Please replace with:
2 – for classrooms
3 – for sport halls
4 – for canteens

D.T3.X.3 ENERGY SIMULATIONS AND TECHNICAL IMPROVEMENT OPTIONS– CLASSROOMS/SPORT HALLS/ CANTEENS

Country

Version 1
08 2018

I. Building #1

1. Summary of the energy performance of the building and suggested improvement options

1.1. Summary of the existing state of the building

From D3.X.2

1.2. Summary table: existing state of the buiilding

Category	Value
Building type[1]	Educational building
Constriction year / major reconstruction year	Xxxx / xxxx
Building fabric[2]	
Building useful area [m^2]	
Useful area of the audited zone [m^2]	
Shape factor - building [1/m]	*Area divided by volume*
Building volume [m^3]	
Volume of the audited zone [m^3]	
Shape factor - audited zone [1/m]	*Area divided by volume*
Number of floors	
Number of building users	
Heating system	*Short characteristics of the system, e.g. electric radiators, district heating + radiators, biomass boiler + under-floor heating, heat pump + air heating system…*
Domestic hot water (DHW) system	*Short characteristics of the system, e.g. central/local, electric/gas, boiler/district heating…*
Cooling system	*Short characteristics of the system*

[1] Single-family house, Apartment block, Office, Educational building, Hospital, Hotels and restaurants, Sport facilities, Wholesale and retail trade services buildings

[2] E.g. Building Fabric, Brick wall with cavity wall, Brick wall without cavity wall, Double-skin façade, Curtain wall, Concrete wall, Stone Wall, Sheet panel, Concrete block wall, Prefabricated, Mainly Glass facade

Lightning system	*Short characteristics of the system*
Primary energy consumption - total [kWh/m^{2}a]	
Primary energy consumption - heating [kWh/m^{2}a]	
Primary energy consumption - DHW [kWh/m^{2}a]	
Primary energy consumption - cooling [kWh/m^{2}a]	
Primary energy consumption - lightning [kWh/m^{2}a]	
Final energy consumption - total [kWh/m^{2}a]	
Final energy consumption - heating [kWh/m^{2}a]	
Final energy consumption - DHW [kWh/m^{2}a]	
Final energy consumption - cooling [kWh/m^{2}a]	
Final energy consumption - lightning [kWh/m^{2}a]	
CO_2 emissions - total [kg/m^{2}a]	
CO_2 emissions - heating [kg/m^{2}a]	
CO_2 emissions - DHW [kg/m^{2}a]	
CO_2 emissions - cooling [kg/m^{2}a]	
CO_2 emissions - lightning [kg/m^{2}a]	

1.3. Suggested implementation programme and its expected results

A short summary of the recommended modernisation variant. The text should summarise the table from the next section.

1.4. Summary table: suggested measures, energy savings, financial savings

No.	Measure	Final energy savings [kWh/a]	Primary energy savings [kWh/a]	CO_2 reduction [Mg/a]	Financial savings [EUR/a]	Investment costs [EUR/a]	Payback time [years]
1.							
2.							
3.							
4.							
5.							

Please add as many rows as needed

2. Energy efficiency improvement options

Please provide in the following sections data on:

- *Name of the energy efficiency measure*
- *Description of the measure (what should be done), including technical parameters of the measure (e.g. heat transfer coefficient of an insulation material, efficiency of technical equipment that should be replaced)*
- *Values of all parameters that are necessary to calculate savings (before and after modernisation)*
- *Final energy savings [kWh/a]*
- *Primary energy savings [kWh/a]*
- *CO_2 reduction [Mg/a]*
- *Financial savings [EUR/a]*
- *Investment costs [EUR/a]*
- *Payback time [years]*

2.1. Heating system

2.2. Water and sewage system

2.3. HVAC

2.4. Cooling system

2.5. Electric system

2.6. Building envelope

2.7. Renewable energy sources

2.8. Lightning system

2.9. Other systems

2.10. User behaviour change

2.11. Other suggestions

2.12. Assumptions used in calculating savings and the resulting accuracy of the recommendations

2.12.1. Assumptions

2.12.2. Accuracy

2.12.3. Methods and standards used

3. Renovation scheme

3.1. Aim of the renovation plan

The aim should be agreed with the school/city managers (e.g. they may wish to renovate the building facade) as well as be based on the FEEDSCHOOLS project objectives (transformation into NZEB). Please indicate here also all boundaries of the renovation, which may have impact on some measures (e.g. in historical buildings it's almost impossible to apply external insulation; there is no gas grid in the neighbourhood so it's not possible to install gas boiler etc.).

3.2. Criteria for ranking energy efficiency improvement measures

Please describe here how you compare various energy efficiency measures and decide on the optimal plan (e.g. shortest payback time, highest final energy savings, highest financial savings, combination of these criteria etc.). Criteria should be discussed with school/ city managers first.

3.3. Potential interactions with other proposed recommendations

Please describe here how measures proposed in Section 2 influence each other (e.g. application of a thermal insulation in the building façade may decrease the capacity of the boiler).

3.4. Suggested measures (optimal implementation plan)

Based on selection criteria chosen and taking into account potential interactions between measures described in previous sections, please indicate here measures that are part of an optimal implementation plan.

