



ENERWATER



An introduction to the *Horizon2020* **ENERWATER** project

Almudena Hospido - University of
Santiago de Compostela
(Coordinator)

www.enerwater.eu





The ENERWATER project

This project will develop, validate and disseminate a **standardized methodology** for continuously assessing, labelling and improving the **overall energy performance of Waste Water Treatment Plants**.

The methodology will be tested in 50 such plants.

A **collaboration network** in the waste water treatment sector, including research groups, SMEs, utilities, city councils, authorities and industry, will be set up. Dialogue will be launched towards the **creation of specific European legislation**, ensuring effluent water quality, environmental protection and compliance with the Water Framework Directive.



The ENERWATER goals

- Definition of performance index adapted to the plant function based not only on the energy consumed but also on the plant performance
- Detailed dynamic monitoring, including seasonal variations at a fast sampling rate, providing data on energy consumption but also on plant performance
- Development of a methodology that can be used for standardization when assessing and benchmarking the energy consumption of a plant
- Training activities for audit of WWTPs for the water utilities members of the consortium
- Correlation with measurable variables and plant management in order to provide insight for diagnosis of the plant performance



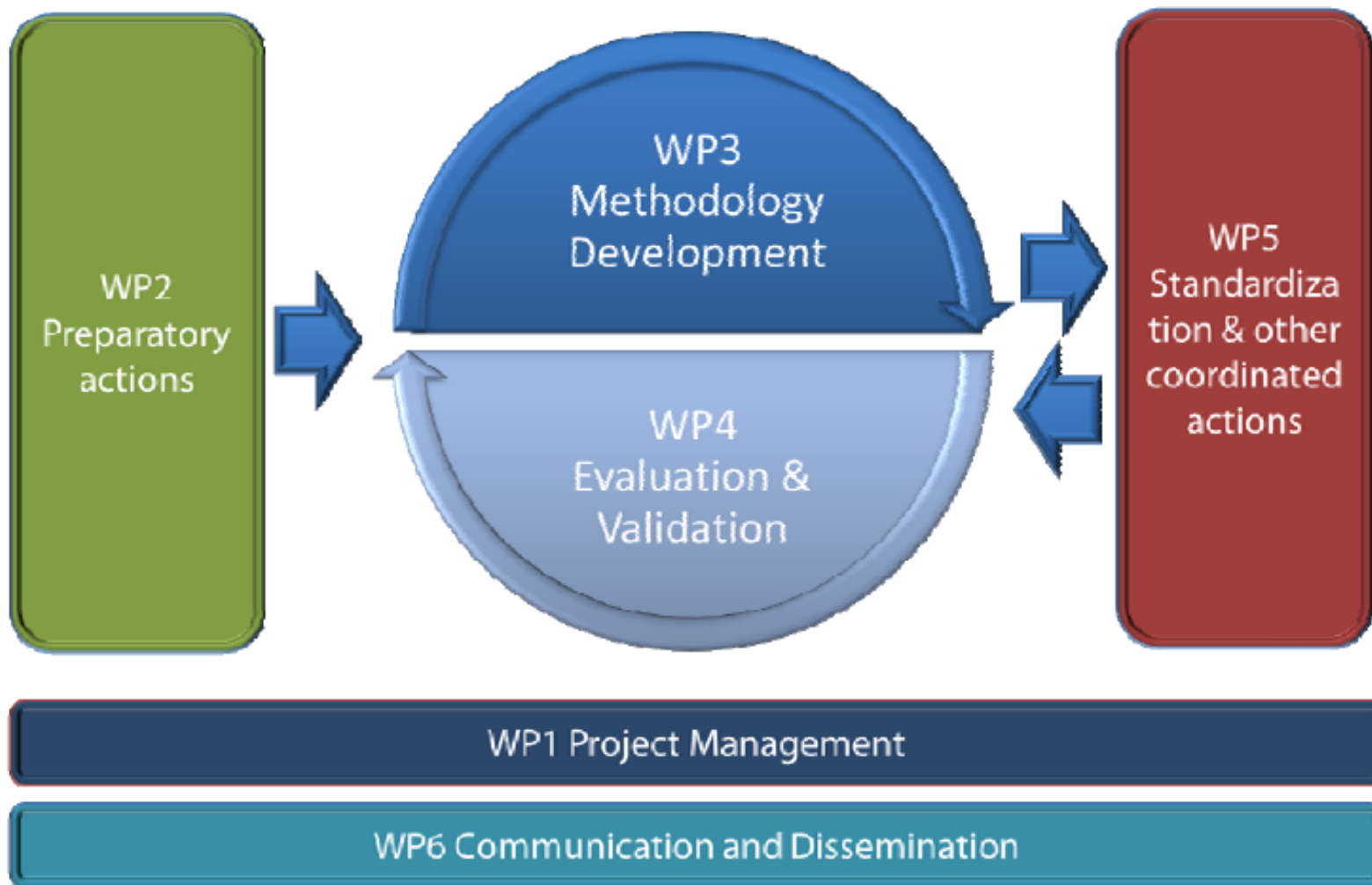
ENERWATER in figures

- **393 proposals** for research & innovation and market-uptake projects → **45 were selected for funding.**
- PEOPLE:

Participant No *	Participant organisation name	Participant Short name	Country
1 (Coordinator)	Universidad Santiago de Compostela	USC	Spain
2	Wellness Smart Cities	WSC	Spain
3	AENOR	AENOR	Spain
4	Cranfield University	CU	UK
5	University of Verona	UniVR	Italy
6	Cologne University of Applied Sciences	CUAS	Germany
7	ETRA Spa	ETRA	Italy
8	Aggerverband	AV	Germany
9	Espinaydelfin	EyD	Spain

- BUDGET: 1,731,087 €
- DURATION: 1st March 2015 – 28th February 2018

The ENERWATER structure





Key deliverables (1st year)

Del. No.	Title	Description	Date
D 2.1	Study of published energy data	Document containing data of at least 500 WWTPs from where best practices and best cases scenarios will be identified.	6
