

O.T1.1 TOOLS FOR MEASUREMENT OF EE&RES IMPROVEMENTS AND URBAN COMPATIBILITY ASSESSMENT FOR THE NEW PLANTS

Conducted by Universität für
Bodenkultur Wien

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TECHNOLOGY
PRAGUE



Reinhaltungsverband Trattnachtal
Biogas Trattnachtal GmbH

KOMPETENZZENTRUM
Wasser Berlin

Output factsheet: Software tool N.1

Version 1

Project index number and acronym	CE946 REEF 2W
Lead partner	ENEA - Italian National Agency for New Technologies, Energy and Sustainable Economic Development
Output number and title	O.T1.1 Tools for measurement of EE&RES improvements and urban compatibility assessment for the new plants
Responsible partner (PP name and number)	PP06 Universität für Bodenkultur Wien
Project website	https://www.interreg-central.eu/Content.Node/REEF-2W.html
Delivery date	03.2018

Summary description of the key features of the tool (developed and/or implemented)

Max. 2.000 characters

The scope of software tool N.1 is to provide a first evaluation on the benefits of applying innovative technological processes at WWTPs concerning waste and wastewater treatment. Together with software tool N.2 it is merged into one Excel. However, key features of software tool N.1 include energy efficiency (EE) evaluations and potential implementation of renewable energy sources (RES). Software tool N.1 evaluates:

- the wastewater treatment process (essential parameters include sludge composition, and other substrates regarding the share of C, H, O, N, Ash, Volatile Matter and Fixed Carbon)
- the energy efficiency (EE) at the WWTP (essential parameters include daily wastewater flow, COD concentration, digestion tower temperature, air temperature, electric energy consumption etc.)
- the potential of applying renewable energy sources (RES) like solar power (including parameters like surface area and electrical/thermal efficiency), hydro power (usable height and turbine efficiency) and energy from biogas at the WWTP (e.g. share that is fed into the grid)

On top of these assessments, economic (including e.g. prices for electricity, natural gas and heat or energy subsidies for RES, biomethane and heat) and ecological evaluations (Life Cycle Analysis with respect to acetic acid, methanol, ferric chloride, sludge use, offgas treatment etc.) are carried out and merged in one single Excel, together with software tool N.2. In the “report” section of the tool a detailed comparison of input and output parameters is presented. Thus, the user can compare different scenarios and derive potential strategic decisions for the utility under consideration.

NUTS region(s) where the tool has been developed and/or implemented (relevant NUTS level)

Max. 500 characters

The tool has been developed and/or implemented in NUTS level 0 including:

- Austria
- Germany
- Italy
- Czech Republic and
- Croatia.

Expected impact and benefits of the tool for the concerned territories and target groups

Max. 1.000 characters

Using software tool N.1 enables WWTP operators and decision-makers on the municipal level to specifically evaluate the wastewater treatment process. Based on the detailed evaluations the overall energy efficiency (EE) of the utility is evaluated and can consequently be improved. Renewable Energy Sources (RES) like solar power, hydro power or energy from biogas are included in the calculations and allows users to assess benefits of RES applications. On top of that economic evaluations are carried out, on which many decisions of potential users are based upon. The included Life Cycle Assessment offers users a first glimpse on the ecological consequences of their decisions. Concerned territories can benefit from the tool applications, as it shows potentials to provide surplus energy to the settlements close to the WWTP (also see software tool N.2).

Sustainability of the tool and its transferability to other territories and stakeholders

Max. 1000 characters

Software tool N.1 can be used for a first step to assess EE and RES potentials on a WWTP. The holistic approach of the tool - due to the Integrated Sustainability Assessment (ISA) and its strategic character - make it easily transferable and applicable in multiple countries. Besides national values (Austria, Croatia, Czech Republic, Germany, Italy) also European values are included and used for the calculations. Main target group of the tool are WWTP operators. However, the goal is that also decision makers on the municipal level can use the tool to initiate strategic planning activities on how to integrate WWTPs into energy concepts etc. Sustainability is fully given, since the ISA approach, on which the tool is based on, integrates multiple levels of sustainability (also see D.T1.5.1 and D.T1.5.4).

Lessons learned from the development/implementation process of the tool and added value of transnational cooperation

Max. 1000 characters

Software tool N.1 is currently still at an early stage of development. However, first feedback was collected and the overall approach of the REEF 2W project, including the Integrated Sustainability Assessment, were generally well received. Concerning the tool development, the single parts of the tool (tool N.1 and tool N.2) have to be connected more consequentially in order to gain more realistic results that can accordingly be used for deriving planning decisions in practice. The specially deployed tool developer workshops during the project proved to be essential in order to develop a tool that is applicable across Central Europe and incorporates aspects across different disciplines.

