

# INCREASED RENEWABLE ENERGY AND ENERGY EFFICIENCY BY INTEGRATING, COMBINING URBAN WASTEWATER AND WASTE MANAGEMENT SYSTEM

TAKING  
**COOPERATION**  
FORWARD



ENEA Brussels Liaison Office



## REEF 2W objectives and expected results



Roberto Farina

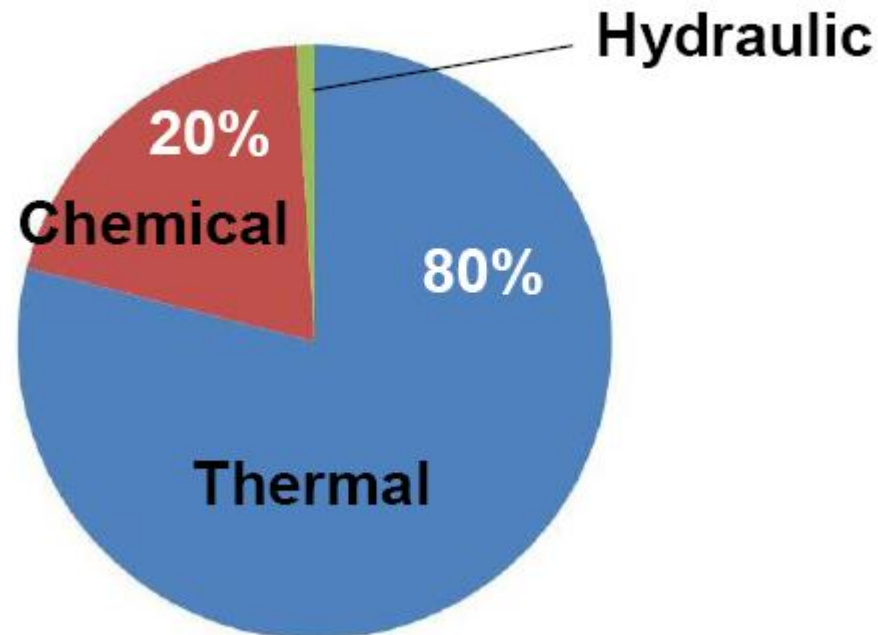
## Energy consumption in the water cycle

In USA the energy consumed to provide drinking water and ensure the treatment of the waste water correspond about the 3% of the total electric energy consumption of the country (US EPA 2006)

