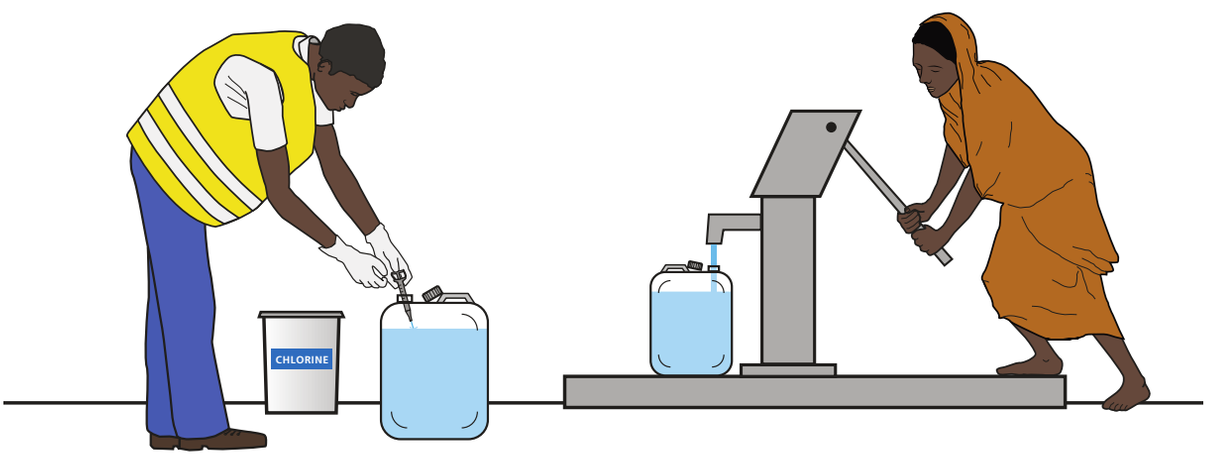
Point-of-Supply Chlorination

Response Phase	Application Level	Management Level	Objectives / Key Features
** Acute Response ** Stabilisation ** Recovery	Household ** Neighbourhood City	Household ** Shared Public	Point-of-supply treatment, water disinfection
Local Availability	**Technical Complexity**	**Maturity Level**	
** Medium	* Low	* Low	



Point-of-Supply Chlorination at community water points, schools, health centres and water tanks involves the installation of a device at the water point that is operated by water pressure. The device continuously releases a dose of chlorine into the collected water by dissolving solid chlorine media or by dosing liquid chlorine. Disinfection occurs during the transport of water to the home and storage in the container. During disease outbreaks, the dosing of chlorine can be done manually (bucket Chlorination).

The technology is compatible with systems supplying water intermittently, such as intermittently operated piped systems or boreholes with manual or mechanical pumping. The chlorine is released into the water at concentrations of around 2 mg/L of free chlorine, which can be adjusted based on the chlorine demand. Chlorine disinfects water during the transport and storage time in the jerrycans and protects the water from recontamination. In disease outbreaks and when the devices for continuous Chlorination are not available, chlorine can be manually dosed. Here, a person would add a required dose of liquid chlorine in every container of water collected at the supply point.

Design Considerations: There are two currently available types of device to automatically dose chlorine. The first is very simple to install and consists of a plastic housing containing a few solid chlorine tabs in the chamber. When water flows through the chamber with the available water pressure, it flows through openings to dissolve the chlorine. The size of the opening can be adjusted mechanically to influence the contact time and the concentration of chlorine released into the water. Once the flow is interrupted, the device drains, and chlorine release is stopped. The volume of water that can be treated with one tab depends on the manufacturer, the specific device used and the tablet concentration. Common commercially available tabs can treat between 1500–2500 L of water. Typical flows are around 10–30 L/min.

