
# Guideline for excel based financial calculation tool

**EFFECT4buildings Toolbox:**

Financial calculations; Annex 1a

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 includes a guideline for a comprehensive excel based Financial calculation tool.
The excel based tool is a pleasant and handy tool, easily available for building managers to study the profitability and other aspects of different investments. With this tool building managers can compare and evaluate energy efficiency measures to get better understanding of energy investment profitability.
In addition Energy auditors are encouraged to take advantage of results from this tool in the energy audit report.

Project has developed also Simplified web calculation tool (https://energi.jahopp.com/energy.html)

## Partners

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/

# First page: “Guidance for using tool”

## Guidance for using tool

**On the first page “**Guidance for using tool”

**On the second page** ”Inputs and results”

First you fill in the background information about the building and energy demand before measures (to the grey cells).

After that you fill in details about your energy efficiency data (to the green cells):

- **An Energy effeciency measure:** fill in measures that you would like to calculate.
- **Length of life cycle/ Technical lifetime (years between 1-50).**

**IMPACT OF THE MEASURES**

- **Energy prices** (€/kWh) for the heating system, electricity and cooling energy
- **Change of purchased amount of energy** (kWh/year)) based on **the measure.**

Both for electricity, heating systems energy and cooling energy

- **Water price** (€/m3)

Includes the price of water and waste water

- **Change of purchased amount of water** (m3/year) based on **the measure**

If the solution **decreases** purchased energy/water, the feeded value is **negative (-)**
If the solution **increases** purchased energy/water, the feeded value is **positive (+)**

- **CO2-emissions of the heating energy, electricity and cooling energy** (kgCO2/kWh).
- **Sensitivity analyse, if energy / water prices change in future**

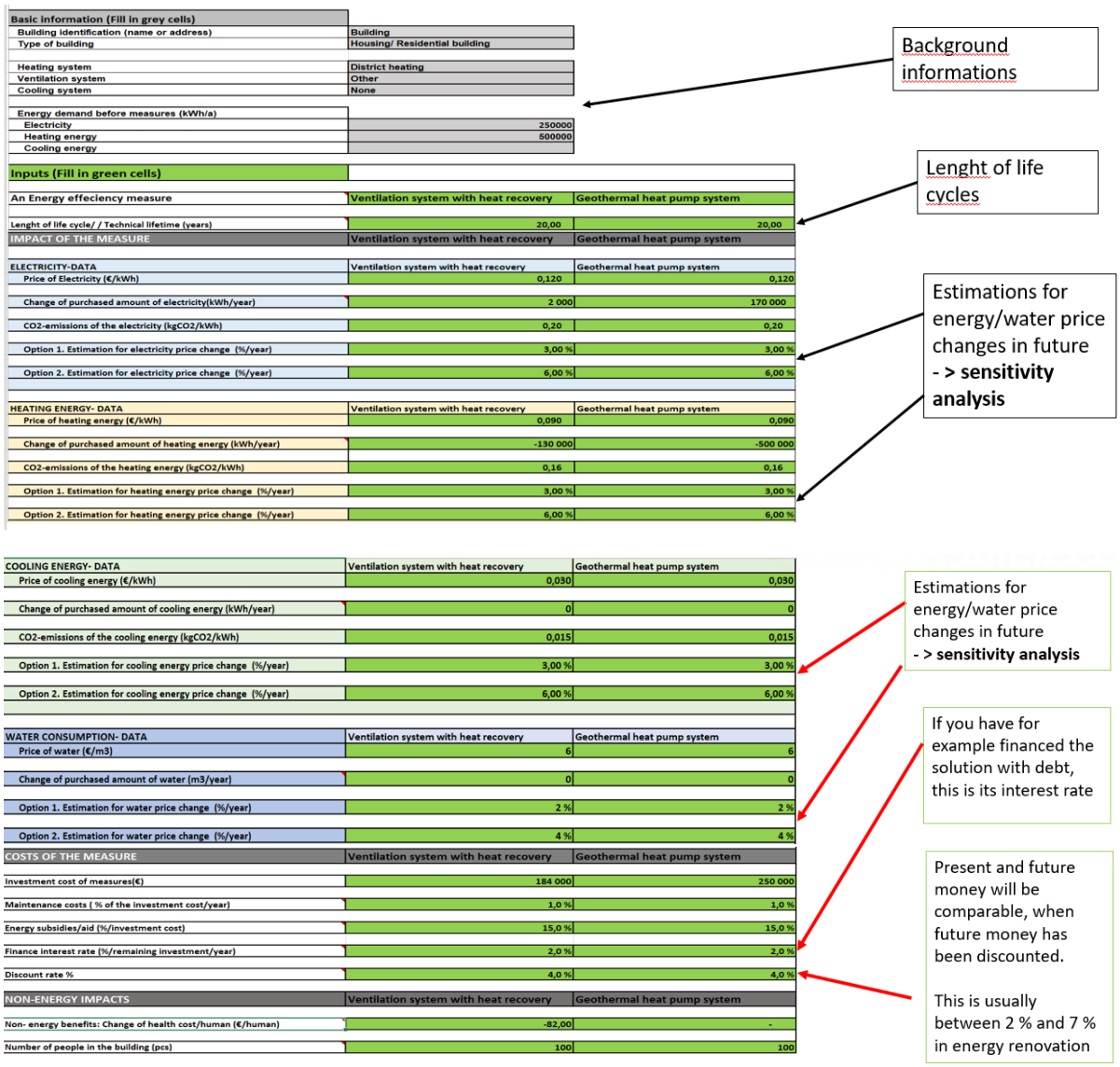
Option 1.Estimation for energy/water price change (% /year) after first year
Option 2.Estimation for energy/water price change (% /year) after first year

