

Considerations for a Water Reuse Network for the Industrial Sector of an Arid Region exemplified by the Lurín Valley, Peru

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Abstract

The Lurín Valley in Peru is very representative of regions in the world that struggle with extreme water scarcity. Most importantly, the impacts generated by strong urban development, concurrently with fast population growth, reinforce the necessity to seek more sustainable ways of exploring local water resources. Considering the lower basin's industrial activity, which is of outstanding relevance for local communities, this study investigates the suitability of water reuse under an integrated approach for this sector.

By splitting industries into two groups according to fundamental quality requirements, nine scenarios were established based on purification levels achieved by available wastewater treatment plants (given their spatial configuration in the valley) and on different proportions in which these consumers demand each effluent quality. Along with possible distribution schemes for every scenario, the respective critical demands and analyses regarding safeguard of supply have been reported.

Taking into account local constraints such as pumping limit and maximum flow rates provided by WWTPs, it has been determined that a maximum of 493 L/s can be delivered the whole industrial area uniformly. Additionally, a notably high supply consistency was observed when sources of equivalent treatment levels were located the furthest apart from each other along the altitude. As clear advantages were identified for every spatial arrangement set up for treatment plants, the scenario with best conditions for safeguard of supply considers two sources of equivalent purification levels in the higher zones of the study area.

Finally, as represented by the possibilities and limitations of every scenario, the fact that industries are not as dispersed over a long distance when compared with agriculture, for example, makes the conception of an integrated water reuse system more viable, especially when considering the feasibility of meeting the demand for the entire sector.