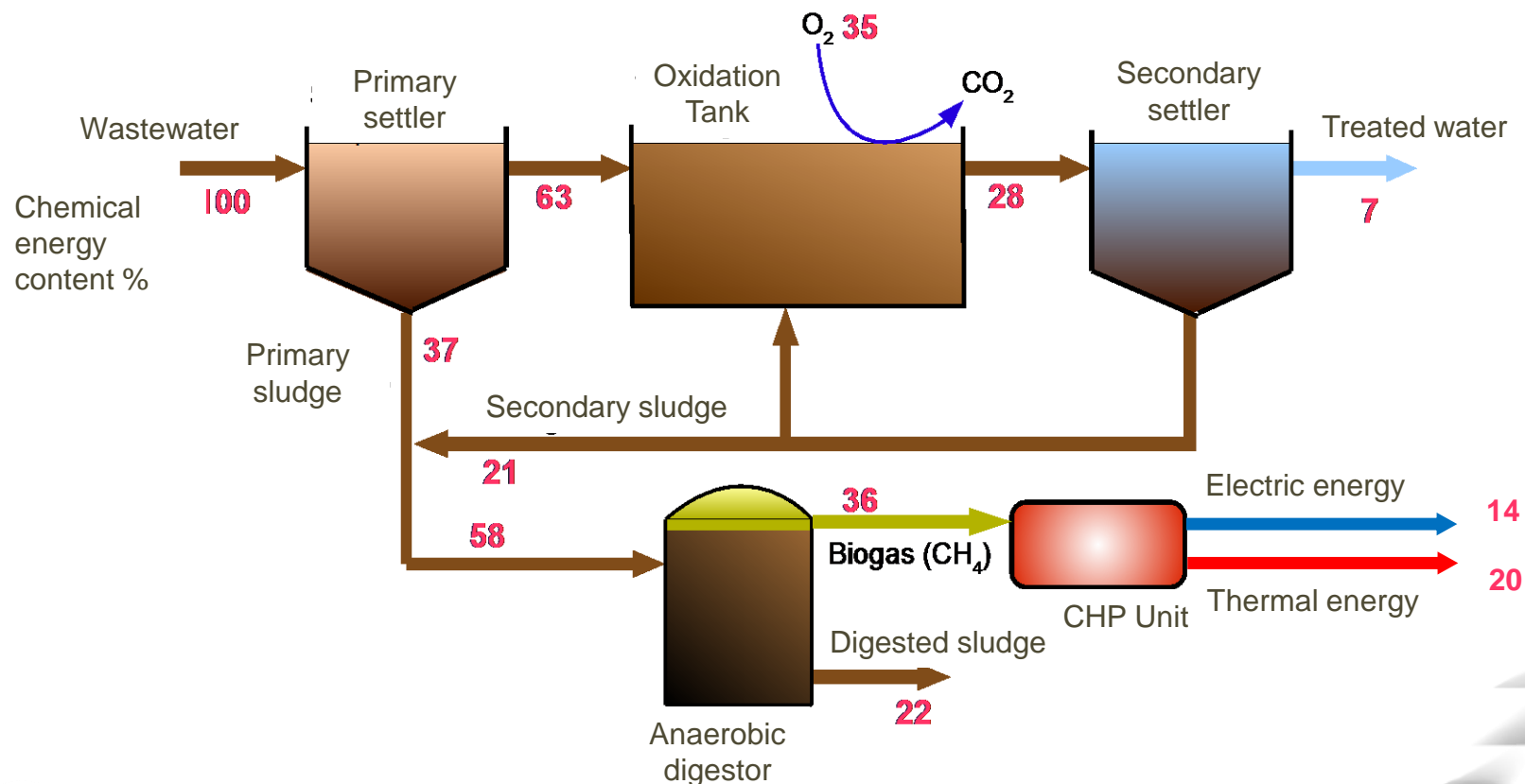


## Potential energy recoverable from wastewater

There is more energy in wastewater than is needed for treatment about 5X more



## Chemical energy recovery



# REEF 2W PARTNERSHIP

- Research and Academic institution will collaborate with industrial partners to develop new strategies for waste and wastewater treatment in the view of the reduction of energy consumption for the treatments and provide energies at the nearby areas
- 5 pilot sites will be studied to understand which are the best possible solutions and the energetic interactions with the urban areas



CENTRUM PRO REEK  
ČESKÉ REPUBLIKY  
zřídil dot. © EuroGeographics for the  
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**Reinholdungsverband Trattnacht  
Biogas Trattnacht GmbH**



# REEF 2W PROJECT



- To provide an interactive software TOOL able to help policy makers and stakeholders to have an overview on possible strategies and technologies to define the health state of the treatment plant and evaluate possible future scenarios for the waste treatment platform integrating waste, wastewater and other renewable energy sources
- To identify possible critical points for the energy efficiency of the WWTPs



# SCOPE OF THE PROJECT

- To provide evaluation, if excess of energy is available, where it can be delivered as electricity, heat, biofuel, biomethane to the nearby community to decrease its energy impact.
- To provide an environmental evaluation of the actions implemented
- To provide an economic evaluation for the implementation of different technologies





# SCOPE OF THE PROJECT

- Identify obstacles and barriers for the implementation of more efficient system to recovery energy from organic wastes
- Involve local authorities to test the tool, and use it to contribute at a better design of the energetic planning



- 5 pilot sites have been identified to study and evaluate technical social and legislative barriers and obstacles
- Are involved :
  - Small and big municipalities are involved
  - Waste and wastewater treatment plants
- Technologies considered are
  - Anaerobic digestion, biogas upgrading, power to gas, CHP
  - Heat recovery from treated wastewater
  - Gasification, Hydrothermal carbonization, composting, incineration
  - Photovoltaic, thermal and hybrids panels
  - Hydroelectric power
  - Others will be possible to implement in future (effects of nutrients recovery, filtration technologies, etc.)



# INTEGRATED SUSTAINABILITY ASSESSMENT (ISA)

- ISA approach has been used to connect all the different aspects that the project consider:

- Energy assessment
- Spatial assessment
- Environmental assessment
- Economical assessment



