

# **Water lifting water: a comprehensive spatiotemporal review on the hydro-powered water pumping technologies**

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## **Abstract-**

Water pumping systems driven by renewable energies are more environmentally sound and, at times, less expensive alternatives to electric- or diesel-based ones. From these, hydro-powered pumps have further advantages. Nevertheless, these seem to be largely ignored nowadays. More than 800 scientific and nonscientific documents contributed to assemble their fragmented storylines. A total of 30 pressure-based hydro-powered pumping technologies worldwide have been classified and plotted in space and time. Although these do not present identifiable patterns, some noticeable clusters appear in regions such as Europe, South-Southeast Asia, and Eastern Africa, and in timeframes around 1960-1990, respectively. Some technologies have had a global impact and interest from their beginnings until contemporary times, others have been crucial for the development of specific countries, and other ones barely had almost imperceptible lives. All of them, nonetheless, have demonstrated to be a sound alternative to conventional pumping technologies, which can be unaffordable or inaccessible, particularly in remote and off-the-grid areas. Currently, hydro-powered pumping technologies face a regained momentum, hence a potentially promising future. However, researchers, manufacturers, and users need to be aware of the importance that management systems, as well as business models, pose for these technologies beyond their mere performance.

**Index Terms-** hydro-powered; water-powered; water-driven; hydro-mechanical; self-reliant; water lifting; water raising; water pump

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