3.5. Impact of the renovation scheme

	Existing	After implementation
Primary energy consumption - total [kWh/m^{2}a]		
Primary energy consumption - heating [kWh/m^{2}a]		
Primary energy consumption - DHW [kWh/m^{2}a]		
Primary energy consumption - cooling [kWh/m^{2}a]		
Primary energy consumption - lightning [kWh/m^{2}a]		
Final energy consumption - total [kWh/m^{2}a]		
Final energy consumption - heating [kWh/m^{2}a]		
Final energy consumption - DHW [kWh/m^{2}a]		
Final energy consumption - cooling [kWh/m^{2}a]		
Final energy consumption - lightning [kWh/m^{2}a]		
CO_2 emissions - total [kg/m^{2}a]		
CO_2 emissions - heating [kg/m^{2}a]		

CO_2 emissions – DHW [kg/m^{2}a]		
CO_2 emissions – cooling [kg/m^{2}a]		
CO_2 emissions – lightning [kg/m^{2}a]		

4. Attachments

II. Building #2

1. Summary of the energy performance of the building and suggested improvement options

1.1. Summary of the existing state of the building

From D3.X.2

1.2. Summary table: existing state of the buiilding

Category	Value
Building type[3]	Educational building
Constriction year / major reconstruction year	Xxxx / xxxx
Building fabric[4]	
Building useful area [m^2]	
Useful area of the audited zone [m^2]	
Shape factor - building [1/m]	*Area divided by volume*
Building volume [m^3]	
Volume of the audited zone [m^3]	
Shape factor - audited zone [1/m]	*Area divided by volume*
Number of floors	
Number of building users	
Heating system	*Short characteristics of the system, e.g. electric radiators, district heating + radiators, biomass boiler + under-floor heating, heat pump + air heating system…*
Domestic hot water (DHW) system	*Short characteristics of the system, e.g. central/local, electric/gas, boiler/district heating…*
Cooling system	*Short characteristics of the system*
Lightning system	*Short characteristics of the system*
Primary energy consumption - total [kWh/m^2a]	
Primary energy consumption - heating [kWh/m^2a]	

[3] Single-family house, Apartment block, Office, Educational building, Hospital, Hotels and restaurants, Sport facilities, Wholesale and retail trade services buildings

[4] E.g. Building Fabric, Brick wall with cavity wall, Brick wall without cavity wall, Double-skin façade, Curtain wall, Concrete wall, Stone Wall, Sheet panel, Concrete block wall, Prefabricated, Mainly Glass facade

Primary energy consumption - DHW [kWh/m^{2}a]	
Primary energy consumption - cooling [kWh/m^{2}a]	
Primary energy consumption - lightning [kWh/m^{2}a]	
Final energy consumption - total [kWh/m^{2}a]	
Final energy consumption - heating [kWh/m^{2}a]	
Final energy consumption - DHW [kWh/m^{2}a]	
Final energy consumption - cooling [kWh/m^{2}a]	
Final energy consumption - lightning [kWh/m^{2}a]	
CO_2 emissions - total [kg/m^{2}a]	
CO_2 emissions - heating [kg/m^{2}a]	
CO_2 emissions - DHW [kg/m^{2}a]	
CO_2 emissions - cooling [kg/m^{2}a]	
CO_2 emissions - lightning [kg/m^{2}a]	

1.3. Suggested implementation programme and its expected results

A short summary of the recommended modernisation variant. The text should summarise the table from the next section.

1.4. Summary table: suggested measures, energy savings, financial savings

No.	Measure	Final energy savings [kWh/a]	Primary energy savings [kWh/a]	CO_2 reduction [Mg/a]	Financial savings [EUR/a]	Investment costs [EUR/a]	Payback time [years]
6.							
7.							
8.							
9.							
10.							

Please add as many rows as needed

2. Energy efficiency improvement options

Please provide in the following sections data on:

- *Name of the energy efficiency measure*
- *Description of the measure (what should be done), including technical parameters of the measure (e.g. heat transfer coefficient of an insulation material, efficiency of technical equipment that should be replaced)*
- *Values of all parameters that are necessary to calculate savings (before and after modernisation)*
- *Final energy savings [kWh/a]*
- *Primary energy savings [kWh/a]*
- *CO_2 reduction [Mg/a]*
- *Financial savings [EUR/a]*
- *Investment costs [EUR/a]*
- *Payback time [years]*

2.1. Heating system

2.2. Water and sewage system

2.3. HVAC

2.4. Cooling system

2.5. Electric system

2.6. Building envelope

2.7. Renewable energy sources

2.8. Lightning system

2.9. Other systems

2.10. User behaviour change

2.11. Other suggestions

2.12. Assumptions used in calculating savings and the resulting accuracy of the recommendations

2.12.1. Assumptions

2.12.2. Accuracy

2.12.3. Methods and standards used

3. Renovation scheme

3.1. Aim of the renovation plan

The aim should be agreed with the school/city managers (e.g. they may wish to renovate the building facade) as well as be based on the FEEDSCHOOLS project objectives (transformation into NZEB). Please indicate here also all boundaries of the renovation, which may have impact on some measures (e.g. in historical buildings it's almost impossible to apply external insulation; there is no gas grid in the neighbourhood so it's not possible to install gas boiler etc.).

3.2. Criteria for ranking energy efficiency improvement measures

Please describe here how you compare various energy efficiency measures and decide on the optimal plan (e.g. shortest payback time, highest final energy savings, highest financial savings, combination of these criteria etc.). Criteria should be discussed with school/ city managers first.

3.3. Potential interactions with other proposed recommendations

Please describe here how measures proposed in Section 2 influence each other (e.g. application of a thermal insulation in the building façade may decrease the capacity of the boiler).

3.4. Suggested measures (optimal implementation plan)

Based on selection criteria chosen and taking into account potential interactions between measures described in previous sections, please indicate here measures that are part of an optimal implementation plan.

