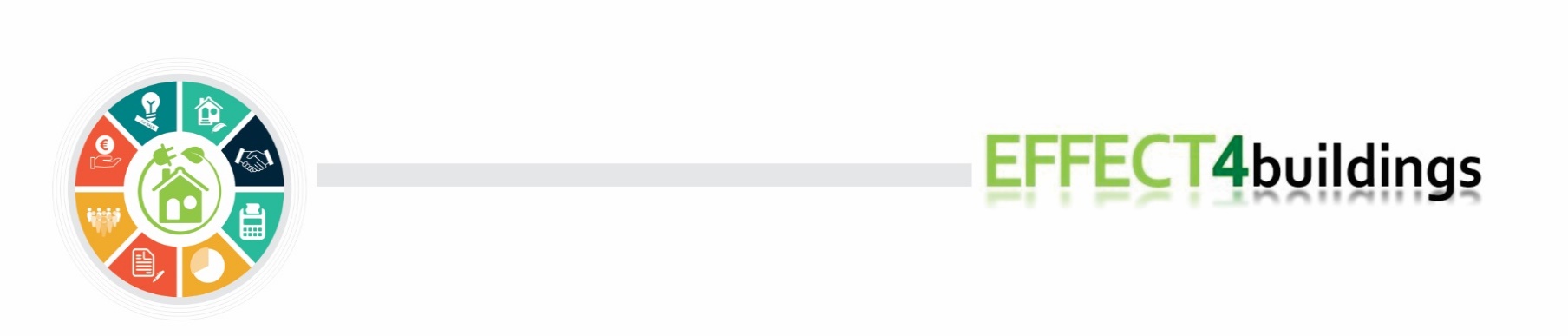




**Mapping of indoor environmental quality in schools by students**

**Template example**

**EFFECT4buildings Toolbox:**Multi Service Contracting; Annex 4.4



The project “Effective Financing Tools for implementing Energy Efficiency in Buildings” (EFFECT4buildings) develops in collaboration with public building managers a comprehensive decision-making support toolbox with a set of financial instruments: **Financial calculation tools**; **Bundling**; **Funding**; **Convincing decision makers**; **Energy Performance Contract**; **Multi Service Contract**; **Green Lease Contract**; **Prosumerism**. The tools and instruments chosen by the project has the biggest potential to help building managers to overcome financial barriers, based on nearly 40 interviews with the target group. The project improves these tools through different real cases.

To make sure building managers invest in the best available solutions, more knowledge on different possibilities is needed as well as confirmation from colleagues that the solutions performs well. EFFECT4buildings mapped **technological solutions** for energy efficiency in buildings with the aim to share knowledge and experiences of energy efficiency solutions among building managers in the Baltic Sea Region.

This document is a part of the Multi Service Contracting (MSC) toolbox within the group of tool 4, “mapping and analysis tools for different services*”*. It presents templates for mapping indoor environmental quality which could be used in an MSC project phase 1.

EFFECT4buildings project is implemented with the support from the EU funding Programme Interreg Baltic Sea Region (European Regional Development Fund) and Norwegian national funding. The aim of the project is to improve the capacity of public building managers in the Baltic Sea Region by providing them a comprehensive decision-making support toolbox with a set of financial instruments to unlock the investments and lower the risks of implementing energy efficiency measures in buildings owned by public stakeholders. More information: <http://www.effect4buildings.se/>



**Partners**

**Table of content**

[Introduction to mapping tool 4](#_Toc43202284)

[Survey indoor environmental quality 5](#_Toc43202285)

[Summary of answers in the survey 6](#_Toc43202286)

[Summary 7](#_Toc43202287)

[Requirements 7](#_Toc43202288)

[Template for technical mapping of indoor environmental quality 8](#_Toc43202289)

[Instruction 8](#_Toc43202290)

[Measurement of light 8](#_Toc43202291)

[Measurement of noise 9](#_Toc43202292)

[Measurement of temperature 9](#_Toc43202293)

[Measurement of carbon dioxide 10](#_Toc43202294)

[Measurement of air humidity 10](#_Toc43202295)

[Measurement of risk for legionella bacteria 11](#_Toc43202296)

[Summary of measurements 12](#_Toc43202297)

[Summary 12](#_Toc43202298)

[Requirements 12](#_Toc43202299)

# Introduction to mapping tool

In phase 0 and phase 1 of the MSC process the building owner defines objectives together with the MSC supplier. In these phases it is important to map the condition of the buildings to assess which objectives should be included in the MSC. With more knowledge gained on actual needs for improvements decision makers can prioritise between objectives. After the renovation we recommend redoing the mapping to follow up on whether the intended effect has been achieved.

