natural strategies for lighting (0-4 pts)	$N_{ST,L,i}$	1	1	2	3	pts

Natural strategies for heating, cooling and lighting are fundamental principles in the design of positive energy buildings. The guidelines are used at the stage of creating the concept of facilities. For individual natural strategies included in the set of acceptable solutions for buildings with a positive energy balance, a point scale was assigned, which is the assessment of the building designer. The assessment is made by an expert - a designer of a specific building.

4) Economic criterion

The calculations of individual economic criteria were carried out in an original spreadsheet created in MS Excel. The economic data are valid as of the first half of 2021.

Total operational cost (TOC)

Total operating costs can be defined as the sum of future fixed and variable costs (total cost) of a building's operation.

The annual fixed operating costs of the building include the following items:
a) $k_{REN,\ i}$ – annual building renovation costs, PLN/a,
b) $k_{SER+REP,\ i}$ – annual costs for the service and repair of technical devices, PLN/a,
c) $k_{INSUR,\ i}$ – annual insurance costs for the i-th project, PLN/a,
e) $k_{PROF\ ZIEL,i}$ – annual profit from renting the current building in Zielonka, PLN/a,
f) $k_{PROF\ OFF,\ i}$ – annual profit from renting the current office building in Murowana Goślina, PLN/a,
g) $k_{FX\ other,\ i}$ – other fixed annual operating costs for the i-th project (including administration costs, rubbish collection, building security, and so on), PLN/a.

The annual variable operating costs of a system is understood as the costs that take account, inter alia, of the following items:
a) $k_{ENERGY,\ i}$ – annual variable costs of energy consumption, PLN/a,
b) $k_{WAT\text{-}SEW,\ i}$ – annual variable costs of water consumption and sewage disposal, PLN/a,
c) $k_{RUBB,\ i}$ – annual variable costs of rubbish disposal, PLN/a,

The following data obtained from the ordering party have been adopted for the calculations:
1. The unit cost of electricity: Murowana Goślina – 0.67 PLN/kWh net / Zielonka – 0.57 PLN/kWh net
2. The unit cost of wood: Murowana Goślina – 148.12 PLN/m^3 / Zielonka – 110.00 PLN/m^3
3. The unit cost of water: Murowana Goślina – 4.43 PLN/m^3 / Zielonka – submersible pumps
4. The unit cost of sewage collection: Murowana Goślina – 23.00 PLN/m^3 disposed / Zielonka wastewater treatment plant
5. The unit cost of rubbish collection: Murowana Goślina – 152.40 PLN/month / Zielonka – 309.04 PLN/month
6. Profit from renting the current building in Zielonka: the average price in 2019 is 11.90 PLN/m^2 per month
7. Profit from renting the office building: as of today, the Forest Experimental Station is renting office space to three entities. The average rental price is 17.65 PLN/m^2 net/month.

Parameter	Symbol	Variant 1	Variant 2	Variant 3A	Variant 3B	Unit
[-]	[-]	[-]	[-]	[-]	[-]	[-]
Total operating costs (TOC)	**TOC_i**	**25 619**	**20 229**	**17 860**	**8 666**	**PLN/a**
annual fixed costs		**7 372**	**5 360**	**95**	**-605**	**PLN/a**
annual building renovation costs	$k_{REN,\,i}$	4 000	4 000	3 000	2 500	PLN/a
annual costs for the service and repair of technical devices	$k_{SER+REP,\,i}$	800	800	700	500	PLN/a
annual insurance costs for the i-th project	$k_{INSUR,\,i}$	1 200	1 200	1 200	1 200	PLN/a
annual profit from renting the current building in Zielonka	$k_{PROF\ ZIEL,\,i}$	-4 165	0	-4 165	-4 165	PLN/a
annual profit from renting the current office building in Murowana Goślina	$k_{PROF\ OFF,\,i}$	0	-6 178	-6 178	-6 178	PLN/a
other fixed annual operating costs for the i-th project	$k_{FXother,\,i}$	5 537	5 537	5 537	5 537	PLN/a
annual variable operating costs		**18 246**	**14 869**	**17 765**	**11 272**	**PLN/a**
annual variable costs of energy consumption	$k_{ENERGY,\,i}$	16 275	14 048	15 793	9 301	PLN/a
annual variable costs of water consumption and sewage disposal	$k_{WAT-SEW,\,i}$	1 971	821	1 971	1 971	PLN/a
annual cost - rubbish disposal	$k_{RUBB,\,i}$	5 537	5 537	5 537	5 537	PLN/a

Total prime cost of investment (TC_{INV})

The total investment costs are understood as the sum of financial outlays that must be incurred in order to build the new headquarters of the LZD together with its technical equipment installations and installations used to obtain renewable energy (RES).