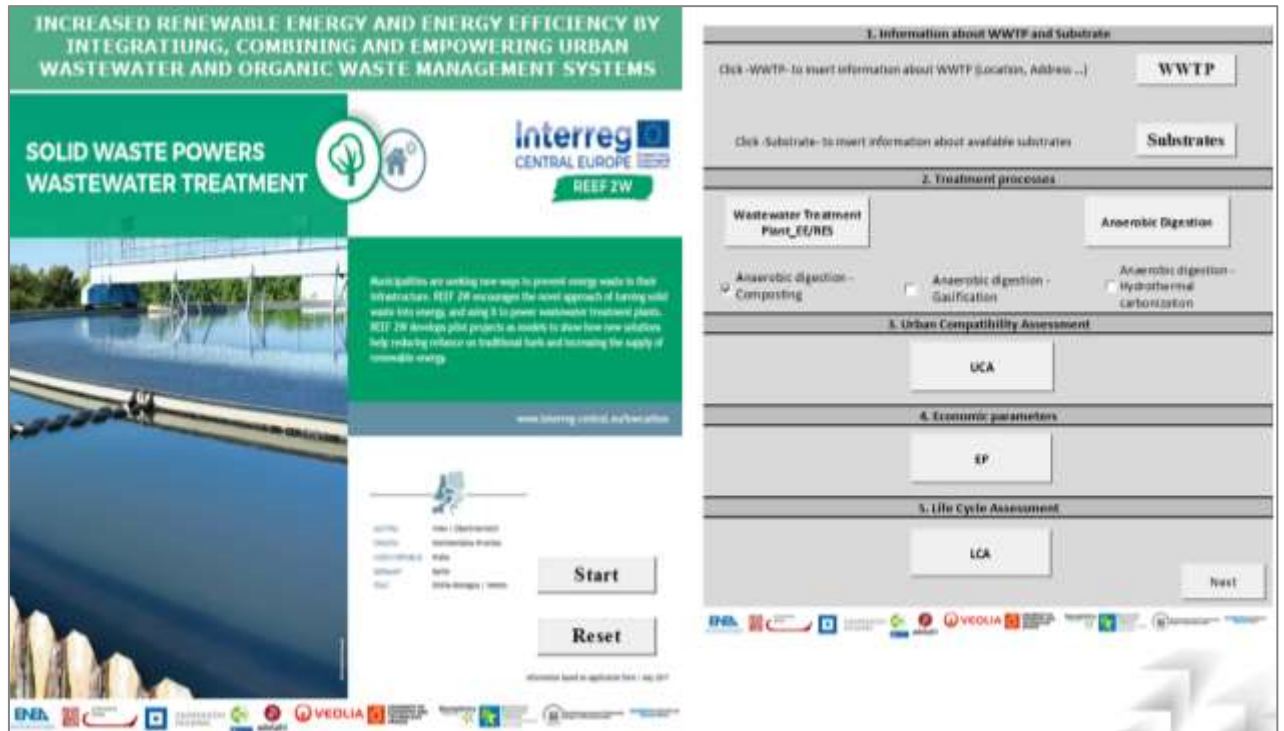
References to relevant deliverables and web-links If applicable, pictures or images to be provided as annex

Max. 1.000 characters

DT.1.4.3

See Annex 1

Annex 1: Home Screen and Front Screen of the REEF 2W Excel-Tool



Annex2: Data-input WWTP Description

WWTP Description ✕

Name of WWTP/Operator

Address of WWTP

Country

Contact person

Year of commissioning of the last expansion stage

Treatment capacity PE (*)

Connected population PE (*)

(*) Equivalent Population

Annex 3: Data-input Substrates

Substrate to select	Tons (*) [t a.s./year]	Total Solid (%)	C (%)	H (%)	O (%)	N (%)	Ask (%)	Volatile Matter (%)	Fixed Carbon (%)	Income Price [€/ton]
Primary Sludge <input type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Secondary Sludge <input type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Other substrates										
OFMSW (**) <input type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Digestate (***) <input type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Food industry waste <input type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Animal Blood <input type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Animal Fat <input type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Other <input type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

(*) As received.
 (**) Organic Fraction of Municipal Solid Waste.
 (***) If you start to observe the combination among Anaerobic Digestion and Composting, Gasification and HTC, at point 2 of this tool, you have to enter digester's data. If you have the data on the tool, enter it, otherwise type zero and it will be calculated by the process of anaerobic digestion. The same applies to other data.

