UN Environment-DHI Centre on Water and Environment
CTCN CLIMATE TECHNOLOGY CENTRE & NETWORK
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Flood-proof wells

Challenge: Water pollution

Adaptation response: Flood proofing for water quality

Description

Flooding of wells often results in contamination of freshwater. Specialized construction design and planning procedures can be used to protect wells against the risks of flooding, and consequent water contamination.

Specific measures include sealing wells with a protective cap (such as concrete or clay) extending several metres below the surface to provide a protective barrier for the upper part of the well. This mitigates contaminant infiltration and improves the well's strength, reducing the risk of collapse during a flooding event. Additional measures include installation of hand pumps at an elevated level that are watertight following use. More advanced wells may be equipped with systems that send a warning if surface water enters the well, prompting a response to reduce health risks, for example prohibiting use of the well or setting up a temporary water treatment site.

Selecting the right site for a well can also reduce water contamination risks. Constructing wells on higher ground, an adequate distance uphill from potential contamination sources (e.g. latrines, fertilized fields) reduces the pollution risks of during flood events. Tube-wells (a pipe or tube bored into an underground aquifer) and boreholes (narrow shafts bored into underground aquifers) are also generally less susceptible to contamination compared to dug wells (hand dug holes leading to a groundwater supply), due to use of a smaller diameter bore that is encased with a protective tube.

Implementation

Sanitary assessments of wells, along with human population distribution surveys and surveys of well locations (including elevation and proximity to potential pollution sources) can provide useful information for planning purposes, particularly for determining well proofing priorities.
Construction of new flood-proof wells (e.g. tube-wells or boreholes) requires specialized equipment and expertise, while retrofitting of existing wells or construction of dug-wells can be done using local materials and relatively simple equipment. Typical flood-proofing measures include construction of walls or mounds to raise the height of the well above historic flood levels, or installation of a pump and a watertight cover to avoid contaminated water infiltration. Well maintenance includes inspection for damage, leaks or holes in covers and protective tubes, regular testing of water quality and testing of warning systems, if installed.

Following a flood event, wells need to be inspected for damage. Water use may be prohibited until results from water quality tests have been verified and the water deemed safe for use. Public campaigns can help promote the importance of hygiene and risks of drinking or using contaminated water.

Environmental Benefits

- Reduces groundwater pollution risks.

Socioeconomic Benefits

- Maintains a safe water supply and reduces health risks during flooding.
- Reduces post flooding reconstruction and alternative water source costs.

Opportunities and Barriers

Opportunities:

- Protective well modifications are generally cheap and relatively simple to apply, delivering significant benefits

Barriers:

- Construction of new wells (if necessary) can be expensive and require special technical equipment
- In certain areas, flooding may prohibit access to the wells

Implementation considerations*

Technological maturity:	4-5
Initial investment:	1-4
Operational costs:	1-2
Implementation timeframe:	1-2

* This adaptation technology brief includes a general assessment of four dimensions relating to implementation of the technology. It represents an indicative assessment scale of 1-5 as follows:
Technological maturity: 1 - in early stages of research and development, to 5 – fully mature and widely used
Initial investment: 1 – very low cost, to 5 – very high cost investment needed to implement technology
Operational costs: 1 – very low/no cost, to 5 – very high costs of operation and maintenance
Implementation timeframe: 1 – very quick to implement and reach desired capacity, to 5 – significant time investments needed to establish and/or reach full capacity
This assessment is to be used as an indication only and is to be seen as relative to the other technologies included in this guide. More specific costs and timelines are to be identified as relevant for the specific technology and geography.

Sources and further information

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