D2.5	Benchmark Database	With the objective to create reference data it will be published one online database .	12 *
D 3.1 D 3.2	Enerwater methodology document V0 & V1	Initial version of the methodology. Should identify the key energy parameters and the main standards that have to be considered. Also should present the different possible configurations of the water energy index. First version of the methodology. First draft of the text.	6 12
D 5.2	Standardisation Landscape	Revision of the existing standards and the ongoing developments in the fields related with the ENERWATER considerations and expected outputs. Moreover, the standardisation TCs working in related fields will also be identified	6



Longo et al. (2016). *Monitoring and diagnosis of energy consumption in wastewater treatment plants. A state of the art and proposals for improvement.*

Applied Energy (in press)

Standard method and online tool for assessing and improving the energy efficiency of waste water treatment plants

H2020-EE-2014-3-MarketUptake

Deliverable 2.1 Study of published energy data

A thorough review of the literature on WWTP energy-use performance and related benchmarking methods

Keywords: 'wastewater', 'WWTP', 'energy', 'energy consumption', 'energy performance', 'energy efficiency assessment', 'energy benchmarking', 'life cycle assessment', and 'LCA'

Sources: Methods used for benchmarking - Peer-reviewed journal articles

Energy consumption data – Some peer-reviewed journals, research books, on-line publications/articles and technical reports + Regional water agencies by private communications.

When available energy consumption was gathered together with data related to the operation, influent and effluent characteristics.

601 WWTPs inventoried, but some plants were omitted from the analysis due to important data gaps => Final sample = 388 WWTPs, which represents the treatment of about 15.7 million PE corresponding a total electric energy consumption of 1.72 GWh/day:

2.62 million PE (16.6%) in North America

3.22 million PE (20%) in Asia

9.86 million PE (62.8%) in Europe



ENERWATER



AENOR: The Spanish Association for Standardisation and Certification is a private non-profit organization that was founded in 1986. Its activity contributes to improving the quality and competitiveness of companies, their products and services.