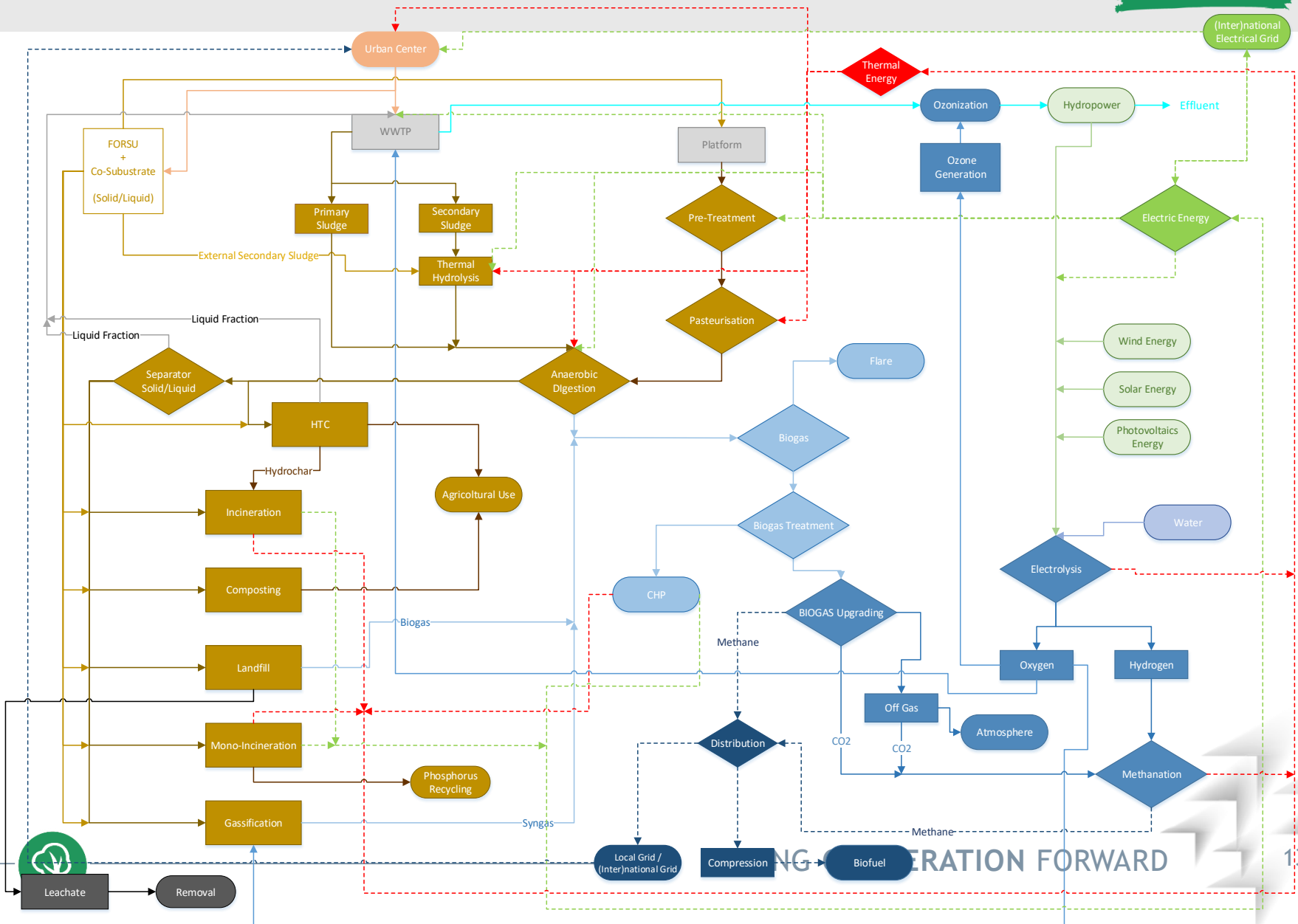
Information about WWTP and Plant type

- Strong involvement of the user in collecting data and defining future credible scenarios



