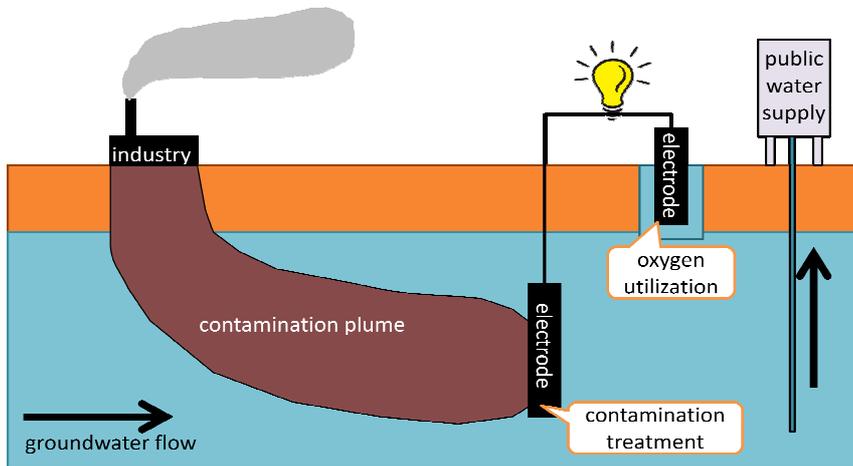


# Bacterial batteries: using groundwater pollution to generate electricity

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**Figure 1** Groundwater contamination and treatment using microbial fuel cell concept.

Groundwater is water flowing beneath the earth's surface in the pores and fractures of the rock. It is an important worldwide source of drinking water (30% of drinking water in England and Wales come from groundwater).

Groundwater can be contaminated by organic compounds which compromise the water quality. Figure 1 shows a typical scenario where groundwater is contaminated by spillage of chemicals from an industrial source with a potential risk to public water supply. Bacteria

present in groundwater are able to biodegrade this pollution but they require oxygen for respiration. Oxygen supply below the ground can be limited and therefore the biodegradation of contaminants is also limited. Traditional technologies pump oxygen below the ground to support biodegradation. These technologies consume electricity and are not sustainable.

New technology for enhancing degradation of contaminants in groundwater using bacterial batteries is being developed - microbial fuel cells (Figure 1). Electrodes are inserted below the ground - one in contact with the contamination, one on the surface in touch with oxygen - and connected by a wire. Bacteria which biodegrade the pollution under the ground are provided with remote access to oxygen and biodegradation is enhanced. Electricity is produced while contamination is biodegraded. This microbial fuel cell technology used for biodegradation enhancement is potentially highly sustainable because electricity is not consumed but produced.

Microbial fuel cells used for enhanced biodegradation are still in development, only tested under laboratory conditions (Figure 2). The amount of electricity produced by this technology is not significant and it is not going to solve the world energy crisis. The main advantages are increasing the biodegradation rate of contamination and electricity savings.



**Figure 2** Laboratory microbial fuel cell producing electricity from contaminated groundwater.



It's not only scientists developing new technologies for electricity production that can make a difference to the environment. Saving energy at work and at home on daily bases can decrease the world electricity consumption significantly. The University of Sheffield promotes electricity saving by a program called Energy Matters. Money saved on electricity bills is used for student scholarships. More information can be found on the university webpage [Energy Matters](#).