Annex 4: Data-input Energy Efficiency and Renewable Energy Sources

WWTP Specific Input

WWTP Properties_Energy Efficiency

Daily average of wastewater flow [m³/d]

Daily average of COD inflow concentration [mg/l]

Digestion tower temperature [°C] (30-60 °C)

Ambient air temperature [°C]

Total heated surface area [m²]

Building heat demand [kWh/(y*m²)]
(depending on the age of the building) (50-150 kWh/(y*m²))

Electric energy consumption [kWh/d]

WWTP Properties_Renewable Energy Sources

Solar power

Hydro power

Energy from biogas (*)

(*) If you want to include the biogas upgrading you need to choose the amount of biogas to fed into the grid or into the CHP.

Annex 5: Data-input Economic parameters

Economic Values ✕

Electricity Total price - partner estimate [€/kWh]

Price of natural gas [€/kWh]

Price of heat [€/GJ]

CNG price for cars [€/kg o Nm3]

Energy subsidies (RES) [€/kWh]

Subsidy for biometan [€/Nm3]

Subsidy for heat [€/GJ]

Disposal price sludge [€/t]

Annex 6: Data input Life Cycle Assessment

Chemicals ✕

	Status quo	Future situation
Acetic acid [kg/y]	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>
Methanol [kg/y]	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>
Ferric chloride [kg/y]	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>
Polyaluminiumchlorid [kg/y]	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>
Polymer [kg/y]	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>

Annex 7: Report section of the tool - Input parameters

Results

WWT Program, Energy Efficiency

Activity	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	Total
WWT plant energy consumption	100000	100000	100000	100000	100000	100000	100000	100000	100000	100000	1000000
WWT plant energy consumption (kWh)	100000	100000	100000	100000	100000	100000	100000	100000	100000	100000	1000000
WWT plant energy consumption (MWh)	100000	100000	100000	100000	100000	100000	100000	100000	100000	100000	1000000

WWT Program, Renewable Energy Sources

Activity	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	Total
WWT plant energy consumption	100000	100000	100000	100000	100000	100000	100000	100000	100000	100000	1000000
WWT plant energy consumption (kWh)	100000	100000	100000	100000	100000	100000	100000	100000	100000	100000	1000000
WWT plant energy consumption (MWh)	100000	100000	100000	100000	100000	100000	100000	100000	100000	100000	1000000

Water Quality

Water Quality

Parameter	Value
Water Quality	100000
Water Quality	100000
Water Quality	100000

Water Quality

Parameter	Value
Water Quality	100000
Water Quality	100000
Water Quality	100000

Water Quality

Parameter	Value
Water Quality	100000
Water Quality	100000
Water Quality	100000

Water Quality

Water Quality

Parameter	Value
Water Quality	100000
Water Quality	100000
Water Quality	100000

Water Quality

Parameter	Value
Water Quality	100000
Water Quality	100000
Water Quality	100000

Water Quality

Parameter	Value
Water Quality	100000
Water Quality	100000
Water Quality	100000

Annex 8: Report section of the tool - Output parameters

Interreg 
CENTRAL EUROPE European Union
European Regional Development Fund

WWT Program, Energy Efficiency

Activity	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	Total
WWT plant energy consumption	100000	100000	100000	100000	100000	100000	100000	100000	100000	100000	1000000
WWT plant energy consumption (kWh)	100000	100000	100000	100000	100000	100000	100000	100000	100000	100000	1000000
WWT plant energy consumption (MWh)	100000	100000	100000	100000	100000	100000	100000	100000	100000	100000	1000000

WWT Program, Renewable Energy Sources

Activity	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	Total
WWT plant energy consumption	100000	100000	100000	100000	100000	100000	100000	100000	100000	100000	1000000
WWT plant energy consumption (kWh)	100000	100000	100000	100000	100000	100000	100000	100000	100000	100000	1000000
WWT plant energy consumption (MWh)	100000	100000	100000	100000	100000	100000	100000	100000	100000	100000	1000000

Water Quality

Water Quality

Parameter	Value
Water Quality	100000
Water Quality	100000
Water Quality	100000

Water Quality

Parameter	Value
Water Quality	100000
Water Quality	100000
Water Quality	100000

Water Quality

Parameter	Value
Water Quality	100000
Water Quality	100000
Water Quality	100000

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Parameter	Value
Water Quality	100000
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Parameter	Value
Water Quality	100000
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Water Quality

Parameter	Value
Water Quality	100000
Water Quality	100000
Water Quality	100000