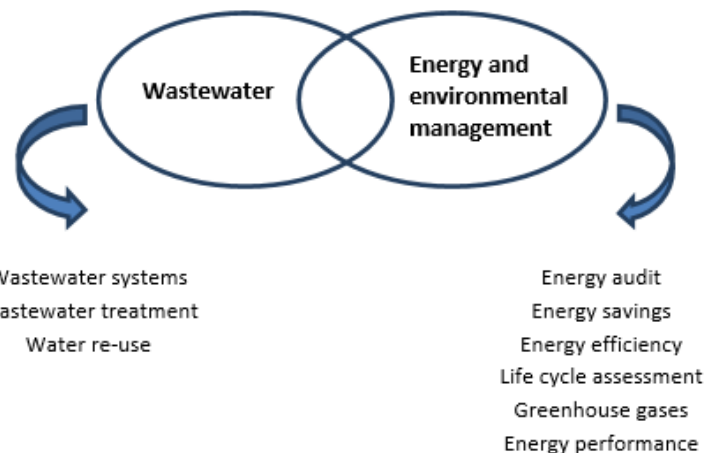
Standard method and online tool for assessing and improving the energy efficiency of waste water treatment plants

H2020-EE-2014-3-MarketUptake

Deliverable 5.2 Standardization landscape

Two sets of terms have been taken into consideration, one related to waste water and the other to general aspects of energy and environmental management:

- To provide the partners with information about the state of the art in standardization, including published standards and standards under development which can be interesting for the project objectives
- To identify the standardization technical committees (TCs) which could be useful for the project



NOTE: Some other keywords like sewage, labelling, etc. were also used to make the search but no satisfactory results for the project have been found.

Key deliverables (2nd year)

Del. No.	Title	Description	Date
D 5.1	Waste Water Stakeholder Workshop	Event with the entities belonging to the network.	13 (several)
D4.2	Methodology V1 Evaluation Report	The first version of the method developed will be tested and validated in the WWTPs, under the presence in-situ of a group of auditors	18
D3.5	Online Method V1	The preliminary version of the web application will be published online in the project website.	19
D5.3	Standardisation Stakeholder Workshop	Organization of a joint standardisation stakeholders workshop	20



ENERWATER will be presented at the Final Conference of the project FP4BATIW “Fostering partnerships for the implementation of best available technologies for water treatment & management in the Mediterranean” 13-14 July 2016 in Barcelona

ENERWATER Stakeholder Workshop 28th June 2016 Cambridge, UK

See the brochure: poster ENERWATER Stakeholder Event V01 ENERWATER Stakeholder Workshop 28th June 2016 from 17:40 to 19:30 West Road Concert Hall, 11 West Road Cambridge CB3 [...]

[Read more](#)

ENERWATER initiates a partnership with the SMART-PLANT project

THE HORIZON2020 INNOVATION ACTION “SMART-Plant” SUCCESSFULLY KICKED-OFF IN VERONA (ITALY) ON 08-09 JUNE 2016. 25 PARTNERS (PUBLIC AND PRIVATE WATER UTILITIES, SMALL AND LARGE SERVICE AND [...])

[Read more](#)

IFAT Conference “How to assess and improve the energy efficiency of municipal wastewater treatment plants” by Prof. Fatone from Verona University

We are pleased to invite you to the following conference on energy efficiency in wastewater plants in collaboration with Gardner Denver. Room A31 in Hall 3 at the [...]



6.11 VENERDÌ
FRIDAY

14.00-17.00

Sala Global Water Expo
Pad. D3

A cura di
Consorzio del progetto
Horizon2020 ENERWATER partners
e CTS ECOMONDO



Metodo standard e piattaforma on-line per classificare e migliorare l'efficienza energetica degli impianti di depurazione urbani (Evento di incontro con stakeholders del progetto Horizon2020 ENERWATER)

Standard method and online tool for assessing and improving the energy efficiency of wastewater treatment plants (Stakeholder event of the ENERWATER project)

SECTION CHAIRS

ALMUDENA HOSPIDO University of Santiago de Compostela, Spain
FRANCESCO BOSCO Associazione Idrotecnica Italiana and Scientific-Technical Committee of Ecomondo

PROGRAM

14:00-14:20 Introduction by Almudena Hospido (Coordinator of the Horizon2020 ENERWATER project)

