Summary first technical webinar

Humanitarian WASH Innovation

Desalination and Reverse Osmosis in humanitarian context - September 12, 2025

CONTEXT

This technical workshop was organized by the Veolia Foundation, the French Water Partnership, and Action Against Hunger as part of a quarterly series of technical discussions following the biennial Humanitarian WASH Workshops held in January 2025. The session aimed to address specific technical questions raised about desalination, particularly regarding saltwater and brackish water treatment in humanitarian contexts. The workshop brought together field practitioners and technology providers to share experiences on energy solutions, maintenance challenges, and environmental impacts of desalination technologies.

MEDAIR - DESALINATION IN YEMEN Favour Mahona, Humanitarian Aid Worker & James Ray, WASH Advisor

Medair implemented two solar-powered desalination units in Yemen: one in Colbihan (Lahaj governorate) serving IDPs and host communities, and another in Aldale, a frontline area. Both systems were designed and assembled by local Yemeni contractors, producing drinking water from high-salinity groundwater sources. Key technical features included pre-treatment stages, reverse osmosis membranes, remineralization processes, and monitoring equipment (flow meters, pressure gauges, TDS and turbidity measurement). The systems incorporated solar panels as the primary energy source, with varying success depending on climate conditions.

Best practices identified include local expertise utilization, local material sourcing, cost efficiency, and solar energy success. Challenges encountered include finding contractors capable of complete system assembly (not just individual components), brine disposal management, particularly in agricultural areas (addressed through soak-away pits), seasonal solar limitations in Aldale (only 6 months of reliable sunshine), and the initial cost uncertainty due to limited experience with the technology

SOLIDARITÉS INTERNATIONAL - EMERGENCY RESPONSE IN GAZA Maud Rivoal, WASH Coordinator

Solidarités International rehabilitated an existing reverse osmosis system in Gaza, partnering with a local NGO to restart operations. The context presented extreme challenges: 96% of the population faced water insecurity, infrastructure was heavily damaged, and 85% of households consumed water without sufficient chlorination as of July 2025. The rehabilitated system produced approximately 100 cubic meters per day (capacity 120 m^3/day), addressing both domestic and drinking water needs. The strategy focused on supporting existing infrastructure rather than introducing new technology.

Technical interventions: main water tank repair, electrical system rehabilitation, membrane replacement, generator rental (solar panels had been stolen, no power grid access), and fuel provision and water quality testing equipment supply.

KATADINE - ENERGY RECOVERY TECHNOLOGY Steven Le Guellec, Sales Manager & Andrew Arietta, Technical Support

Katadine presented their proprietary energy recovery reverse osmosis systems using specialized pumps (Pearson pump for larger systems, Clark pump for smaller units) that address two primary humanitarian challenges: high energy consumption and complicated maintenance.

Key technical advantages include the energy efficiency (75% reduction in power requirements compared to conventional RO systems through automatic brine pressure reinjection), the fixed 50% recovery rate (ne liter input produces half a liter fresh water, half a liter brine), the self-adjusting operation (system automatically operates at lowest possible osmotic pressure based on temperature and salinity, requiring no operator calculations or pressure adjustments), and the extended membrane life: Low-pressure operation and cross-flow circulation enable membranes to last 6-8 years

Presentation of the Aquifer 4000 portable system and its performance. Emerging technology: brine recirculation loops in development, achieving up to 95% recovery rates in laboratory testing (vs. 50% standard), significantly reducing brine waste and environmental impact. Support services: Pre-delivery training, technical support, remote troubleshooting, and connection systems for remote monitoring of fixed installations.

KEY EXCHANGES

Challenge prioritization by context: the Yemen experience demonstrated that priorities vary by location. Environmental impact (brine disposal) was critical in agricultural Aldale but less concerning in Colbihan. Energy availability was reliable in sunny Lahaj but problematic in Aldale with seasonal rains. Cost decreased significantly once local sourcing was established.

Spare parts and maintenance: success depends on local material availability, training approaches that pair contractors with community operators, and maintaining manufacturer support relationships. Gaza's context required improvisation, while Yemen benefited from in-country availability of all components.

Environmental sustainability concerns: participants raised concerns about groundwater depletion in already water-stressed regions like the Middle East. The consensus emphasized that desalination must be a last resort after exhausting surface water collection options. Organizations must verify sustainable extraction rates and conduct proper environmental impact assessments.

Social vs. technical solutions: emphasis on the social issue around access to water, which requires governance solutions. Example of the Yemen's Al Moha region where 90% of fresh water goes to agriculture, while nearby communities with salty groundwater must travel to access water. Water allocation and resource sharing may be more sustainable than expensive desalination infrastructure.

Water quality and chlorination: significant discussion addressed community resistance to chlorinated water in Gaza despite health risks. Simple pool testers with DPD-1 tablets should be prioritized in humanitarian supply chains for immediate water quality feedback.

CONCLUSION

Solar power offers sustainability when climate permits, providing independence from fuel supply chains and long-term viability. However, desalination should only be implemented when simpler alternatives are exhausted: it should be considered a last resort. Proper assessment of water resources, recharge rates, and environmental impact is essential. Organizations must conduct proper impact assessments, verify sustainable extraction rates, plan for brine disposal impacts (particularly in agricultural areas), and consider social/governance solutions before technical interventions. Emerging brine recirculation technologies show promise for reducing environmental impact. Both field experiences emphasized the critical importance of local contractors, retired engineers, community volunteers, and in-country material availability. Training programs should pair contractors with community operators during installation to ensure knowledge transfer.