**COST OF THE MEASURE**

- **Investment cost of measures** (€) and estimated maintenance cost per year (% / investment costs / year).
- **Possible energy subsidies/aid for the measures** (% / investment costs). If there are no subsidies granted for the measure, insert value as ”0”.
- **Finance interest rate** (%/remaining investment/year). If not, insert value as "0".

# Second page: “Inputs and results”

- Basic information of the building
- Inputs of energy efficiency measures (which shall be compared and evaluated)
- Results



| Basic information (Fill in grey cells) | |
|---|---|
| Building identification (name or address) | Building |
| Type of building | Housing/ Residential building |
| Heating system | District heating |
| Ventilation system | Other |
| Cooling system | None |
| Energy demand before measures (kWh/a) | |
| Electricity | 250000 |
| Heating energy | 500000 |
| Cooling energy | |

| Inputs (Fill in green cells) | | |
|---|---|---|
| An Energy effeciency measure | Ventilation system with heat recovery | Geothermal heat pump system |
| Lenght of life cycle/ / Technical lifetime (years) | 20,00 | 20,00 |
| IMPACT OF THE MEASURE | Ventilation system with heat recovery | Geothermal heat pump system |
| ELECTRICITY-DATA | Ventilation system with heat recovery | Geothermal heat pump system |
| Price of Electricity (€/kWh) | 0,120 | 0,120 |
| Change of purchased amount of electricity(kWh/year) | 2 000 | 170 000 |
| CO2-emissions of the electricity (kgCO2/kWh) | 0,20 | 0,20 |
| Option 1. Estimation for electricity price change (%/year) | 3,00 % | 3,00 % |
| Option 2. Estimation for electricity price change (%/year) | 6,00 % | 6,00 % |
| HEATING ENERGY- DATA | Ventilation system with heat recovery | Geothermal heat pump system |
| Price of heating energy (€/kWh) | 0,090 | 0,090 |
| Change of purchased amount of heating energy (kWh/year) | -130 000 | -500 000 |
| CO2-emissions of the heating energy (kgCO2/kWh) | 0,16 | 0,16 |
| Option 1. Estimation for heating energy price change (%/year) | 3,00 % | 3,00 % |
| Option 2. Estimation for heating energy price change (%/year) | 6,00 % | 6,00 % |