3.5. Impact of the renovation scheme

	Existing	After implementation
Primary energy consumption - total [kWh/m^{2}a]		
Primary energy consumption - heating [kWh/m^{2}a]		
Primary energy consumption - DHW [kWh/m^{2}a]		
Primary energy consumption - cooling [kWh/m^{2}a]		
Primary energy consumption - lightning [kWh/m^{2}a]		
Final energy consumption - total [kWh/m^{2}a]		
Final energy consumption - heating [kWh/m^{2}a]		
Final energy consumption - DHW [kWh/m^{2}a]		
Final energy consumption - cooling [kWh/m^{2}a]		
Final energy consumption - lightning [kWh/m^{2}a]		
CO_2 emissions - total [kg/m^{2}a]		
CO_2 emissions - heating [kg/m^{2}a]		

CO_2 emissions – DHW [kg/m^{2}a]		
CO_2 emissions – cooling [kg/m^{2}a]		
CO_2 emissions – lightning [kg/m^{2}a]		

4. Attachments

III. Building #3

1. Summary of the energy performance of the building and suggested improvement options

1.1. Summary of the existing state of the building

From D3.X.2

1.2. Summary table: existing state of the buiiding

Category	Value
Building type[5]	Educational building
Constriction year / major reconstruction year	Xxxx / xxxx
Building fabric[6]	
Building useful area [m^2]	
Useful area of the audited zone [m^2]	
Shape factor - building [1/m]	*Area divided by volume*
Building volume [m^3]	
Volume of the audited zone [m^3]	
Shape factor - audited zone [1/m]	*Area divided by volume*
Number of floors	
Number of building users	
Heating system	*Short characteristics of the system, e.g. electric radiators, district heating + radiators, biomass boiler + under-floor heating, heat pump + air heating system…*
Domestic hot water (DHW) system	*Short characteristics of the system, e.g. central/local, electric/gas, boiler/district heating…*
Cooling system	*Short characteristics of the system*
Lightning system	*Short characteristics of the system*
Primary energy consumption - total [kWh/m^2a]	
Primary energy consumption - heating [kWh/m^2a]	

[5] Single-family house, Apartment block, Office, Educational building, Hospital, Hotels and restaurants, Sport facilities, Wholesale and retail trade services buildings

[6] E.g. Building Fabric, Brick wall with cavity wall, Brick wall without cavity wall, Double-skin façade, Curtain wall, Concrete wall, Stone Wall, Sheet panel, Concrete block wall, Prefabricated, Mainly Glass facade

Primary energy consumption - DHW [kWh/m^{2}a]	
Primary energy consumption - cooling [kWh/m^{2}a]	
Primary energy consumption - lightning [kWh/m^{2}a]	
Final energy consumption - total [kWh/m^{2}a]	
Final energy consumption - heating [kWh/m^{2}a]	
Final energy consumption - DHW [kWh/m^{2}a]	
Final energy consumption - cooling [kWh/m^{2}a]	
Final energy consumption - lightning [kWh/m^{2}a]	
CO_2 emissions - total [kg/m^{2}a]	
CO_2 emissions - heating [kg/m^{2}a]	
CO_2 emissions - DHW [kg/m^{2}a]	
CO_2 emissions - cooling [kg/m^{2}a]	
CO_2 emissions - lightning [kg/m^{2}a]	

1.3. Suggested implementation programme and its expected results

A short summary of the recommended modernisation variant. The text should summarise the table from the next section.

1.4. Summary table: suggested measures, energy savings, financial savings

No.	Measure	Final energy savings [kWh/a]	Primary energy savings [kWh/a]	CO_2 reduction [Mg/a]	Financial savings [EUR/a]	Investment costs [EUR/a]	Payback time [years]
11.							
12.							
13.							
14.							
15.							

Please add as many rows as needed

2. Energy efficiency improvement options

Please provide in the following sections data on:

- *Name of the energy efficiency measure*
- *Description of the measure (what should be done), including technical parameters of the measure (e.g. heat transfer coefficient of an insulation material, efficiency of technical equipment that should be replaced)*
- *Values of all parameters that are necessary to calculate savings (before and after modernisation)*
- *Final energy savings [kWh/a]*
- *Primary energy savings [kWh/a]*
- *CO_2 reduction [Mg/a]*
- *Financial savings [EUR/a]*
- *Investment costs [EUR/a]*
- *Payback time [years]*

2.1. Heating system

2.2. Water and sewage system

2.3. HVAC

2.4. Cooling system

2.5. Electric system

2.6. Building envelope

2.7. Renewable energy sources

2.8. Lightning system

2.9. Other systems

2.10. User behaviour change

2.11. Other suggestions

2.12. Assumptions used in calculating savings and the resulting accuracy of the recommendations

2.12.1. Assumptions

2.12.2. Accuracy

2.12.3. Methods and standards used

3. Renovation scheme

3.1. Aim of the renovation plan

The aim should be agreed with the school/city managers (e.g. they may wish to renovate the building facade) as well as be based on the FEEDSCHOOLS project objectives (transformation into NZEB). Please indicate here also all boundaries of the renovation, which may have impact on some measures (e.g. in historical buildings it's almost impossible to apply external insulation; there is no gas grid in the neighbourhood so it's not possible to install gas boiler etc.).

3.2. Criteria for ranking energy efficiency improvement measures

Please describe here how you compare various energy efficiency measures and decide on the optimal plan (e.g. shortest payback time, highest final energy savings, highest financial savings, combination of these criteria etc.). Criteria should be discussed with school/ city managers first.

3.3. Potential interactions with other proposed recommendations

Please describe here how measures proposed in Section 2 influence each other (e.g. application of a thermal insulation in the building façade may decrease the capacity of the boiler).

3.4. Suggested measures (optimal implementation plan)

Based on selection criteria chosen and taking into account potential interactions between measures described in previous sections, please indicate here measures that are part of an optimal implementation plan.