The second type of device doses liquid chlorine using a basic principle of fluid mechanics – the venturi principle. When water flowing at a defined pressure encounters a thin tube, the pressure drops and the lower pressure at this point sucks the liquid chlorine into the water. Liquid chlorine needs to be filled regularly in this device. The installation of the device should be done by a trained professional. Manual dosing of chlorine, also known as bucket Chlorination, can be done with a syringe or a small measuring cap, dosing an exact volume of liquid chlorine solution directly into a jerrycan. Chlorine dispensers dose a fixed volume of liquid chlorine into jerrycans or buckets by turning a tap or pressing a button.

Materials: Few devices are commercially available. In most cases, the devices need to be imported, although they are compact, and the installation is usually simple and fast. A constant supply of chlorine in a form required by the device needs to be assured locally. While liquid chlorine might be available locally, the solid chlorine tablets usually need to be supplied from abroad. Bucket Chlorination requires trained staff.

Applicability: The technology uses existing water supply points, such as boreholes or standpipes. It is appropriate for intermittently operated systems. Point-of-Supply Chlorination is suitable when water is contaminated at the tap or if contamination is expected to occur later. It is suitable for any stage of an emergency when water quality needs to be improved at the water point or at the household level and wells or where a distribution network is in place. It can be easier to manage than distributing liquid chlorine to households but requires a constant supply of chlorine in a form required by the device. Bucket Chlorination is mostly used during epidemics or as an epidemics prevention measure when there is a high risk. This is usually done only during defined periods, as it is resource and time intensive. In the long term, bucket Chlorination should be replaced by automated solutions, either at the point of supply or at the source.

Operation and Maintenance: Once installed, Point-of-Supply Chlorination devices are self-operating, and users do not have to expend any additional efforts at the water point. Bucket Chlorination at the point of supply requires the user to dose the chlorine. The chlorine concentration must be adjusted initially and monitored over time. Fluctuating water quality requires frequent monitoring and adjustment. Liquid and solid chlorine needs to be refilled regularly. Chlorine may degrade over time or if incorrectly stored and should always be stored away from direct sunlight, excessive humidity and high or varying temperatures. Open packages should be used quickly, respecting the information regarding shelf life provided by the manufacturer. If liquid chlorine is produced on site **(T.7)**, the staff should be properly trained. These systems cannot be used with turbid water (> 5 NTU), so an initial pre-treatment for turbid water is essential.

Health and Safety: Chlorination at typical concentrations used for drinking water treatment is very efficient at inactivating bacteria, less efficient against viruses and not efficient against some protozoa. Turbidity is an issue, as particles in the water may shield microorganisms from disinfection. High organic matter content in the water leads to the formation of disinfection by-products (DBPs) that should be minimised due to the potential health concerns associated with their long-term exposure. However, the long-term potential risks to health from these by-products are low in comparison with the confirmed acute risks associated with inadequate disinfection, and disinfection should therefore not be compromised in attempting to control DBPs in the acute phase of an emergency. Chlorine products must be handled carefully and kept away from children, as they can irritate the skin, eyes and respiratory system. Continuity of product supply and extensive education are essential. Safety data sheets provided with chlorine-containing products should be consulted for requirements regarding safety and protection.

Costs: The costs for a solid chlorine refill for a community water point are around 50 USD for around 100 000 L of water. Installation costs need to be added, with flow-through devices for tablets costing around 20–40 USD and venturi-based systems for liquid chlorine costing around 200 USD. If bucket Chlorination is used, respective staff time and salaries need to be considered.

Social and Environmental Considerations: Some users may be reluctant to chlorinate due to its impact on the taste and odour of water. User scepticism about effectiveness might be supported by the unchanged appearance of water.

Strengths and Weaknesses:

- ⊕ Requires almost no behavioural change, since it uses locally available and community water points
- ⊕ Easier to manage and lower cost due to its scale, as compared to household Chlorination
- ⊕ Requires no additional work for the users
- ⊕ Provides residual chlorine for avoiding recontamination

- ⊖ Requires regular supply of chlorine
- ⊖ Effectiveness will depend on various factors like turbidity, temperature, sanitary conditions and pH
- ⊖ Taste may not be acceptable to some users
- ⊖ Dose and contact times might need to be adjusted over time

→ **References and further reading material for this technology can be found on page 222**