Technology Fact Sheet for Adaptation

Technology: Improving resilience of protected wells to flooding. [i]	
Technology characteristics	
Introduction	Increasing access to groundwater is a key strategy for household water supply (both potable and nonpotable) , particularly in rural communities. Access to groundwater is critical during drought. Therefore, water supply schemes and drought relief programs in rural areas typically incorporate drilling or deepening of tubewells and/or boreholes. Protected wells can potentially provide a water supply that is highly resilient to flooding. However, improper design and construction can make them vulnerable during flooding. The key vulnerabilities of wells during flooding are: (1) ingress or infiltration of contaminated waters; (2) lack of wellhead access due to flood waters; and (3) collapse of unlined hand dug wells when soil becomes saturated. Protected wells can include tubewells, boreholes and hand-dug wells. The salient features of all protected wells include the following: (1) a concrete apron to direct surface water away from the well; (2) a sanitary seal (normally clay, grout, and concrete) that extends at least 1-3 m below ground to prevent infiltration of contaminants; and (3) a method to access water that enables it to be sealed following use. The technology includes “sanitary surveys” of wells to identify key vulnerabilities related to flooding. In addition to protection of wells currently used for drinking water, sealing abandoned wells is also essential to protecting groundwater quality in flood zones. If an abandoned well in not properly sealed, floodwaters that inundate the abandoned well are likely to contaminate both shallow and deep groundwater. Flooding can lead to contamination of drinking water wells and can also prevent physical access when floodwaters are high enough. Protecting wells against flooding is an effective mechanism to reduce the vulnerability of communities during flood events.
Institutional and organizational requirements	A training or certification program may be necessary for those carrying out sanitary surveys of wells in flood-prone areas. Some institutional capacity is necessary to determine if, where and how public funds should be allocated for constructing or retro-fitting wells.

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Operation and maintenance	Mainly maintenance of installed and protected systems.
Endorsement by experts	Endorsed by experts.
Adequacy for current climate	Very suitable for both current variability and future climate change. It empowers communities to adapt appropriately to seasonal flooding that could result in contamination of or temporary lack of access to wells.
Size of beneficiaries group	Households and communities.
Disadvantages	The main disadvantage is cost, particularly if new wells drilled.
Capital costs	
Cost to implement adaptation options	Cost of constructing and protecting one borehole may be up to US $15,000. Protecting an existing well be cost up to US $5,000.00
Additional cost to implement adaptation option, compared to "business as usual" (extra storage capacity)	
Development impacts, indirect benefits	
Reduction of vulnerability to climate change, indirect	Reduces the vulnerability of flood-prone communities increased flooding from climate change.
Economic benefits Employment Investment Public and private expenditures	 Employment for technicians undertaking "sanitary surveys" and artisans for construction works. Initial investment may be high but maintenance is simple and less expensive. Reduces public expenditures on resettling communities displaced due to lack of access to flooded wells.
Social benefits Income Learning Health	 Ensuring availability of good quality water in flooded communities would reduce household expenditure on more expensive potable water sources such as from water tankers and bottled water. Training of local artisans and communities as a whole in maintaining the systems put in place. The technology ensures continuous access of

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	communities/households to uncontaminated water during floods thereby contributing to improved health of households..
Environmental benefits	Groundwater is protected from contamination.
Local context	
Opportunities and Barriers	Communities that are frequently flooded with temporary lack of access to their wells would certainly be willing to invest in flood-proofing. However, those with alternative (e.g. piped) water supplies may be less likely to demand/ less willing to invest in flood-proofing wells.
Market potential	
Status	Some protected wells already exist in several rural communities. The technology is being promoted by the CWSA and some NGOs in Ghana.
Timeframe	The implementation can start now. A large number of communities are already vulnerable to well contamination from frequent floods, especially in the northern parts of the country.
Acceptability to local stakeholders	The technology is acceptable to local stakeholders.

[i] **This fact sheet has been extracted from TNA Report – Technology Needs Assessment Report – Ghana. You can access the complete report from the TNA project website http://tech-action.org/**