# LOGICAL SCHEME TO DEVELOP THE TOOL

REEF 2W



GENERATION FORWARD

# INTEGRATED SUSTAINABILITY ASSESSMENT (ISA)

## Energy assessment

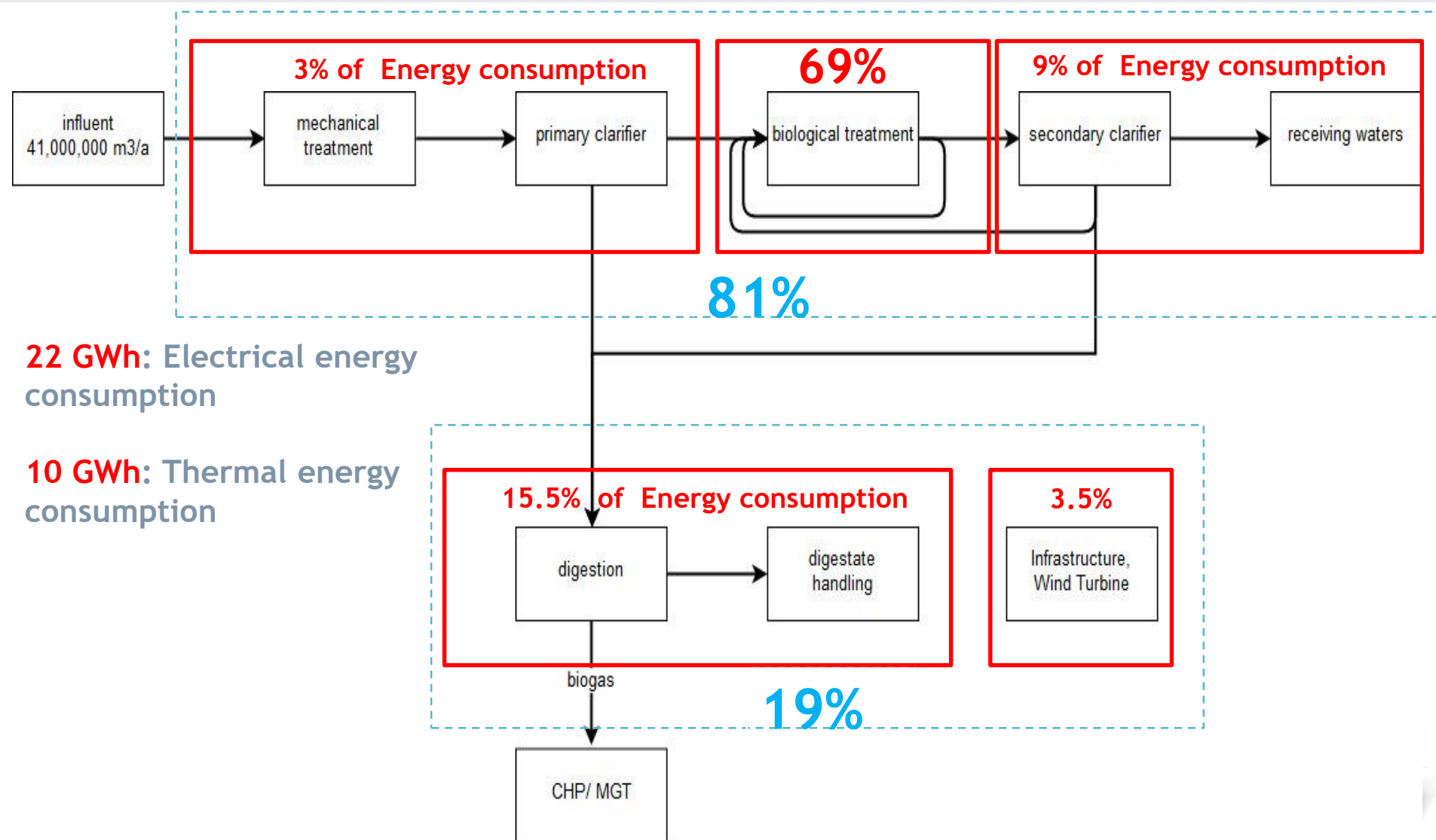


### Energy Assessment

- To evaluate the possibility to reduce the energetic impact
  - Energy efficiency of WWTP will compare performance data with available benchmarks
  - Available biomasses can be considered, including organic industrial residues, to be digested or to be gasified
  - Heat recovery from treated wastewater
  - Possible other sources of RES to be connected with the treatment platform
    - Hydropower production from the WW flow
    - Photovoltaic panels
    - Thermal panels



# DESCRIPTION OF WWTP PILOT SITE IN GERMANY ENERGY PERFORMANCE



# EVALUATION OF ENERGY EFFICIENCY RESULT OF THE REEF 2W TOOL

## Electrical energy efficiency

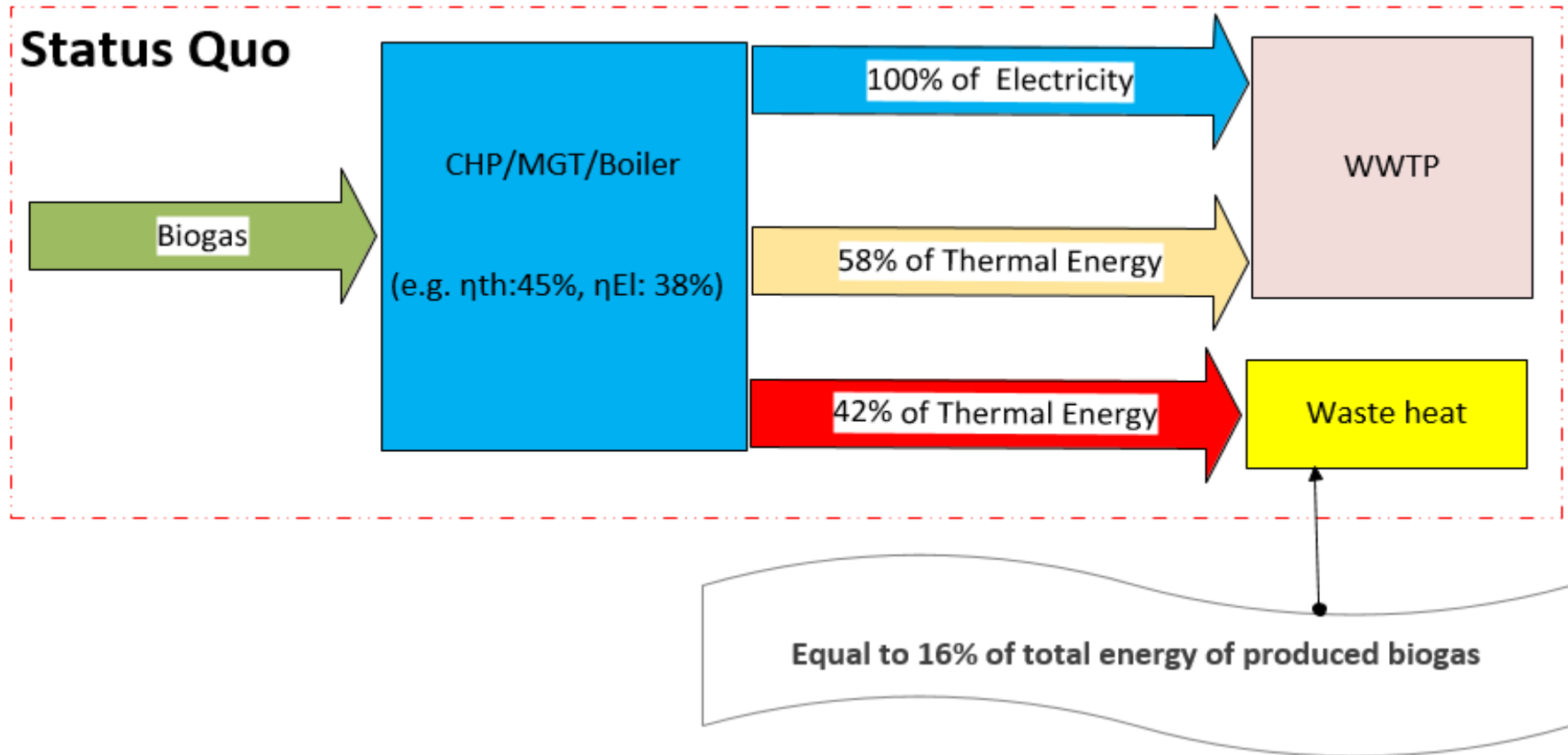
<b>Electric energy consumption</b>		<i>Standard range</i>	
WWTP total [kWh/PE120/a]	23,27	<b>20,00</b>	<b>50,00</b>
1) inflow pumping station and mechanical pre-treatment [kWh/PE120/a]	1,05	<b>2,50</b>	<b>5,50</b>
2) mechanical-biological treatment [kWh/PE120/a]	17,60	<b>14,50</b>	<b>33,00</b>
3) sludge treatment [kWh/PE120/a]	3,50	<b>2,00</b>	<b>7,00</b>
4) infrastructure [kWh/PE120/a]	1,12	<b>1,00</b>	<b>4,50</b>