The H2020 ENERWATER project to standardize the energy audit and efficiency in municipal wastewater treatment plant

14:20-14:40 Current needs for standardization of energy efficiency in wastewater sector in the European Union

Carmen Martín Marino (Asociación Española de Normalización y Certificación AENOR, Spain)

14:40-15:00 The ENERWATER methodology for energy audit and efficiency in wastewater treatment plants

Ana Soares (Cranfield University, United Kingdom)

15:00-15:20 Discussion with ENERWATER stakeholders

15:20-15:40 Energy use benchmark in the European Union, energy efficiency in Aggervverband and the expected benefits from ENERWATER

Erik Akkersdijk and Michael Bongards (Aggervverband and Cologne University of Applied Sciences, Germany)

15:40-16:00 On-line devices and tools to monitor and optimize energy efficiency in wastewater treatment plants: current market and ENERWATER advances

Antonio Chaparro (Wellness Smart Cities S.L., Spain)

16:00-16:20 Energy audit and efficiency in Italian water utilities: the case study of ETRA SpA and the expected benefits from ENERWATER

Enrico Parelli and Francesco Fatone (ETRA SpA and University of Verona, Italy)

16:20-16:40 Nitrification process control with a continuous online titrimeter prototype in a large wastewater treatment plant (LIFE BIOCLC)

Cecilia Caretti, Alberto Mannucci, Giulio Munz (University of Florence), Simone Neri (West Systems s.r.l.), Ester Coppini (GIDA SpA)

16:40-17:00 Stakeholder roundtable and Closure

ENERWATER



ENERWATER - ENERGY EFFICIENCY IN WASTEWATER TREATMENT PLANTS



Cranfield
UNIVERSITY

ENERWATER Stakeholder Workshop

28th June 2016 from 17:40 to 19:30
West Road Concert Hall, 11 West Road
Cambridge CB3 9DP, UK
Attendance is free – please register [here](#)



Description

Across Europe, the treatment of wastewater represents over 1% of the electricity consumption, which is one of the largest energy demands in the public sector. Thus understating how energy is used in wastewater treatment plants (WWTPs) seems critical for the European utilities to comply with the 2020 Climate and Energy Package targets. Nevertheless, there is a lack of normative documents specific to the determination of energy efficiency in WWTPs.

Funded by the EU Horizon 2020, the ENERWATER consortium main objective is to develop, validate and disseminate an innovative standard methodology for continuously assessing, labeling and improving the overall energy performance of WWTPs. To achieve this aim, an energy monitoring tool will be tested in 50 plants across Germany, Italy and Spain and then be made available on-line to facilitate its use among WWTP managers.

To encourage the exchange of information and receive feedback on the methodology currently under development, ENERWATER invites stakeholder groups, including academics, consultants, energy managers and monitoring specialists, SMEs, utilities, city councils, and policy makers to attend this workshop.

Agenda

- 17.40-17.50 Introduction to ENERWATER by Almudena Hospido, University of Santiago de Compostela, Spain
- 17.50-18.05 ENERWATER key performance indicators, weightings and energy bands, Pablo Campo, Cranfield University, UK
- 18.05-18.50 Case studies from Germany, Italy and Spain
- 18.50-19.05 Software platform and user interface, Antonio Chaparro, Wellness Smart Cities, Spain
- 19.05-19.30 Open discussion and conclusion