| COOLING ENERGY- DATA | Ventilation system with heat recovery | Geothermal heat pump system |
|---|---|---|
| Price of cooling energy (€/kWh) | 0,030 | 0,030 |
| Change of purchased amount of cooling energy (kWh/year) | 0 | 0 |
| CO2-emissions of the cooling energy (kgCO2/kWh) | 0,015 | 0,015 |
| Option 1. Estimation for cooling energy price change (%/year) | 3,00 % | 3,00 % |
| Option 2. Estimation for cooling energy price change (%/year) | 6,00 % | 6,00 % |
| WATER CONSUMPTION- DATA | Ventilation system with heat recovery | Geothermal heat pump system |
| Price of water (€/m3) | 6 | 6 |
| Change of purchased amount of water (m3/year) | 0 | 0 |
| Option 1. Estimation for water price change (%/year) | 2 % | 2 % |
| Option 2. Estimation for water price change (%/year) | 4 % | 4 % |
| COSTS OF THE MEASURE | Ventilation system with heat recovery | Geothermal heat pump system |
| Investment cost of measures(€) | 184 000 | 250 000 |
| Maintenance costs ( % of the investment cost/year) | 1,0 % | 1,0 % |
| Energy subsidies/aid (%/investment cost) | 15,0 % | 15,0 % |
| Finance interest rate (%/remaining investment/year) | 2,0 % | 2,0 % |
| Discount rate % | 4,0 % | 4,0 % |
| NON-ENERGY IMPACTS | Ventilation system with heat recovery | Geothermal heat pump system |
| Non- energy benefits: Change of health cost/human (€/human) | -82,00 | - |
| Number of people in the building (pcs) | 100 | 100 |

| COSTS OF LIFE CYCLE | Ventilation system with heat recovery | Geothermal heat pump system |
|---|---|---|
| Life cycle result (€) | 36 000 | 229 500 |

= Decreased costs due to measures- increased costs due to measures

| REDUCTION OF CO2-EMISSIONS | Ventilation system with heat recovery | Geothermal heat pump system |
|---|---|---|
| Reduction of CO2- emissions (kgCO2/year) | 20 400 | 46 000 |
| Reduction of CO2-emissions / CO2-emissions before measures (%) | 16 % | 35 % |
| Reduction of CO2- emissions during the Life cycle (kgCO2) | 408 000 | 920 000 |

Reduction of CO2-emissions. Now can be also seen how many percent CO2-emissions have been reduced compared situation before measure.

| NON- ENERGY BENEFITS | Ventilation system with heat recovery | Geothermal heat pump system |
|---|---|---|
| Decrease cost due the Non-energy benefit (€/year) | 8 200 | 0 |
| Pay back time 2 (year), includes the effects of non-energy benefit (for example decrease health costs) | 7,96 | 8,64 |

Results, that include in also the effects of non-energy benefit

| FINANCIAL RESULTS | Ventilation system with heat recovery | Geothermal heat pump system |
|---|---|---|
| Pay back time (year) | 13,65 | 8,64 |

| FINANCIAL RESULTS | Ventilation system with heat recovery | Geothermal heat pump system |
|---|---|---|
| Internal rate of return, IRR (%) | 2,06 % | 8,28 % |
| Internal rate of return, IRR (%), Option 1. Energy/water prices change | 5,24 % | 11,39 % |
| Internal rate of return, IRR (%), Option 2. Energy/water prices change | 8,29 % | 14,43 % |
| Net Present Value, NPV (€) | -51 933 | 65 892 |
| Net Present Value, NPV (€), Option 1. Energy/water prices change | -2 699 | 165 449 |
| Net Present Value, NPV (€), Option 2. Energy/water prices change | 63 833 | 304 738 |
| Cash flow (€) | 1 339 | 203 612 |
| Cash flow (€), Option 1. Energy/water prices change | 86 343 | 374 897 |
| Cash flow (€), Option 2. Energy/water prices change | 203 427 | 620 443 |

Comparison of Internal rate of returns

Comparison of Net present values

Comparison of Cash flows

# Pages 3-7: “Results presented as visual charts”

- Page 3. Package of charts
- Page 4. Cash flow analysis
- Page 5. Net present value, NPV
- Page 6. Payback time
- Page 7. Change of CO2-emissions

## Package of charts

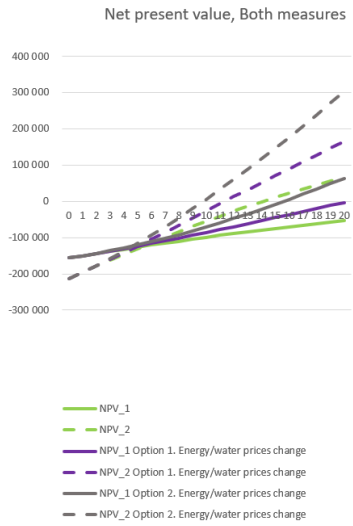

The results of the second operation are shown in dashed lines - - - -, which makes reading easier, especially in the middle diagram, where both actions are shown.