## Thermal energy efficiency

<b>Thermal energy consumption</b>		<i>Standard range</i>	
WWTP total [kWh/PE120/a]	13,15	<b>0,00</b>	<b>30,00</b>
sludge heating [kWh/PE120/a]	10,42	<b>8,00</b>	<b>12,00</b>
transmission loss, digester tower heating [kWh/PE120/a]	0,54	<b>0,00</b>	<b>4,00</b>
generation, storage and distribution loss [kWh/PE120/a]	1,10	<b>0,00</b>	<b>2,00</b>
heat for buildings [kWh/PE120/a]	1,09	<b>0,00</b>	<b>2,00</b>



# APPLICATION OF RENEWABLE ENERGIES (RES TOOL) BIOGAS UPGRADING

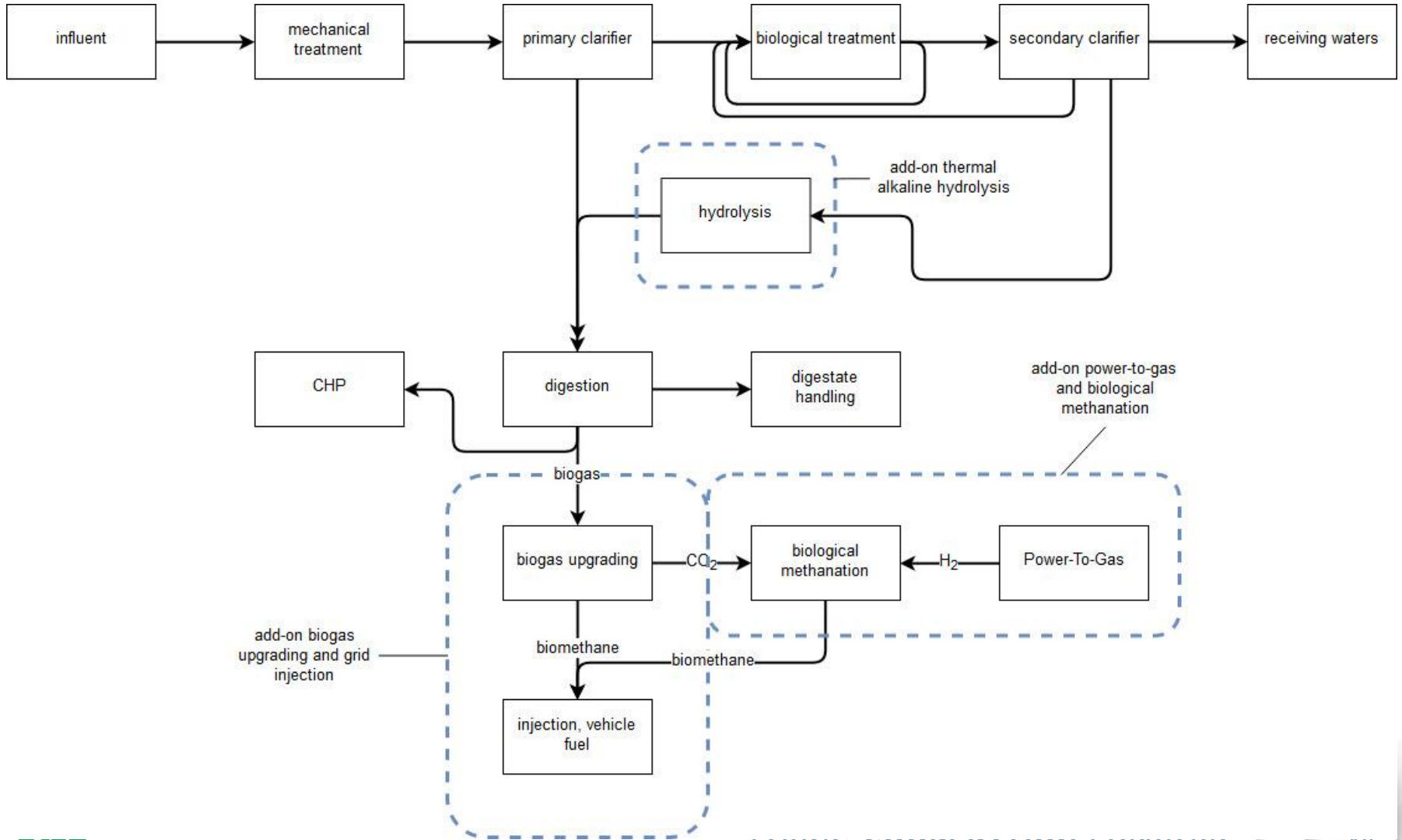


Biogas upgrading could save this waste energy,  
or we can do a spatial assessment