3.5. Impact of the renovation scheme

	Existing	After implementation
Primary energy consumption - total [kWh/m^{2}a]		
Primary energy consumption - heating [kWh/m^{2}a]		
Primary energy consumption - DHW [kWh/m^{2}a]		
Primary energy consumption - cooling [kWh/m^{2}a]		
Primary energy consumption - lightning [kWh/m^{2}a]		
Final energy consumption - total [kWh/m^{2}a]		
Final energy consumption - heating [kWh/m^{2}a]		
Final energy consumption - DHW [kWh/m^{2}a]		
Final energy consumption - cooling [kWh/m^{2}a]		
Final energy consumption - lightning [kWh/m^{2}a]		
CO_2 emissions - total [kg/m^{2}a]		
CO_2 emissions - heating [kg/m^{2}a]		

CO_2 emissions – DHW [kg/m^{2}a]		
CO_2 emissions – cooling [kg/m^{2}a]		
CO_2 emissions – lightning [kg/m^{2}a]		

4. Attachments

IV. Building #4

1. Summary of the energy performance of the building and suggested improvement options

1.1. Summary of the existing state of the building

From D3.X.2

1.2. Summary table: existing state of the buiilding

Category	Value
Building type[7]	Educational building
Constriction year / major reconstruction year	Xxxx / xxxx
Building fabric[8]	
Building useful area [m^2]	
Useful area of the audited zone [m^2]	
Shape factor - building [1/m]	*Area divided by volume*
Building volume [m^3]	
Volume of the audited zone [m^3]	
Shape factor - audited zone [1/m]	*Area divided by volume*
Number of floors	
Number of building users	
Heating system	*Short characteristics of the system, e.g. electric radiators, district heating + radiators, biomass boiler + under-floor heating, heat pump + air heating system…*
Domestic hot water (DHW) system	*Short characteristics of the system, e.g. central/local, electric/gas, boiler/district heating…*
Cooling system	*Short characteristics of the system*
Lightning system	*Short characteristics of the system*
Primary energy consumption - total [kWh/m^2a]	
Primary energy consumption - heating [kWh/m^2a]	

[7] Single-family house, Apartment block, Office, Educational building, Hospital, Hotels and restaurants, Sport facilities, Wholesale and retail trade services buildings

[8] E.g. Building Fabric, Brick wall with cavity wall, Brick wall without cavity wall, Double-skin façade, Curtain wall, Concrete wall, Stone Wall, Sheet panel, Concrete block wall, Prefabricated, Mainly Glass facade

Primary energy consumption - DHW [kWh/m^{2}a]	
Primary energy consumption - cooling [kWh/m^{2}a]	
Primary energy consumption - lightning [kWh/m^{2}a]	
Final energy consumption - total [kWh/m^{2}a]	
Final energy consumption - heating [kWh/m^{2}a]	
Final energy consumption - DHW [kWh/m^{2}a]	
Final energy consumption - cooling [kWh/m^{2}a]	
Final energy consumption - lightning [kWh/m^{2}a]	
CO_2 emissions - total [kg/m^{2}a]	
CO_2 emissions - heating [kg/m^{2}a]	
CO_2 emissions - DHW [kg/m^{2}a]	
CO_2 emissions - cooling [kg/m^{2}a]	
CO_2 emissions - lightning [kg/m^{2}a]	

1.3. Suggested implementation programme and its expected results

A short summary of the recommended modernisation variant. The text should summarise the table from the next section.

1.4. Summary table: suggested measures, energy savings, financial savings

No.	Measure	Final energy savings [kWh/a]	Primary energy savings [kWh/a]	CO_2 reduction [Mg/a]	Financial savings [EUR/a]	Investment costs [EUR/a]	Payback time [years]
16.							
17.							
18.							
19.							
20.							

Please add as many rows as needed

2. Energy efficiency improvement options

Please provide in the following sections data on:

- *Name of the energy efficiency measure*
- *Description of the measure (what should be done), including technical parameters of the measure (e.g. heat transfer coefficient of an insulation material, efficiency of technical equipment that should be replaced)*
- *Values of all parameters that are necessary to calculate savings (before and after modernisation)*
- *Final energy savings [kWh/a]*
- *Primary energy savings [kWh/a]*
- *CO_2 reduction [Mg/a]*
- *Financial savings [EUR/a]*
- *Investment costs [EUR/a]*
- *Payback time [years]*

2.1. Heating system

2.2. Water and sewage system

2.3. HVAC

2.4. Cooling system

2.5. Electric system

2.6. Building envelope

2.7. Renewable energy sources

2.8. Lightning system

2.9. Other systems

2.10. User behaviour change

2.11. Other suggestions

2.12. Assumptions used in calculating savings and the resulting accuracy of the recommendations

2.12.1. Assumptions

2.12.2. Accuracy

2.12.3. Methods and standards used

3. Renovation scheme

3.1. Aim of the renovation plan

The aim should be agreed with the school/city managers (e.g. they may wish to renovate the building facade) as well as be based on the FEEDSCHOOLS project objectives (transformation into NZEB). Please indicate here also all boundaries of the renovation, which may have impact on some measures (e.g. in historical buildings it's almost impossible to apply external insulation; there is no gas grid in the neighbourhood so it's not possible to install gas boiler etc.).

3.2. Criteria for ranking energy efficiency improvement measures

Please describe here how you compare various energy efficiency measures and decide on the optimal plan (e.g. shortest payback time, highest final energy savings, highest financial savings, combination of these criteria etc.). Criteria should be discussed with school/ city managers first.

3.3. Potential interactions with other proposed recommendations

Please describe here how measures proposed in Section 2 influence each other (e.g. application of a thermal insulation in the building façade may decrease the capacity of the boiler).

3.4. Suggested measures (optimal implementation plan)

Based on selection criteria chosen and taking into account potential interactions between measures described in previous sections, please indicate here measures that are part of an optimal implementation plan.

