Main results and lessons learned

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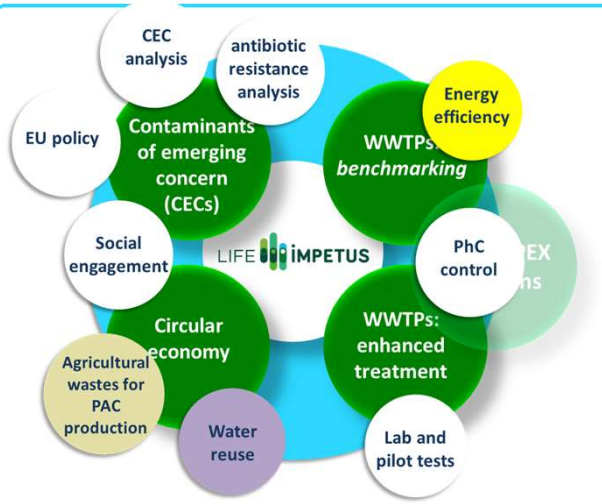
LIFE14 ENV/PT/000739
Improving current barriers for controlling pharmaceutical compounds in urban wastewater treatment plants
www.life-impetus.eu

Remembering
the project's context in 2014…



Fulfilment of objectives

Improving current barriers for controlling pharmaceutical compounds in urban wastewater treatment plants

- ✓ To produce valuable **knowledge for water resource protection from PhCs** and associated **environmental policy** on PhC occurrence, concentration and control in WWTPs, bacterial antibiotic resistance and PhC bioaccumulation in clams
- ✓ To demonstrate **measures for improving the control of pharmaceutical compounds** (PhCs) in urban wastewater treatment plants (WWTPs) with conventional activated sludge (CAS) treatment

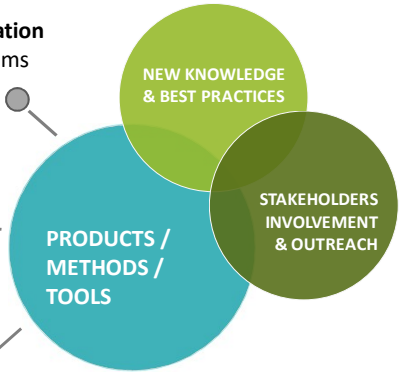
3-level innovation

3-level innovation… key results

Procedures for PhCs' quantification in wastewaters, sludges and clams (TRL 9)

Performance assessment system for a sound identification and monitoring of the **improvement strategies** (TRL 7)

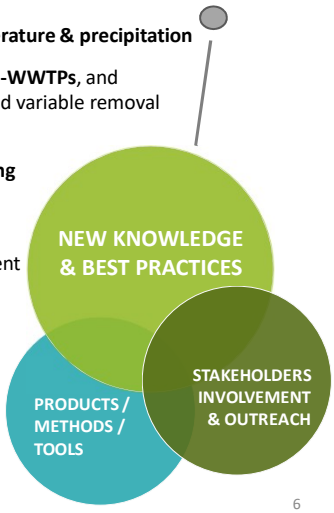
New high performing PAC produced from pine nut shell residues (TRL 7)



3-level innovation… key results

2-year data of PhC occurrence in 2 urban CAS-WWTPs (~ 9000 results) from where we:

- **characterized the PhC occurrence** and its variation with **temperature & precipitation**
- understood **how far can we go in PhC control in current urban-WWTPs**, and identified the recalcitrant PhCs and those with intermediate and variable removal for which extra measures are needed
- derived a **4-class PhC framework for interpreting and predicting** the **PhC treatability** in urban CAS-WWTPs (from A-easily removed to D-recalcitrant)
- identified **low capex, low energy strategies** for improving current barriers for PhC control in urban CAS-WWTPs, these being:
  - **operation strategies** (e.g. F/M ratio control) TRL 9, full-scale demo
  - **PAC-enhanced treatment strategies** (dosing eco-friendly PAC to the biological reactor) TRL 8, long-term pilot & short-term full-scale demo



