INNOQUA: Sustainable sanitation with nature-based solution

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 689817.

A commitment

- Develop a decentralised sanitation system suitable for the Global North and the Global South
- Urban and rural areas
- A 4 years R&D project
- 20 partners from diverse horizons

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Specifications

- Market studies
- Social acceptance questionnaire
- Legal requirements
- End-user requirements
- Environmental and cost assessment
- Communication

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4 Technologies from the concept to the product

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INNOQUA System

4 Modular Technologies

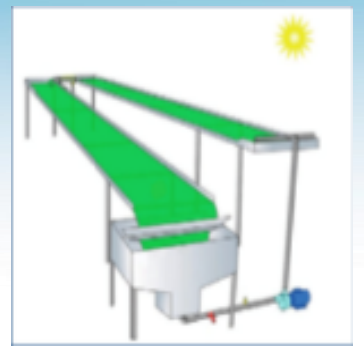
Lumbrifilter

- Primary and secondary treatment
- Aerobic system utilising earthworms and bacteria
- Removes BOD, suspended solids, ammonium

Daphniafilter

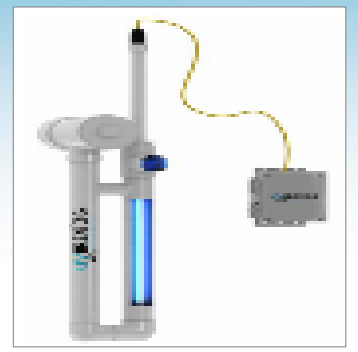
- Tertiary treatment
- Daphnia species consume very fine suspended solids, including bacteria
- Biofilm removes nutrients and other pollutants

Bio Solar Purification



- Tertiary treatment
- Biofilm removes nutrients and other pollutants

UV Disinfection



- Disinfection
- Optimised UV lamp configuration kills pathogens in treated wastewater

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The lumbrifilter

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INNOQUA Worldwide demonstration

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The challenge

Selected wastewater characteristics for the demonstration sites (on a mg / L basis, unless otherwise specified)

Country	Flow Volume (m^3/day)	pH	Suspended Solids	COD	BOD_5	Ammonium (as N)	Total Nitrogen (as N)	Total Phosphorus (as P)
Ireland	0.2	7.5	5483	8148	-	57.6	252	-
France	0.6	7.5	609	1313	495	164	-	-
Italy	0.5	7.1	325	1016	380	161	145	13
UK	2.00	-	68	335	147	32	-	-
Turkey	1.50	7.5	595	772	261	53.8	-	7.34
Romania	2.40	-	324	857	395	36.7	103	8
Ecuador	2.00	7.2	164	506	298	62	-	-
Peru	2.5	8.2	134	872	511	180	-	-
Tanzania	1.40	-	95	511	-	78	-	-
India	1.2	7.5	2644	2036	1217	117	-	-

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Worldwide demonstration

Prototype	Configuration
Ireland	LBF+DF+UV
Spain	LBF+DF+BSP

Demosite	Configuration
Ireland Ecuador	LBF
Italy	LBF+UV
France Romania Scotland	LBF + DF
Tanzania Turkey	LBF + DF + UV
India Peru	LBF + DF + UV LBF + BSP
France	Lumbricomposting

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Lumbrifilter (Ireland) – municipal wastewater (primary settled)

Ireland – pilot & demo-site

% Removal - average effluent value in ()					
COD	BOD_5	TN	TSS	NH_4-N	TP
78	93	40	80	88	29
(111)	(15)	(23)	(23)	(4)	(5)
Surface Removal Rate ($g/m^2.day$)					
192	115	10	30	13	1.1

- Top up woodchip (once a year)
- No other maintenance

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Lumbrifilter (Ireland)

Ireland – agricultural demo-site

Up to 0.2 m^3/day

	COD (mg/L)	TSS (mg/L)	NH_4-N (mg/L)	TN (mg N/L)
Influent	8,148.3 ± 7342.3	5,484.3 ± 8,706.5	57.6 ± 19.5	251.9 ± 49.6
Effluent	1,875.9 ± 905.7	370.0 ± 195.8	16.3 ± 10.7	85.9 ± 34.4
% removal	62.6 ± 128.9	83.1 ± 14.5	71.9 ± 15.6	68.8 ± 16.1

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Lumbrifilter +UV system (Italy)

Italy demo-site

	Inlet lumbrifilter (mg/L) n = 24	Outlet lumbrifilter (mg/L) n = 24	Removal efficiency (%)	Local discharge Regulation (mg/L)
TSS	316	23	93	80
COD	998	143	86	160
BOD	391	16	96	40
NH4	88	10	87	15

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Lumbrifilter +DF (France, Romania, Scotland)

SEPTIC TANK LUMBRIFILTER DAPHNIAFILTER

	Inlet lumbrifilter (mg/L) n = 10	Outlet lumbrifilter (mg/L) n = 10	Global efficiency (%) n = 10	Discharge limit (mg/L)
TSS	609	40	**91**	25
COD	1313	216	**81**	
BOD	495	**21**	**85**	35
NH4	164	36	**78**	

French demo-site

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Lumbrifilter +DF +UV system
Lumbrifilter +BSP
(India &Peru)

Demo-site Peru

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Observations from the project team include:

- Occasional raking of the top surface of the Lumbrifilter has been required in some sites once or twice a month during normal operating conditions.
- Occasional top-up of woodchip has been required in the Lumbrifilter—perhaps 100 mm over 4–6 months. No further maintenance has been required.
- The Lumbrifilter is very robust and recovers quickly even when flows have stopped for several weeks—providing the woodchip remains damp and does not freeze.
- In long periods where wastewater volumes are low the Lumbrifilter dosing system can be adjusted to maintain a good worm population.

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Thankyou for taking part!

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