3.5. Impact of the renovation scheme

	Existing	After implementation
Primary energy consumption - total [kWh/m^{2}a]		
Primary energy consumption - heating [kWh/m^{2}a]		
Primary energy consumption - DHW [kWh/m^{2}a]		
Primary energy consumption - cooling [kWh/m^{2}a]		
Primary energy consumption - lightning [kWh/m^{2}a]		
Final energy consumption - total [kWh/m^{2}a]		
Final energy consumption - heating [kWh/m^{2}a]		
Final energy consumption - DHW [kWh/m^{2}a]		
Final energy consumption - cooling [kWh/m^{2}a]		
Final energy consumption - lightning [kWh/m^{2}a]		
CO_2 emissions - total [kg/m^{2}a]		
CO_2 emissions - heating [kg/m^{2}a]		

CO_2 emissions – DHW [kg/m^{2}a]		
CO_2 emissions – cooling [kg/m^{2}a]		
CO_2 emissions – lightning [kg/m^{2}a]		

4. Attachments

V. Building #5

1. Summary of the energy performance of the building and suggested improvement options

1.1. Summary of the existing state of the building

From D3.X.2

1.2. Summary table: existing state of the buiiding

Category	Value
Building type[9]	Educational building
Constriction year / major reconstruction year	Xxxx / xxxx
Building fabric[10]	
Building useful area [m^2]	
Useful area of the audited zone [m^2]	
Shape factor - building [1/m]	*Area divided by volume*
Building volume [m^3]	
Volume of the audited zone [m^3]	
Shape factor - audited zone [1/m]	*Area divided by volume*
Number of floors	
Number of building users	
Heating system	*Short characteristics of the system, e.g. electric radiators, district heating + radiators, biomass boiler + under-floor heating, heat pump + air heating system…*
Domestic hot water (DHW) system	*Short characteristics of the system, e.g. central/local, electric/gas, boiler/district heating…*
Cooling system	*Short characteristics of the system*
Lightning system	*Short characteristics of the system*
Primary energy consumption - total [kWh/m^2a]	
Primary energy consumption - heating [kWh/m^2a]	

[9] Single-family house, Apartment block, Office, Educational building, Hospital, Hotels and restaurants, Sport facilities, Wholesale and retail trade services buildings

[10] E.g. Building Fabric, Brick wall with cavity wall, Brick wall without cavity wall, Double-skin façade, Curtain wall, Concrete wall, Stone Wall, Sheet panel, Concrete block wall, Prefabricated, Mainly Glass facade

Primary energy consumption - DHW [kWh/m^{2}a]	
Primary energy consumption - cooling [kWh/m^{2}a]	
Primary energy consumption - lightning [kWh/m^{2}a]	
Final energy consumption - total [kWh/m^{2}a]	
Final energy consumption - heating [kWh/m^{2}a]	
Final energy consumption - DHW [kWh/m^{2}a]	
Final energy consumption - cooling [kWh/m^{2}a]	
Final energy consumption - lightning [kWh/m^{2}a]	
CO_2 emissions - total [kg/m^{2}a]	
CO_2 emissions - heating [kg/m^{2}a]	
CO_2 emissions - DHW [kg/m^{2}a]	
CO_2 emissions - cooling [kg/m^{2}a]	
CO_2 emissions - lightning [kg/m^{2}a]	

1.3. Suggested implementation programme and its expected results

A short summary of the recommended modernisation variant. The text should summarise the table from the next section.

1.4. Summary table: suggested measures, energy savings, financial savings

No.	Measure	Final energy savings [kWh/a]	Primary energy savings [kWh/a]	CO_2 reduction [Mg/a]	Financial savings [EUR/a]	Investment costs [EUR/a]	Payback time [years]
21.							
22.							
23.							
24.							
25.							

Please add as many rows as needed

2. Energy efficiency improvement options

Please provide in the following sections data on:

- *Name of the energy efficiency measure*
- *Description of the measure (what should be done), including technical parameters of the measure (e.g. heat transfer coefficient of an insulation material, efficiency of technical equipment that should be replaced)*
- *Values of all parameters that are necessary to calculate savings (before and after modernisation)*
- *Final energy savings [kWh/a]*
- *Primary energy savings [kWh/a]*
- *CO_2 reduction [Mg/a]*
- *Financial savings [EUR/a]*
- *Investment costs [EUR/a]*
- *Payback time [years]*

2.1. Heating system

2.2. Water and sewage system

2.3. HVAC

2.4. Cooling system

2.5. Electric system

2.6. Building envelope

2.7. Renewable energy sources

2.8. Lightning system

2.9. Other systems

2.10. User behaviour change

2.11. Other suggestions

2.12. Assumptions used in calculating savings and the resulting accuracy of the recommendations

2.12.1. Assumptions

2.12.2. Accuracy

2.12.3. Methods and standards used

3. Renovation scheme

3.1. Aim of the renovation plan

The aim should be agreed with the school/city managers (e.g. they may wish to renovate the building facade) as well as be based on the FEEDSCHOOLS project objectives (transformation into NZEB). Please indicate here also all boundaries of the renovation, which may have impact on some measures (e.g. in historical buildings it's almost impossible to apply external insulation; there is no gas grid in the neighbourhood so it's not possible to install gas boiler etc.).

3.2. Criteria for ranking energy efficiency improvement measures

Please describe here how you compare various energy efficiency measures and decide on the optimal plan (e.g. shortest payback time, highest final energy savings, highest financial savings, combination of these criteria etc.). Criteria should be discussed with school/ city managers first.

3.3. Potential interactions with other proposed recommendations

Please describe here how measures proposed in Section 2 influence each other (e.g. application of a thermal insulation in the building façade may decrease the capacity of the boiler).

3.4. Suggested measures (optimal implementation plan)

Based on selection criteria chosen and taking into account potential interactions between measures described in previous sections, please indicate here measures that are part of an optimal implementation plan.

3.5. Impact of the renovation scheme

	Existing	After implementation
Primary energy consumption - total [kWh/m^{2}a]		
Primary energy consumption - heating [kWh/m^{2}a]		
Primary energy consumption - DHW [kWh/m^{2}a]		
Primary energy consumption - cooling [kWh/m^{2}a]		
Primary energy consumption - lightning [kWh/m^{2}a]		
Final energy consumption - total [kWh/m^{2}a]		
Final energy consumption - heating [kWh/m^{2}a]		
Final energy consumption - DHW [kWh/m^{2}a]		
Final energy consumption - cooling [kWh/m^{2}a]		
Final energy consumption - lightning [kWh/m^{2}a]		
CO_2 emissions - total [kg/m^{2}a]		
CO_2 emissions - heating [kg/m^{2}a]		

