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## Run4Life project: A step forward in NPK recovery from source-separated wastewaters.

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Domestic wastewater (WW) is an important carrier of nutrients usually wasted away by current centralised sewage treatment plants. The Run4Life project proposes an alternative strategy for increasing circularity of WW treatment systems and improving nutrient recovery rates and material qualities. This is based on a decentralised treatment of segregated black water (BW), kitchen waste and grey water combining existing and innovative technologies.

Run4Life is currently improving innovative nutrient recovery technologies, these being: (i) an ultra-low flush vacuum toilet, which uses around 0.5L/flush, thus less water than conventional vacuum toilets, allowing concentration of BW compared to conventional toilets and vacuum toilets. (ii) Bio-electrochemical systems for nitrogen recovery, which recovers up to 12.8 g/m<sup>2</sup>\*d of Nitrogen present in blackwater as liquid fertilizer (ammonium nitrate) (iii) (Hyper-)thermophilic anaerobic digestion, which aims to recover the phosphorous and nitrogen in the hygienised effluent in a one-step treatment and ready for use as fertilisers.

Nutrient recycling technologies from domestic WW are demonstrated at large scale in four demonstration sites where decentralised WW treatment systems are implemented: Ghent (Belgium, 430 houses), Helsingborg (Sweden, 320 apartments), Sneek (The Netherlands, 32 houses), and Vigo (Spain, 1 office building). This will result in solid and liquid NPK fertilizers being recovered in the form of struvite, ammonium nitrate, calcium phosphate, organic fertilizers and reclaimed water.

The environmental, economic and societal impact of the obtained fertilizers is being tested by means of ecotoxicology tests, pot experiments, field trials, and by a selection of key performance indicators based on European, national and regional legislation present in the four different countries. Life cycle assessments are being performed for each technology and demonstration

site, and active measures such as knowledge brokerage activities are being developed as an engagement strategy to advocate the institutional, legal and social acceptance of the Run4Life nutrient recovery technologies and fertilizers produced. In addition, new business models which can benefit from the Run4Life project are currently being assessed.

It is expected that, by the end of the project, more than 90% of the water will be reused, and that nutrient recovery rates will achieve 100%.