Parameter	Symbol	Variant 1	Variant 2	Variant 3A	Variant 3B	Unit
[-]	[-]	[-]	[-]	[-]	[-]	[-]
Total prime cost of investment (TC_{INv})	**$TC_{INV,i}$**	**2 562 750**	**2 603 000**	**3 003 550**	**3 140 300**	**PLN**
investment costs incurred for the construction of the building to the finishing stage (without installation)	$C_{INV,BLD,i}$	1 260 000	1 330 000	2 100 000	2 240 000	PLN
investment costs incurred for the construction of the installation of the building's technical equipment	$C_{INV,INS,i}$	510 750	575 000	671 750	680 500	PLN
investment costs incurred for the construction of RE installations	$C_{INV,RES,i}$	767 000	668 000	211 800	199 800	PLN

other investment costs related to the construction implementation	$C_{INV,OTHER,i}$	25 000	30 000	20 000	20 000	PLN

5) Social criterion

The calculations of individual social criteria were performed using an original spreadsheet created in MS Excel. The score for a particular solution variant is given by a designer of sanitary installations and/or an architect and/or an energy auditor.

Compliance with the thermal comfort parameters (TC)

Parameter	Symbol	Variant 1	Variant 2	Variant 3A	Variant 3B	Unit
[-]	[-]	[-]	[-]	[-]	[-]	[-]
Compliance with the air quality parameters (AQ)	**AQ**	**4.00**	**5.00**	**8.00**	**10.00**	**pts**
manner of fresh air distribution	$C_{CC,dis\ air,i}$	1	1	2	2.5	pts
physical pollution (dust)	$C_{CC,phys\ pol,i}$	1	1	2	2.5	pts
compliance with the thermal comfort parameters (TC)	TC	1	1	2	2.5	pts
compliance with acoustic comfort parameters (KA)	KA	1	2	2	2.5	pts

Impact of the building and its installations on the surrounding environment (I_{ENV})

Parameter	Symbol	Variant 1	Variant 2	Variant 3A	Variant 3B	Unit
[-]	[-]	[-]	[-]	[-]	[-]	[-]
Impact of the building and its installations on the surrounding environment (I_{ENV})	**$c_{S\ I,ENV,i}$**	**9.00**	**8.00**	**5.00**	**2.00**	**pts**
spatial and landscape impact of the building on the surrounding environment (0-4 pts)	$I_{VIS,\ i}$	3	2	1	1	pts
acoustic impact of the building on the surrounding environment (0-3 pts)	$I_{ACOU,\ i}$	3	3	1	1	pts
pollution emitted by the building and its technical installations (0-3 pts)	$I_{POL,\ i}$	3	3	3	0	pts

The impact of the building and/or its technical installations on the environment may be a criterion of social factors used to decide on the selection of a building body or installation of technical equipment that emit noise outside the facility or otherwise significantly affect the environment. The size of spatial and landscape conflicts can be assessed on the basis of an analysis of spatial development in the vicinity of the examined object. The lower the value of the total impact of a building and its technical installations, the better its rating. The indicator is characterized by a decreasing preference. The assessment is made by an expert - a designer of a specific building.

6) Environmental criterion

The calculations of individual environmental criteria were performed using an original spreadsheet created in MS Excel.

Life-cycle analysis of the building (LCA)

Parameter	Symbol	Variant 1	Variant 2	Variant 3A	Variant 3B	Unit

[-]	[-]	[-]	[-]	[-]	[-]	[-]
Life-cycle analysis of the building (LCA)	**$c_{ENV\ LCA,\ i}$**	**9.00**	**7.00**	**5.00**	**2.00**	**pts**

The lower the value of the lice-cycle analysis of the building, the better its rating. The indicator is characterized by a decreasing preference. The assessment is made by an expert - a designer of a specific building.