CO_2 emissions – DHW [kg/m^{2}a]		
CO_2 emissions – cooling [kg/m^{2}a]		
CO_2 emissions – lightning [kg/m^{2}a]		

4. Attachments

VI. Building #6

1. Summary of the energy performance of the building and suggested improvement options

1.1. Summary of the existing state of the building

From D3.X.2

1.2. Summary table: existing state of the buiilding

Category	Value
Building type[11]	Educational building
Constriction year / major reconstruction year	Xxxx / xxxx
Building fabric[12]	
Building useful area [m^2]	
Useful area of the audited zone [m^2]	
Shape factor - building [1/m]	*Area divided by volume*
Building volume [m^3]	
Volume of the audited zone [m^3]	
Shape factor - audited zone [1/m]	*Area divided by volume*
Number of floors	
Number of building users	
Heating system	*Short characteristics of the system, e.g. electric radiators, district heating + radiators, biomass boiler + under-floor heating, heat pump + air heating system…*
Domestic hot water (DHW) system	*Short characteristics of the system, e.g. central/local, electric/gas, boiler/district heating…*
Cooling system	*Short characteristics of the system*
Lightning system	*Short characteristics of the system*
Primary energy consumption - total [kWh/m^2a]	
Primary energy consumption - heating [kWh/m^2a]	

[11] Single-family house, Apartment block, Office, Educational building, Hospital, Hotels and restaurants, Sport facilities, Wholesale and retail trade services buildings

[12] E.g. Building Fabric, Brick wall with cavity wall, Brick wall without cavity wall, Double-skin façade, Curtain wall, Concrete wall, Stone Wall, Sheet panel, Concrete block wall, Prefabricated, Mainly Glass facade

Primary energy consumption - DHW [kWh/m^{2}a]	
Primary energy consumption - cooling [kWh/m^{2}a]	
Primary energy consumption - lightning [kWh/m^{2}a]	
Final energy consumption - total [kWh/m^{2}a]	
Final energy consumption - heating [kWh/m^{2}a]	
Final energy consumption - DHW [kWh/m^{2}a]	
Final energy consumption - cooling [kWh/m^{2}a]	
Final energy consumption - lightning [kWh/m^{2}a]	
CO_2 emissions - total [kg/m^{2}a]	
CO_2 emissions - heating [kg/m^{2}a]	
CO_2 emissions - DHW [kg/m^{2}a]	
CO_2 emissions - cooling [kg/m^{2}a]	
CO_2 emissions - lightning [kg/m^{2}a]	

1.3. Suggested implementation programme and its expected results

A short summary of the recommended modernisation variant. The text should summarise the table from the next section.

1.4. Summary table: suggested measures, energy savings, financial savings

No.	Measure	Final energy savings [kWh/a]	Primary energy savings [kWh/a]	CO_2 reduction [Mg/a]	Financial savings [EUR/a]	Investment costs [EUR/a]	Payback time [years]
26.							
27.							
28.							
29.							
30.							

Please add as many rows as needed

2. Energy efficiency improvement options

Please provide in the following sections data on:

- *Name of the energy efficiency measure*
- *Description of the measure (what should be done), including technical parameters of the measure (e.g. heat transfer coefficient of an insulation material, efficiency of technical equipment that should be replaced)*
- *Values of all parameters that are necessary to calculate savings (before and after modernisation)*
- *Final energy savings [kWh/a]*
- *Primary energy savings [kWh/a]*
- *CO_2 reduction [Mg/a]*
- *Financial savings [EUR/a]*
- *Investment costs [EUR/a]*
- *Payback time [years]*

2.1. Heating system

2.2. Water and sewage system

2.3. HVAC

2.4. Cooling system

2.5. Electric system

2.6. Building envelope

2.7. Renewable energy sources

2.8. Lightning system

2.9. Other systems

2.10. User behaviour change

2.11. Other suggestions

2.12. Assumptions used in calculating savings and the resulting accuracy of the recommendations

2.12.1. Assumptions

2.12.2. Accuracy

2.12.3. Methods and standards used

3. Renovation scheme

3.1. Aim of the renovation plan

The aim should be agreed with the school/city managers (e.g. they may wish to renovate the building facade) as well as be based on the FEEDSCHOOLS project objectives (transformation into NZEB). Please indicate here also all boundaries of the renovation, which may have impact on some measures (e.g. in historical buildings it's almost impossible to apply external insulation; there is no gas grid in the neighbourhood so it's not possible to install gas boiler etc.).

3.2. Criteria for ranking energy efficiency improvement measures

Please describe here how you compare various energy efficiency measures and decide on the optimal plan (e.g. shortest payback time, highest final energy savings, highest financial savings, combination of these criteria etc.). Criteria should be discussed with school/ city managers first.

3.3. Potential interactions with other proposed recommendations

Please describe here how measures proposed in Section 2 influence each other (e.g. application of a thermal insulation in the building façade may decrease the capacity of the boiler).

3.4. Suggested measures (optimal implementation plan)

Based on selection criteria chosen and taking into account potential interactions between measures described in previous sections, please indicate here measures that are part of an optimal implementation plan.

3.5. Impact of the renovation scheme

	Existing	After implementation
Primary energy consumption - total [kWh/m^{2}a]		
Primary energy consumption - heating [kWh/m^{2}a]		
Primary energy consumption - DHW [kWh/m^{2}a]		
Primary energy consumption - cooling [kWh/m^{2}a]		
Primary energy consumption - lightning [kWh/m^{2}a]		
Final energy consumption - total [kWh/m^{2}a]		
Final energy consumption - heating [kWh/m^{2}a]		
Final energy consumption - DHW [kWh/m^{2}a]		
Final energy consumption - cooling [kWh/m^{2}a]		
Final energy consumption - lightning [kWh/m^{2}a]		
CO_2 emissions - total [kg/m^{2}a]		
CO_2 emissions - heating [kg/m^{2}a]		

CO_2 emissions – DHW [kg/m^{2}a]		
CO_2 emissions – cooling [kg/m^{2}a]		
CO_2 emissions – lightning [kg/m^{2}a]		