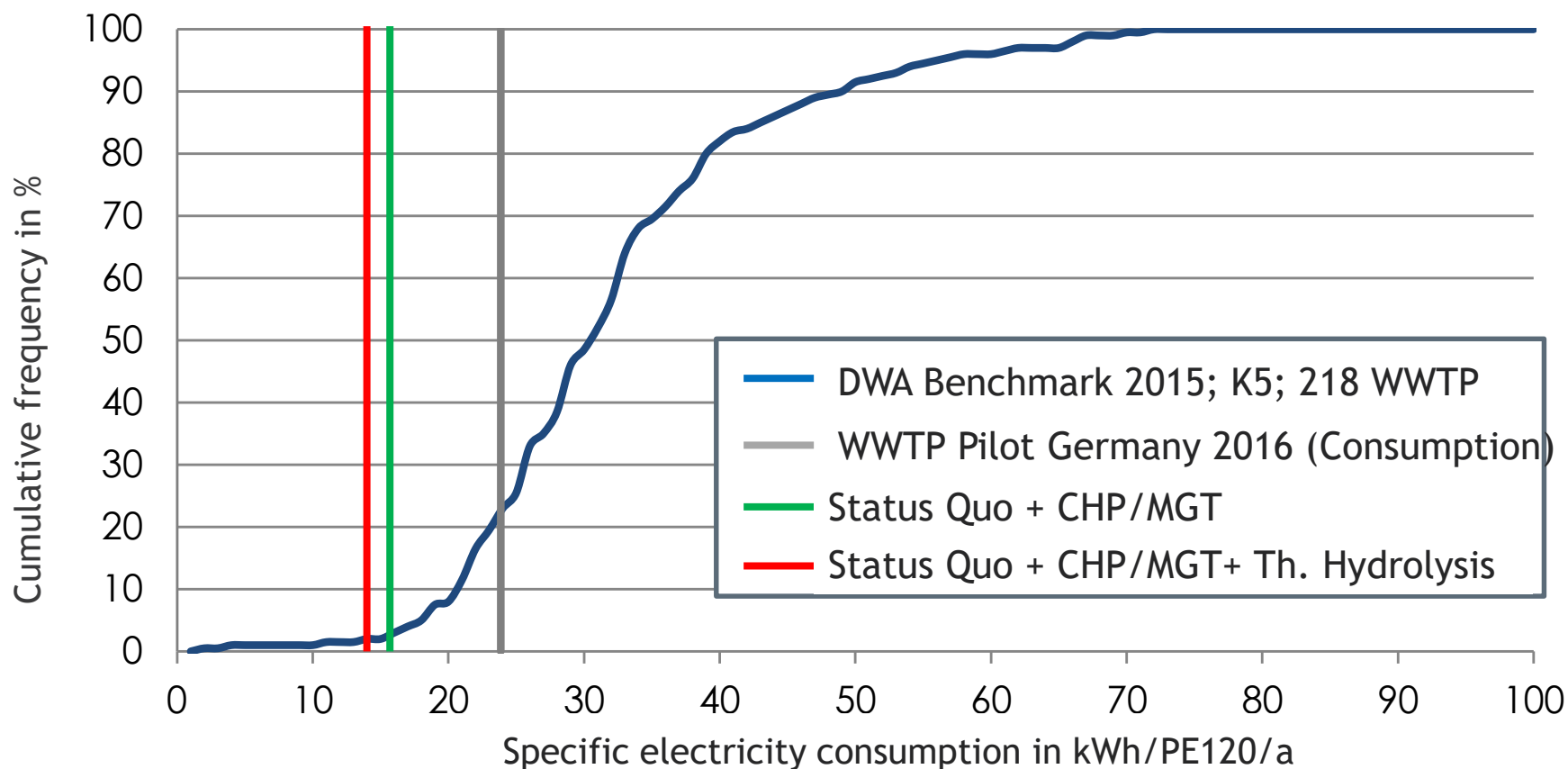




# PILOT SITE GERMANY FUTURE DEVELOPMENT



# APPLICATION OF RENEWABLE ENERGIES TOOL COMPARISON TO BENCHMARK



# INTEGRATED SUSTAINABILITY ASSESSMENT (ISA)

## Spatial assessment



### Spatial Assessment






- Evaluate the existing energetic requirements of the considered urban area for the different urbanized areas considered (centre, peri-urban, industrial, rural)
- Evaluate the potential development that the urban area will have
- Suggest possible energetic interaction between the treatment platform and the urban area