3-level innovation… key results

2-year data of PhC occurrence in two urban CAS-WWTPs

On anti-microbial resistance

- a total of almost 7000 **antibiotic-resistant colonies were isolated** from raw and treated wastewater samples
- antibiotic test susceptibility of 300 **antibiotic-resistant isolates showed resistance to two or more antibiotic groups** (incl. to 3rd generation cephalosporins)
- **multiresistance (to 3 or 4 antibiotic groups)** were found in ca. 30-60% of the isolates from raw water samples and in ca. 12-35% of the isolates from treated wastewater samples
- 198 **resistant genes** (mainly CTX-M type genes, responsible for resistance to b-lactams) were found from these isolates

3-level innovation… key results

2-year data of PhC occurrence in two urban CAS-WWTPs

anti-microbial resistance

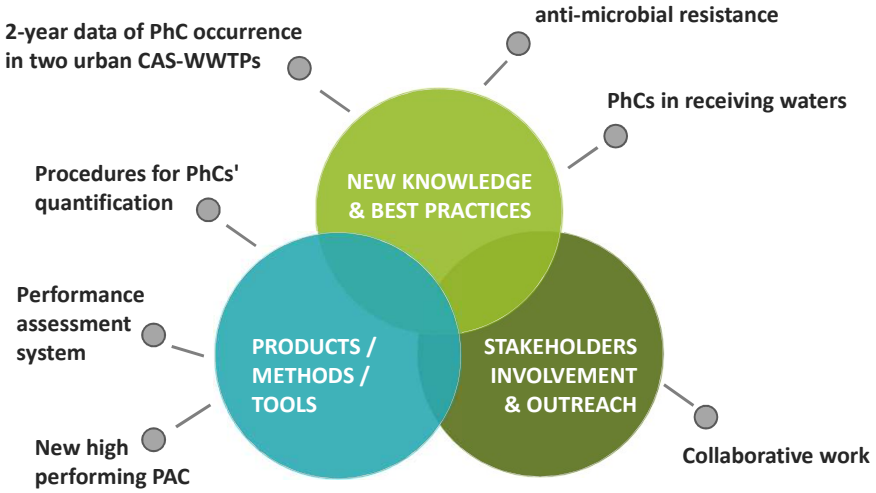
On PhCs in receiving waters

- three 1-month field campaigns (2016, 2017, 2018) of clams exposure to a gradient of WWTP discharge in Ria Formosa, Algarve (where 90% of the PT production of clams occur), from where we propose that:
  - *Ruditapes decussatus* (a clam species) is a suitable **bioindicator of PhC bioavailability** in real water environments, better than the water samples' data
  - PhC uptake & bioaccumulation depend on **PhC properties**, **abiotic** and **biotic factors**

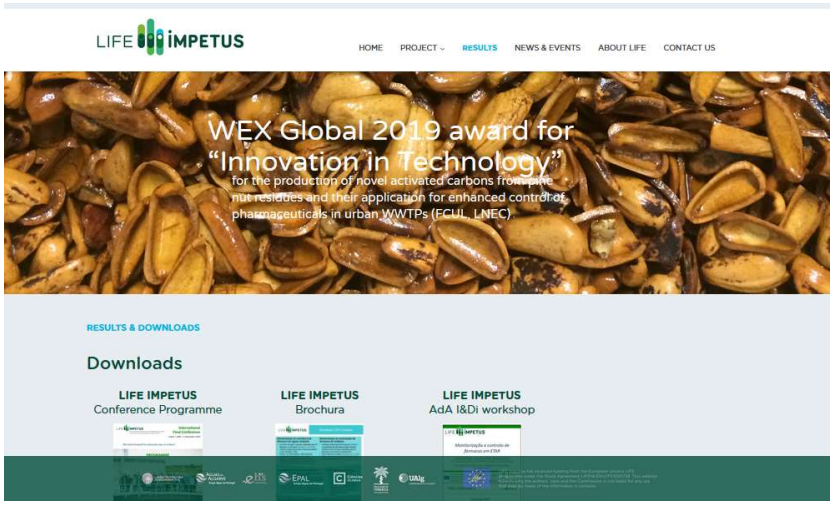
3-level innovation… key results

- **Collaborative work** was developed with a stakeholders' panel to characterize:
  - their perceptions and attitudes towards PhC use and release in the environment
  - intangible costs and benefits of their control in urban WWTPs (an input to the CBA)

3-level innovation



More results in *www.life-impetus.eu*



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Thank you
Obrigada

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