4. Attachments

VII. Building #7

1. Summary of the energy performance of the building and suggested improvement options

1.1. Summary of the existing state of the building

From D3.X.2

1.2. Summary table: existing state of the buiiding

Category	Value
Building type[13]	Educational building
Constriction year / major reconstruction year	Xxxx / xxxx
Building fabric[14]	
Building useful area [m^2]	
Useful area of the audited zone [m^2]	
Shape factor - building [1/m]	*Area divided by volume*
Building volume [m^3]	
Volume of the audited zone [m^3]	
Shape factor - audited zone [1/m]	*Area divided by volume*
Number of floors	
Number of building users	
Heating system	*Short characteristics of the system, e.g. electric radiators, district heating + radiators, biomass boiler + under-floor heating, heat pump + air heating system…*
Domestic hot water (DHW) system	*Short characteristics of the system, e.g. central/local, electric/gas, boiler/district heating…*
Cooling system	*Short characteristics of the system*
Lightning system	*Short characteristics of the system*
Primary energy consumption - total [kWh/m^2a]	
Primary energy consumption - heating [kWh/m^2a]	

[13] Single-family house, Apartment block, Office, Educational building, Hospital, Hotels and restaurants, Sport facilities, Wholesale and retail trade services buildings

[14] E.g. Building Fabric, Brick wall with cavity wall, Brick wall without cavity wall, Double-skin façade, Curtain wall, Concrete wall, Stone Wall, Sheet panel, Concrete block wall, Prefabricated, Mainly Glass facade

Primary energy consumption - DHW [kWh/m^{2}a]	
Primary energy consumption - cooling [kWh/m^{2}a]	
Primary energy consumption - lightning [kWh/m^{2}a]	
Final energy consumption - total [kWh/m^{2}a]	
Final energy consumption - heating [kWh/m^{2}a]	
Final energy consumption - DHW [kWh/m^{2}a]	
Final energy consumption - cooling [kWh/m^{2}a]	
Final energy consumption - lightning [kWh/m^{2}a]	
CO_2 emissions - total [kg/m^{2}a]	
CO_2 emissions - heating [kg/m^{2}a]	
CO_2 emissions - DHW [kg/m^{2}a]	
CO_2 emissions - cooling [kg/m^{2}a]	
CO_2 emissions - lightning [kg/m^{2}a]	

1.3. Suggested implementation programme and its expected results

A short summary of the recommended modernisation variant. The text should summarise the table from the next section.

1.4. Summary table: suggested measures, energy savings, financial savings

No.	Measure	Final energy savings [kWh/a]	Primary energy savings [kWh/a]	CO_2 reduction [Mg/a]	Financial savings [EUR/a]	Investment costs [EUR/a]	Payback time [years]
31.							
32.							
33.							
34.							
35.							

Please add as many rows as needed

2. Energy efficiency improvement options

Please provide in the following sections data on:

- *Name of the energy efficiency measure*
- *Description of the measure (what should be done), including technical parameters of the measure (e.g. heat transfer coefficient of an insulation material, efficiency of technical equipment that should be replaced)*
- *Values of all parameters that are necessary to calculate savings (before and after modernisation)*
- *Final energy savings [kWh/a]*
- *Primary energy savings [kWh/a]*
- *CO_2 reduction [Mg/a]*
- *Financial savings [EUR/a]*
- *Investment costs [EUR/a]*
- *Payback time [years]*

2.1. Heating system

2.2. Water and sewage system

2.3. HVAC

2.4. Cooling system

2.5. Electric system

2.6. Building envelope

2.7. Renewable energy sources

2.8. Lightning system

2.9. Other systems

2.10. User behaviour change

2.11. Other suggestions

2.12. Assumptions used in calculating savings and the resulting accuracy of the recommendations

2.12.1. Assumptions

2.12.2. Accuracy

2.12.3. Methods and standards used

3. Renovation scheme

3.1. Aim of the renovation plan

The aim should be agreed with the school/city managers (e.g. they may wish to renovate the building facade) as well as be based on the FEEDSCHOOLS project objectives (transformation into NZEB). Please indicate here also all boundaries of the renovation, which may have impact on some measures (e.g. in historical buildings it's almost impossible to apply external insulation; there is no gas grid in the neighbourhood so it's not possible to install gas boiler etc.).

3.2. Criteria for ranking energy efficiency improvement measures

Please describe here how you compare various energy efficiency measures and decide on the optimal plan (e.g. shortest payback time, highest final energy savings, highest financial savings, combination of these criteria etc.). Criteria should be discussed with school/ city managers first.

3.3. Potential interactions with other proposed recommendations

Please describe here how measures proposed in Section 2 influence each other (e.g. application of a thermal insulation in the building façade may decrease the capacity of the boiler).

3.4. Suggested measures (optimal implementation plan)

Based on selection criteria chosen and taking into account potential interactions between measures described in previous sections, please indicate here measures that are part of an optimal implementation plan.

3.5. Impact of the renovation scheme

	Existing	After implementation
Primary energy consumption - total [kWh/m^{2}a]		
Primary energy consumption - heating [kWh/m^{2}a]		
Primary energy consumption - DHW [kWh/m^{2}a]		
Primary energy consumption - cooling [kWh/m^{2}a]		
Primary energy consumption - lightning [kWh/m^{2}a]		
Final energy consumption - total [kWh/m^{2}a]		
Final energy consumption - heating [kWh/m^{2}a]		
Final energy consumption - DHW [kWh/m^{2}a]		
Final energy consumption - cooling [kWh/m^{2}a]		
Final energy consumption - lightning [kWh/m^{2}a]		
CO_2 emissions - total [kg/m^{2}a]		
CO_2 emissions - heating [kg/m^{2}a]		

CO_2 emissions – DHW [kg/m^{2}a]		
CO_2 emissions – cooling [kg/m^{2}a]		
CO_2 emissions – lightning [kg/m^{2}a]		