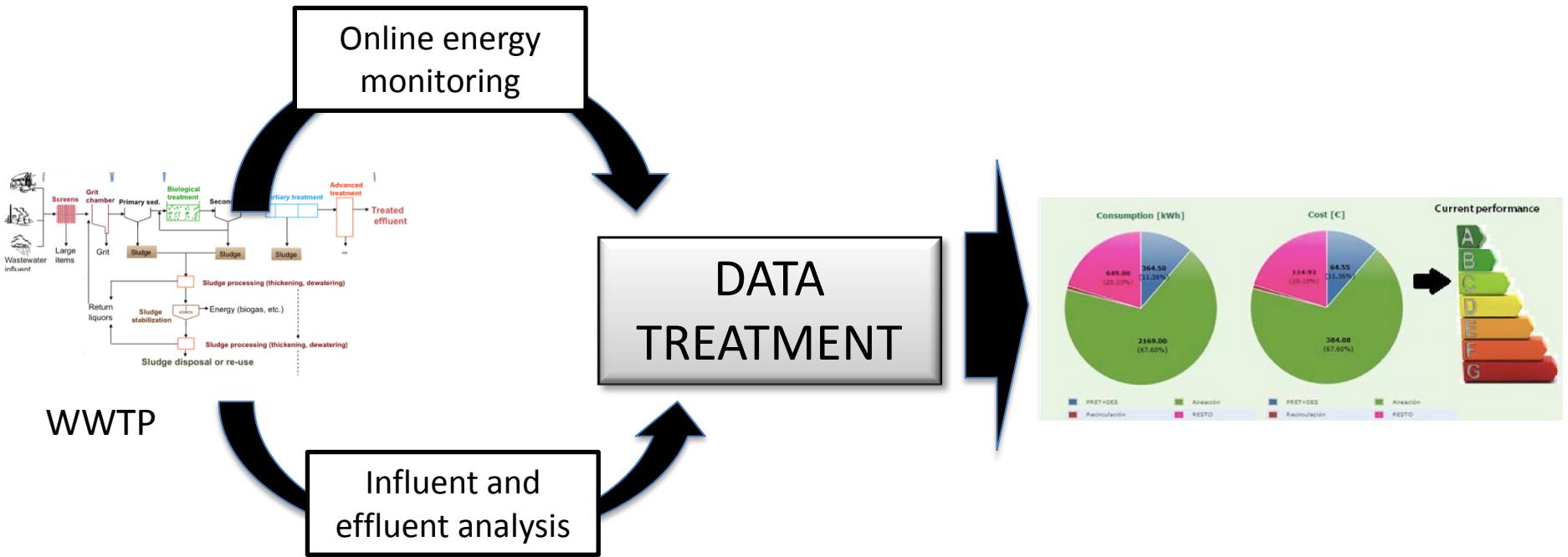
ENERWATER encourages the interactive participation of the audience during the workshop. Please download the Socrative-student app for smart phone, tablet or laptop [here](#)

The Workshop will take place during the 3rd IWA Specialized International Conference Ecotechnologies for Wastewater Treatment 2016 (ecoSTP16). For more information, please visit www.ecostp2016.com



Events to be held in Germany and Spain during 2017

WWTP monitoring translated into meaningful data



Step 1. Data collection
 (Sampling points and frequency of measurements)

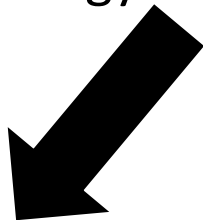
Step 2. Determination
 of Key Performance
 Indicators (KPIs)



What is the function of a WWTP?

- It is just a by-pass between the sewers and the sea
- Reducing the BOD of wastewater to be sent to the water bodies
- Removing N and P
- Producing biogas from COD
- Producing an effluent free of pathogens, PPCPs that does not contribute to eutrophication
- Producing an effluent that can be used to recharge an aquifer

European wide (even regionally wide), not all the WWTPs do the same function. Therefore, they cannot be merely compared in terms of energy consumption, also on what they do