# ANALYSIS OF THE WWTPS SPATIAL CONTEXT



**Legende**

-  RHV-Trattnachtal and Biogas Trattnachtal GmbH
-  River Trattnach
-  Municipal Boundary
-  External Connections
-  Relevant Areas



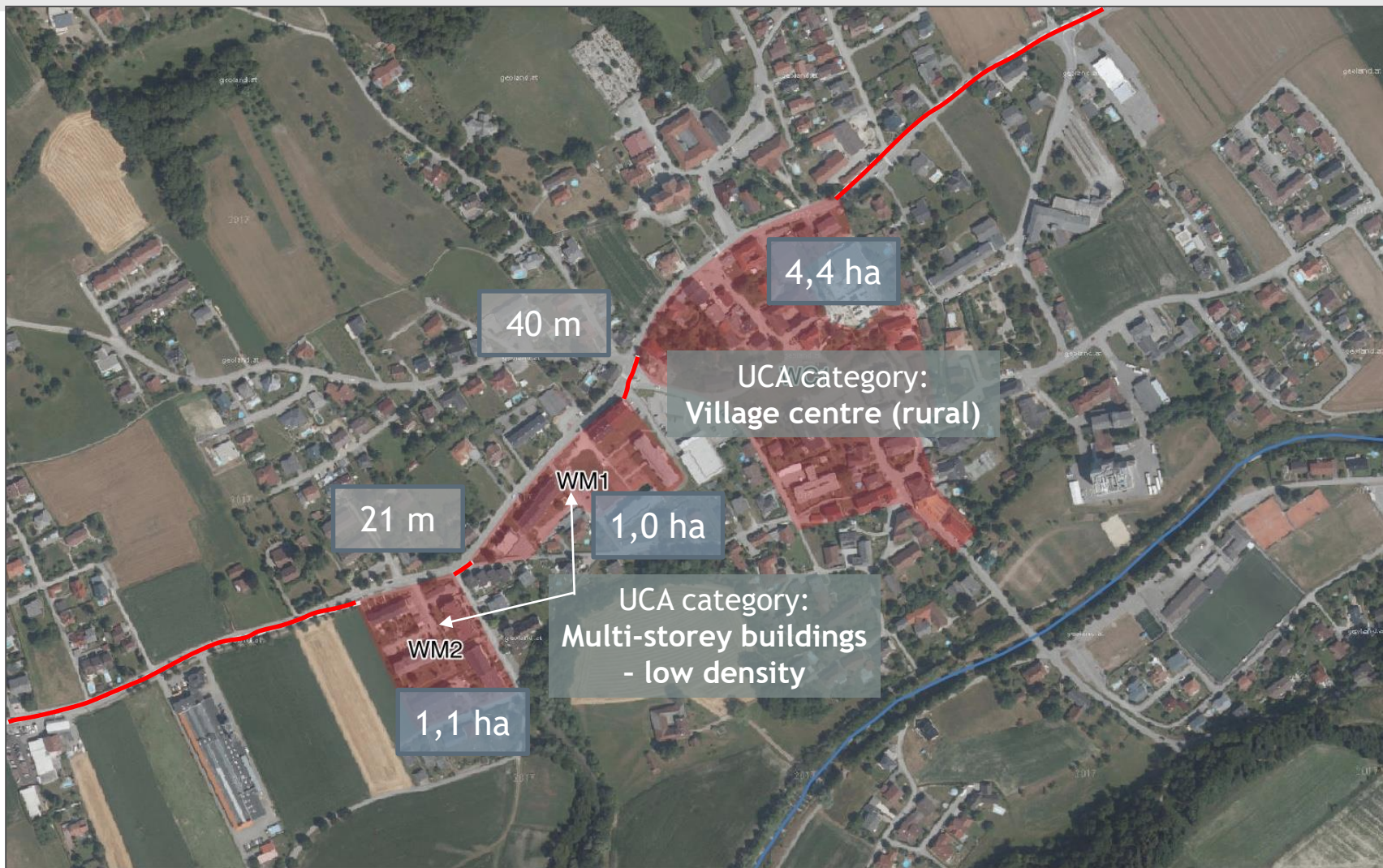
Maßstab 1:12000



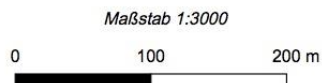
Datum: 29.04.2019  
Quellen: basemap.at, geoland.at  
Statistik Austria, eigene Bearbeitung



# ANALYSIS OF THE WWTPS SPATIAL CONTEXT



- Legende
- External Connections
  - Relevant Areas
  - River Trattnach



Datum: 29.04.2019  
Quellen: basemap.at, geoland.at  
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# ANALYSIS OF THE WWTPS SPATIAL CONTEXT - AND APPLICATION OF SOFTWARE TOOL N.2