The green line represents a situation where the energy prices will not rise in the future

Violet: prices rise 3% per year

Gray: prices rise 6% per year

## For example Net present value




| Year_1 | Nl Year_2 | Nl Year | NPV_1 Ventilation system with heat re | NPV_2 Geothermal heat pump | NPV_1 Option 1. Energy/water pric Ventilation system with heat recov | NPV_2 Option 1. Energy/water pri Geothermal heat pump system | NPV_1 Option 2. Energy/water pri Ventilation system with heat recor | NPV_2 Option 2. Energy/water prices change Geothermal heat pump system |
|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | -155 400 | -212 500 | -155 400 | -212 500 | -156 400 | -212 500 |
| 1 | 1 | 1 | -150 158 | -195 337 | -150 158 | -195 337 | -150 158 | -195 337 |
| 2 | 2 | 2 | -144 035 | -178 503 | -143 719 | -177 821 | -143 400 | -177 138 |
| 3 | 3 | 3 | -138 031 | -161 993 | -137 086 | -159 966 | -136 124 | -157 900 |
| 4 | 4 | 4 | -132 142 | -145 801 | -130 271 | -141 786 | -128 227 | -137 613 |
| 5 | 5 | 5 | -126 366 | -129 920 | -123 278 | -123 292 | -120 008 | -116 272 |
| 6 | 6 | 6 | -120 701 | -114 345 | -116 114 | -104 497 | -111 162 | -93 868 |
| 7 | 7 | 7 | -115 146 | -99 069 | -108 784 | -85 414 | -101 787 | -70 394 |
| 8 | 8 | 8 | -109 697 | -84 087 | -101 296 | -66 054 | -91 880 | -45 842 |
| 9 | 9 | 9 | -104 352 | -69 393 | -93 654 | -46 428 | -81 437 | -20 202 |
| 10 | 10 | 10 | -99 111 | -54 982 | -85 885 | -26 549 | -70 454 | 6 186 |
| 11 | 11 | 11 | -93 970 | -40 847 | -77 935 | -6 697 | -59 928 | 33 179 |
| 12 | 12 | 12 | -88 929 | -27 044 | -69 868 | 13 010 | -46 854 | 60 785 |
| 13 | 13 | 13 | -83 984 | -13 771 | -61 671 | 32 573 | -34 229 | 89 012 |
| 14 | 14 | 14 | -79 134 | -1 009 | -53 349 | 51 991 | -21 176 | 117 869 |
| 15 | 15 | 15 | -74 378 | 11 262 | -44 906 | 71 264 | -7 811 | 147 363 |
| 16 | 16 | 16 | -69 713 | 23 062 | -36 356 | 90 392 | 5 870 | 177 505 |
| 17 | 17 | 17 | -65 138 | 34 407 | -27 859 | 109 374 | 19 671 | 208 304 |
| 18 | 18 | 18 | -60 650 | 45 316 | -19 417 | 128 211 | 34 196 | 239 769 |
| 19 | 19 | 19 | -56 249 | 55 806 | -11 030 | 146 903 | 48 848 | 271 910 |
| 20 | 20 | 20 | -51 933 | 65 892 | -2 699 | 165 449 | 63 833 | 304 738 |

# Results are available and presented in diverse optional ways

- building managers will get the best information about the profitability of investments
- other partners and relevant stakeholders (for example decision makers) will review results in quite a short time for example in the meeting.

-> to fulfill this requirement the most relevant results are also presented as visual and clear charts.

Interreg Baltic Sea Region

EUROPEAN UNION

EUROPEAN REGIONAL DEVELOPMENT FUND

EU STRATEGY FOR THE BALTIC SEA REGION FLAGSHIP

EFFECT4buildings