4. Attachments

VIII. Building #8

1. Summary of the energy performance of the building and suggested improvement options

1.1. Summary of the existing state of the building

From D3.X.2

1.2. Summary table: existing state of the buiiding

Category	Value
Building type[15]	Educational building
Constriction year / major reconstruction year	Xxxx / xxxx
Building fabric[16]	
Building useful area [m^2]	
Useful area of the audited zone [m^2]	
Shape factor - building [1/m]	*Area divided by volume*
Building volume [m^3]	
Volume of the audited zone [m^3]	
Shape factor - audited zone [1/m]	*Area divided by volume*
Number of floors	
Number of building users	
Heating system	*Short characteristics of the system, e.g. electric radiators, district heating + radiators, biomass boiler + under-floor heating, heat pump + air heating system…*
Domestic hot water (DHW) system	*Short characteristics of the system, e.g. central/local, electric/gas, boiler/district heating…*
Cooling system	*Short characteristics of the system*
Lightning system	*Short characteristics of the system*
Primary energy consumption - total [kWh/m^2a]	
Primary energy consumption - heating [kWh/m^2a]	

[15] Single-family house, Apartment block, Office, Educational building, Hospital, Hotels and restaurants, Sport facilities, Wholesale and retail trade services buildings

[16] E.g. Building Fabric, Brick wall with cavity wall, Brick wall without cavity wall, Double-skin façade, Curtain wall, Concrete wall, Stone Wall, Sheet panel, Concrete block wall, Prefabricated, Mainly Glass facade

Primary energy consumption - DHW [kWh/m^{2}a]	
Primary energy consumption - cooling [kWh/m^{2}a]	
Primary energy consumption - lightning [kWh/m^{2}a]	
Final energy consumption - total [kWh/m^{2}a]	
Final energy consumption - heating [kWh/m^{2}a]	
Final energy consumption - DHW [kWh/m^{2}a]	
Final energy consumption - cooling [kWh/m^{2}a]	
Final energy consumption - lightning [kWh/m^{2}a]	
CO_2 emissions - total [kg/m^{2}a]	
CO_2 emissions - heating [kg/m^{2}a]	
CO_2 emissions - DHW [kg/m^{2}a]	
CO_2 emissions - cooling [kg/m^{2}a]	
CO_2 emissions - lightning [kg/m^{2}a]	

1.3. Suggested implementation programme and its expected results

A short summary of the recommended modernisation variant. The text should summarise the table from the next section.

1.4. Summary table: suggested measures, energy savings, financial savings

No.	Measure	Final energy savings [kWh/a]	Primary energy savings [kWh/a]	CO_2 reduction [Mg/a]	Financial savings [EUR/a]	Investment costs [EUR/a]	Payback time [years]
36.							
37.							
38.							
39.							
40.							

Please add as many rows as needed

2. Energy efficiency improvement options

Please provide in the following sections data on:

- *Name of the energy efficiency measure*
- *Description of the measure (what should be done), including technical parameters of the measure (e.g. heat transfer coefficient of an insulation material, efficiency of technical equipment that should be replaced)*
- *Values of all parameters that are necessary to calculate savings (before and after modernisation)*
- *Final energy savings [kWh/a]*
- *Primary energy savings [kWh/a]*
- *CO_2 reduction [Mg/a]*
- *Financial savings [EUR/a]*
- *Investment costs [EUR/a]*
- *Payback time [years]*

2.1. Heating system

2.2. Water and sewage system

2.3. HVAC

2.4. Cooling system

2.5. Electric system

2.6. Building envelope

2.7. Renewable energy sources

2.8. Lightning system

2.9. Other systems

2.10. User behaviour change

2.11. Other suggestions

2.12. Assumptions used in calculating savings and the resulting accuracy of the recommendations

2.12.1. Assumptions

2.12.2. Accuracy

2.12.3. Methods and standards used

3. Renovation scheme

3.1. Aim of the renovation plan

The aim should be agreed with the school/city managers (e.g. they may wish to renovate the building facade) as well as be based on the FEEDSCHOOLS project objectives (transformation into NZEB). Please indicate here also all boundaries of the renovation, which may have impact on some measures (e.g. in historical buildings it's almost impossible to apply external insulation; there is no gas grid in the neighbourhood so it's not possible to install gas boiler etc.).

3.2. Criteria for ranking energy efficiency improvement measures

Please describe here how you compare various energy efficiency measures and decide on the optimal plan (e.g. shortest payback time, highest final energy savings, highest financial savings, combination of these criteria etc.). Criteria should be discussed with school/ city managers first.

3.3. Potential interactions with other proposed recommendations

Please describe here how measures proposed in Section 2 influence each other (e.g. application of a thermal insulation in the building façade may decrease the capacity of the boiler).

3.4. Suggested measures (optimal implementation plan)

Based on selection criteria chosen and taking into account potential interactions between measures described in previous sections, please indicate here measures that are part of an optimal implementation plan.

3.5. Impact of the renovation scheme

	Existing	After implementation
Primary energy consumption - total [kWh/m^{2}a]		
Primary energy consumption - heating [kWh/m^{2}a]		
Primary energy consumption - DHW [kWh/m^{2}a]		
Primary energy consumption - cooling [kWh/m^{2}a]		
Primary energy consumption - lightning [kWh/m^{2}a]		
Final energy consumption - total [kWh/m^{2}a]		
Final energy consumption - heating [kWh/m^{2}a]		
Final energy consumption - DHW [kWh/m^{2}a]		
Final energy consumption - cooling [kWh/m^{2}a]		
Final energy consumption - lightning [kWh/m^{2}a]		
CO_2 emissions - total [kg/m^{2}a]		
CO_2 emissions - heating [kg/m^{2}a]		

CO_2 emissions – DHW [kg/m^{2}a]		
CO_2 emissions – cooling [kg/m^{2}a]		
CO_2 emissions – lightning [kg/m^{2}a]		

4. Attachments