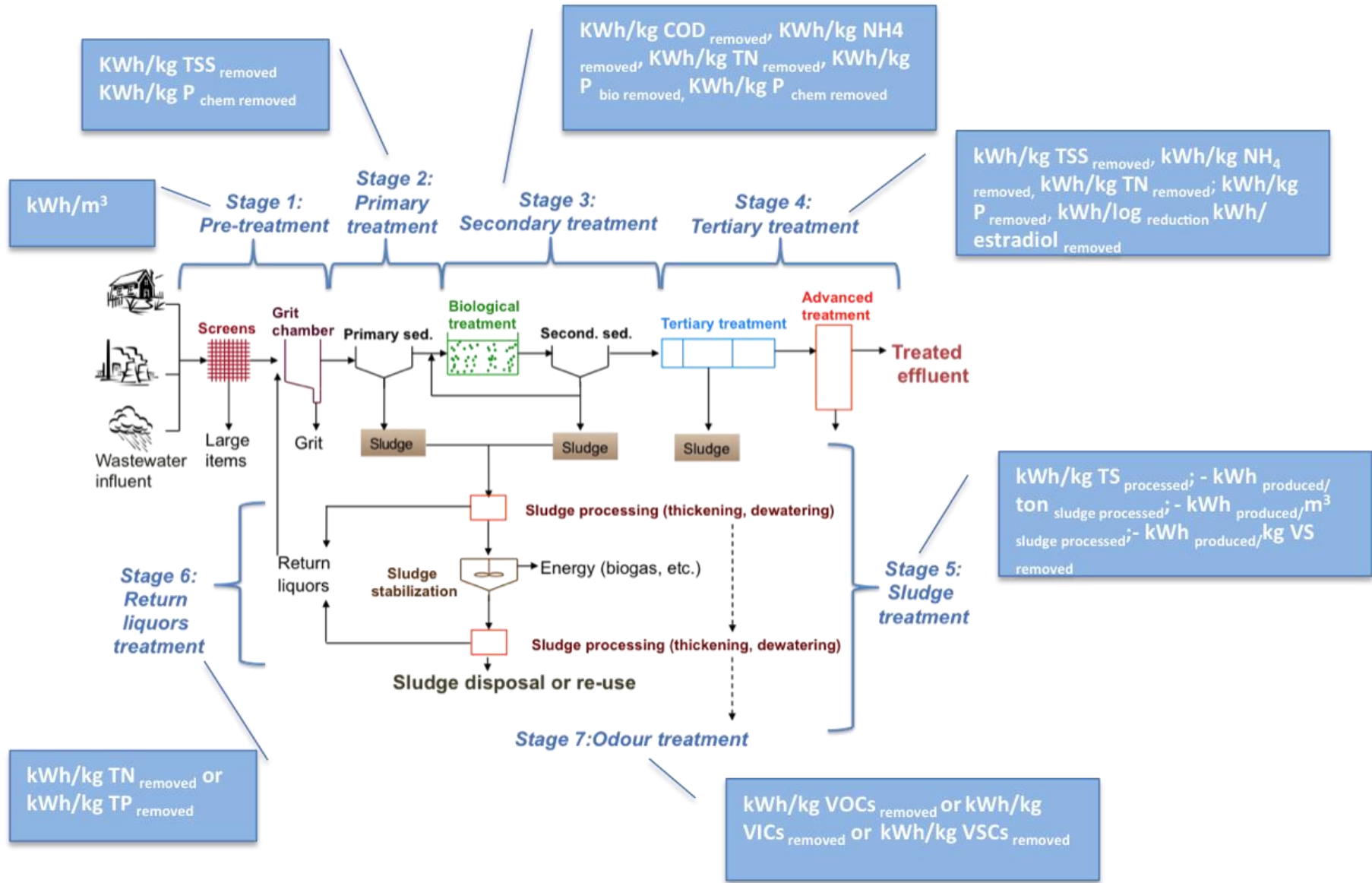


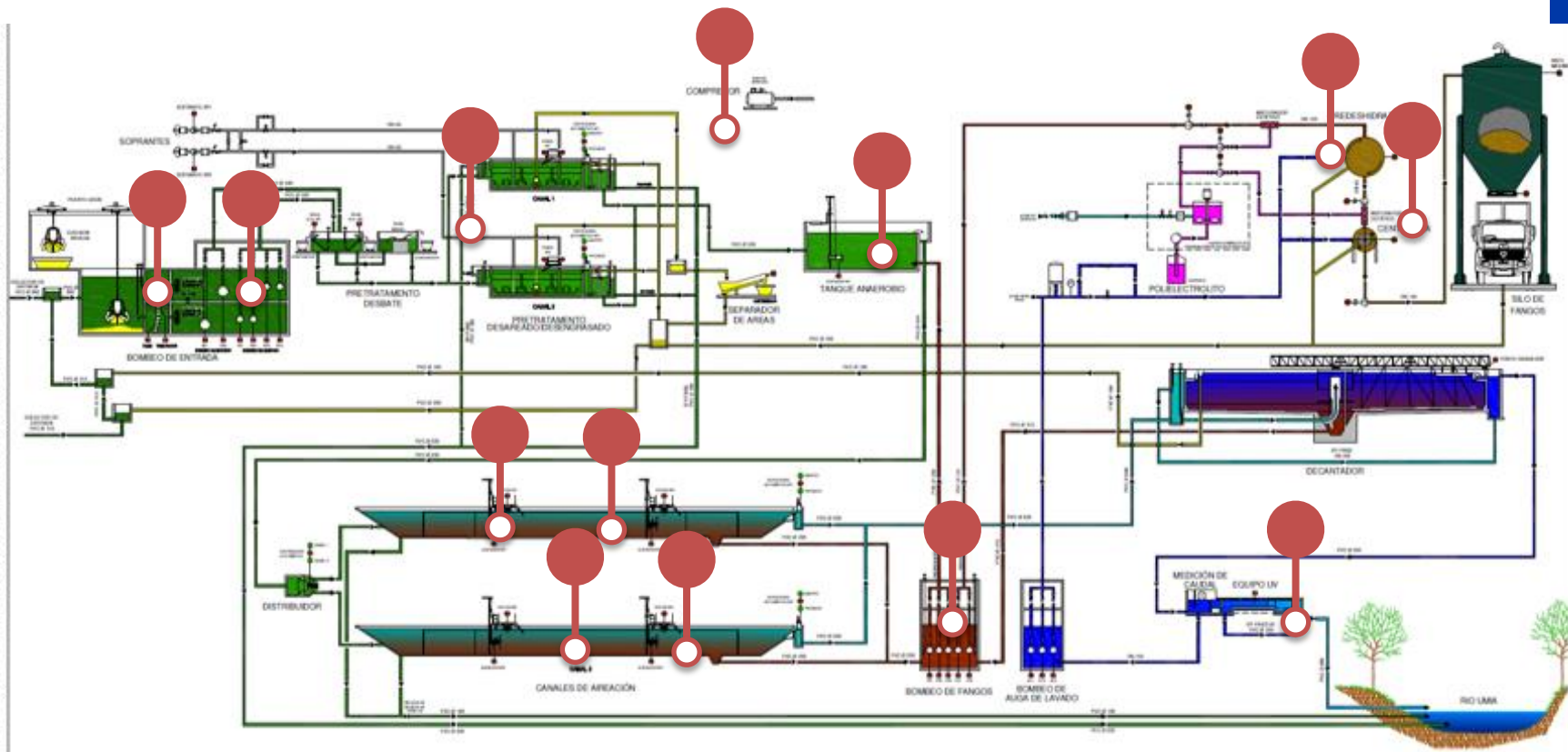
Definition of WWTP types



Definition of appropriate KPIs

Stages and related KPIs





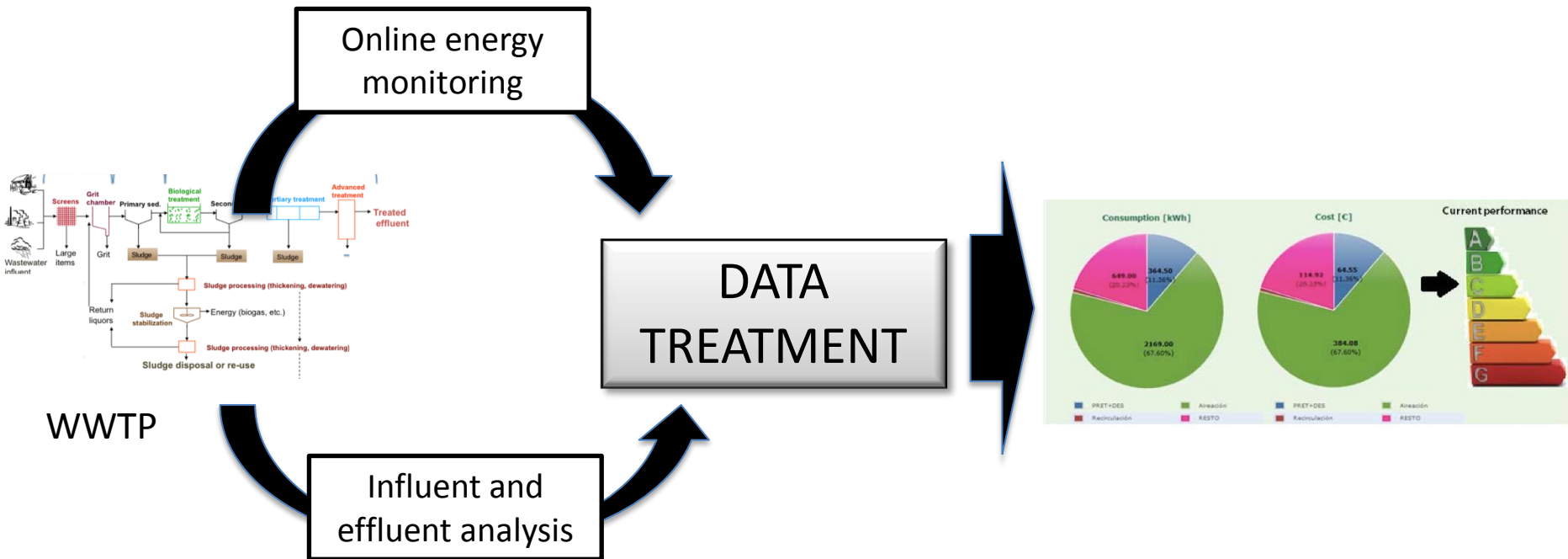
SAMPLING CAMPAIGN:

- Composite samples for 3 temporal windows
 - 1) Daily variation
 - 2) Weekly variation (tourist zone)
 - 3) Seasonal variation (integrate sampling where necessary)

Most important processes or pieces of equipment to monitor

- Aerators should be monitored individually
- Recirculation Sludge pumps should be monitored individually
- Clarifiers' motors
- Sludge dehydration
- Tertiary treatment (UV)
- Office building
- Illumination
- Energy generation if present

WWTP monitoring translated into meaningful data



Step 1. Data collection (Sampling points and frequency of measurements)

Step 2. Determination of Key Performance Indicators (KPIs)

Step 3 Determination of the **WATER TREATMENT ENERGY INDEX (WTEI)** and energy class



Key deliverables (3rd year)