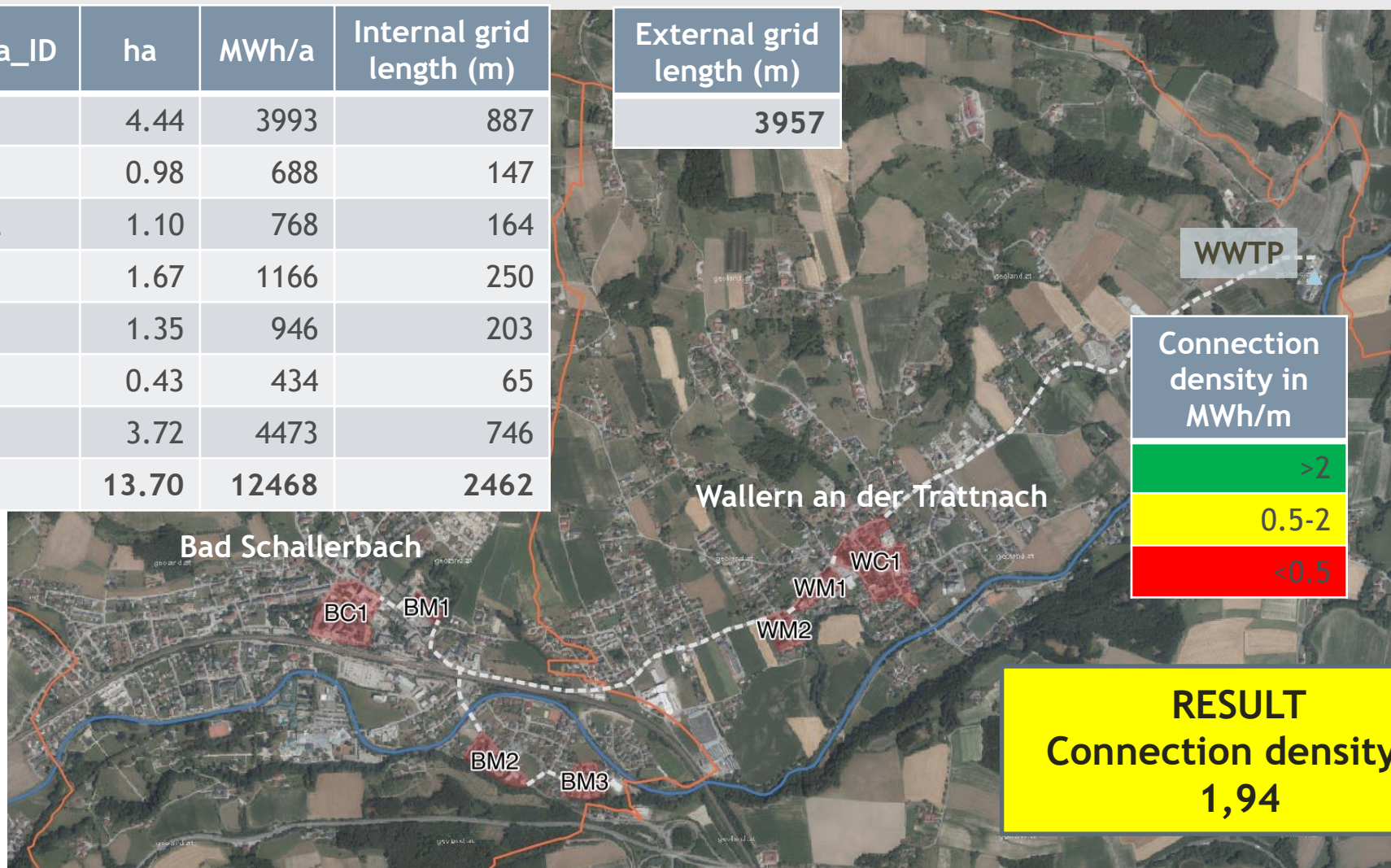
Area_ID	ha	MWh/a	Internal grid length (m)
WC1	4.44	3993	887
WM1	0.98	688	147
WM2	1.10	768	164
BM2	1.67	1166	250
BM3	1.35	946	203
BM1	0.43	434	65
BC1	3.72	4473	746
Sum	13.70	12468	2462

External grid length (m)  
**3957**

Connection density in MWh/m

>2
0.5-2
<0.5

**RESULT**  
Connection density =  
**1,94**



# INTEGRATED SUSTAINABILITY ASSESSMENT (ISA)

## Environmental assessment



Environment Assessment

- Environmental evaluation is based on the reduction of carbon dioxide emissions
- Existing and future situation are considered and compared. The effect on the greenhouse gases emission are analysed and reported.



# INTEGRATED SUSTAINABILITY ASSESSMENT (ISA)

## Economic assessment



### Economic Assessment

- Operational cost have been considered for the evaluation of the economic advantage that the recovery of energy from wastes can determine, considering also incomes from new wastes disposal, and subsidies for the production or energies
- Investment costs are considered to provide a rough idea about.





# REEF 2W TOOL

## Tool progress status:

Status quo

Future situation



Energy Assessment



Information about WWTP and Plant type



Spatial Assessment



Environment Assessment



Economic Assessment

Future situation

Report

Reset





## Involvement of Public Administrations and Stakeholders

- Other Public Administrations and Stakeholders than already involved in the project will be contacted to help them in the evaluation of their possibility to decrease the energetic impact of the municipality recovering energy from wastes



# *Thank You for your attention*

## *REEF 2W Team*



# Contact details



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