This template can be used for mapping the indoor environmental quality and is costumed to schools. It can also be used for other building types with some adjustments. The template entails both a template for a survey with focus on experienced indoor environment and a template for a technical mapping of indoor environment. The approvement levels set in the technical mapping are corresponding with Swedish regulation and one should always check corresponding regulation in one’s own country.

The survey is intended to be carried out by the student representatives to find out what students at the school think about the school's work environment. It is desirable that all students at the school respond, but each school determines the scope. After the survey is completed, the student representatives have a better idea of which premises that needs to be measured in the technical mapping. The measurements are carried out by the student representatives ideally together with the school's janitor or operation staff and with the help of measuring equipment.

The template is made for being used by student representatives involved in management of the indoor environment but could be used by others. Yet, whoever carries out the mapping should have some prior knowledge of the subject, adjust the template to the project and for the technical part have access to and apply certain instruments for measuring.

The templates have been developed and tested together with the student union “Sveriges Elevkårer”.

# Survey indoor environmental quality

**1. Are there places in the school where you find that light is bad?**Yes No

If you answered yes to the question, where are those places?

**2. Are there places in the school where you find it is a lot of noise?**Yes No

If you answered yes to the question, where are those places?

**3. Are there places in the school where you find that air is bad?**Yes No

If you answered yes to the question, where are those places?

**4. Are there places in the school where you find that it is to warm or cold?**Yes No

If you answered yes to the question, where are those places?

**5. Are there places in the school that you think are badly cleaned?**Yes No

If you answered yes to the question, where are those places?

**6. Do you find that there are places in the school where you risk hurting yourself or being injured by someone/something?**  
Yes No

If you answered yes to the question, where are those places?

**Is there anything else you would like to have improved in the indoor environment?**

## Summary of answers in the survey

School \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Amount of answers \_\_\_\_\_\_\_\_\_\_\_\_\_ (number of how many that answered)

Count the number of answers for each question and write down how many percent answered yes or no. Then make a list of the most common answers in the open questions.

|  |  |  |
| --- | --- | --- |
| **Question 1 (light)** | **Yes (%)** | **No (%)** |
|  |  |  |

|  |  |
| --- | --- |
| **Open answers** |  |

|  |  |  |
| --- | --- | --- |
| **Question 2 (noise)** | **Yes (%)** | **No (%)** |
|  |  |  |

|  |  |
| --- | --- |
| **Open answers** |  |

|  |  |  |
| --- | --- | --- |
| **Question 3 (air)** | **Yes (%)** | **No (%)** |
|  |  |  |

|  |  |
| --- | --- |
| **Open answers** |  |

|  |  |  |
| --- | --- | --- |
| **Question 4 (temp)** | **Yes (%)** | **No (%)** |
|  |  |  |

|  |  |
| --- | --- |
| **Open answers** |  |

|  |  |  |
| --- | --- | --- |
| **Question 5 (cleaning)** | **Yes (%)** | **No (%)** |
|  |  |  |

|  |  |
| --- | --- |
| **Open answers** |  |

|  |  |  |
| --- | --- | --- |
| **Question 6 (danger)** | **Yes (%)** | **No (%)** |
|  |  |  |

|  |  |
| --- | --- |
| **Open answers** |  |

**Other answers**



SummaryWrite a short summary of the findings in the survey.

RequirementsMake a list of things that you want changed.