Del. No.	Title	Description	Date
D 3.4	Methodology document V3	Final version of the document. This version contains the modifications agreed on stakeholder workshop D5.3	27
D3.6	Online Method V2	Based on D3.4, a revised web application will be published	27
D4.5	Actual Energy Savings Eval. Rep.	Calculation of the reduction achieved within the project in the pilot WWTPs	36
D5.4	Report on standardisation activity	Report on the standardisation route , the technical proposal itself and the advance reached in the consensus building process as well as future expectations after the project lifetime	36
D5.6	Recommendations for a future Directive	Technical report will be delivered and published to address the main issues present for the creation of an EU directive	36

What ENERWATER can do for you and what can you do for ENERWATER?

Strictly speaking, ENERWATER is not a research project. It is a Coordination and Support Action

- Be informed of our activities
- Attend our workshops
- Share the energy consumption data you monitor
- Make contributions to the methodology and standardization activities
- Use the methodology to assess the performance of your WWTPs (and hopefully save energy)
- Be part of the ENERWATER network, your input is really appreciate!

<http://www.enerwater.eu/network-members/>



ENERWATER



Thank you very much for you input!



Acknowledgements & Disclaimer:

The ENERWATER project has received funding from the European Union's Horizon 2020 research and innovation programme under **grant agreement No 649819** (H2020-EE-2014-3-MarketUptake). Although the project's information is considered accurate, no responsibility will be accepted for any subsequent use thereof. The EC accepts no responsibility or liability whatsoever with regard to the presented material, and the work hereby presented does not anticipate the Commission's future policy in this area.

Further Information: www.enerwater.eu

www.linkedin.com/grps/ENERWATER-Project-8309883/about



@EnerwaterPro