# Template for technical mapping of indoor environmental quality

Use the template for filling in the results from measurements at the same time as you are doing them. To do the survey, tools for measurement of light, noise, temperature, carbon dioxide and air humidity is needed. Measurements can be made in those parts of the school where problems have been reported in the survey or on the basis of other choice. Measurements should be made in several of the school's premises and it may need to be measured in several places in each room, especially if the room is large.

## Instruction

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Premises** | **Place** | **Target** | **Measurement** | **Approved** |
| Class room nr 12 | Blackboard | 500 lux | 600 lux | YES |
| Library | Reading lamp | 600 lux | 500 lux | NO |

## Measurement of light

For measurement of light a luxmeter is needed. The following target values apply:

Reading: At least 500 lux  
From roof lamps: At least 300 lux  
Corridors: At least 150 lux  
By the blackboard: At least 500 lux  
In face height: At least 200 lux

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Premises** | **Place** | **Target**  **(lux)** | **Measurement  (lux)** | **Approved** |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

## Measurement of noise

For measurement of noise a decibel meter is needed. It should be done when pupils are present and work in a normal way. The following target values apply:

Background noise: Maximum 30 dB  
Ordinary conversations: Maximum 60 dB  
Risk for hearing loss: Maximum 85 dB  
Lasting hearing loss: Maximum 120 dB

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Premises** | **Place** | **Target**  **(dB)** | **Measurement  (dB)** | **Approved** |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

## Measurement of temperature

For measurement of temperature a thermometer is needed. It should be done when pupils are present and work in a normal way. The following target values apply:

Classroom: 18-22oC  
Assembly hall: 18-22oC  
Sports hall: 15-19oC

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Premises** | **Place** | **Target**  **(oC)** | **Measurement  (oC)** | **Approved** |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

## Measurement of carbon dioxide

For measurement of carbon dioxide, a carbon meter is needed. It should be done when pupils are present and work in a normal way. The following target values apply:

Carbon dioxide: 1000 ppm

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Premises** | **Place** | **Target**  **(ppm)** | **Measurement  (ppm)** | **Approved** |
|  |  | 1000 |  |  |
|  |  | 1000 |  |  |
|  |  | 1000 |  |  |
|  |  | 1000 |  |  |
|  |  | 1000 |  |  |
|  |  | 1000 |  |  |
|  |  | 1000 |  |  |
|  |  | 1000 |  |  |
|  |  | 1000 |  |  |

## Measurement of air humidity

For measurement of air humidity, a hygrometer is needed. It should be done when pupils are present and work in a normal way. The following target values apply:

Air humidity: 35-70 %

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Premises** | **Place** | **Target**  **(%)** | **Measurement  (%)** | **Approved** |
|  |  | 35-70 % |  |  |
|  |  | 35-70 % |  |  |
|  |  | 35-70 % |  |  |
|  |  | 35-70 % |  |  |
|  |  | 35-70 % |  |  |
|  |  | 35-70 % |  |  |
|  |  | 35-70 % |  |  |
|  |  | 35-70 % |  |  |

## Measurement of risk for legionella bacteria

Legionella bacteria can be found in the showers in e.g. schools and sport centres and are dangerous when it is inhaled (e.g. in the form of very small droplets), but not when drinking. It proliferates most in stagnant warm water (± 40°C). It cannot withstand temperatures higher than 60°C and dies. To prevent risks the water flow should be hot enough. To measure legionella risk a thermometer is needed. Temperature should be measured on the water coming straight from the hot water tap. The following target values apply:

Hot water temperature: 55-60oC

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Premises** | **Place** | **Target**  **(oC)** | **Measurement  (oC)** | **Approved** |
|  |  | 55-60oC |  |  |
|  |  | 55-60oC |  |  |
|  |  | 55-60oC |  |  |
|  |  | 55-60oC |  |  |
|  |  | 55-60oC |  |  |
|  |  | 55-60oC |  |  |
|  |  | 55-60oC |  |  |
|  |  | 55-60oC |  |  |
|  |  | 55-60oC |  |  |

## Summary of measurements

Make a summary of the places in the school that has not been approved.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Premises** | **Place** | **Measurement done by** | **Target** | **Measurement** |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

SummaryWrite a short summary of the findings in the technical mapping.

RequirementsMake a list of things that you want changed.





