

Implementation Plan for Arsenic Mitigation in Bangladesh

1. Introduction

Evidence thus far indicates concentration of arsenic above the permissible levels of 50 parts per billion (ppb) in the groundwater in many parts of Bangladesh. Ninety seven percent of Bangladesh's population relies on groundwater as source of drinking water. Most of this water comes from about 10 million tube wells, about 90% percent of them privately owned. In 2000 it was estimated that 2.65 million hectares that is about 75% of the total land under irrigation are irrigated by ground water. Some estimates show that more than 95% of the ground water extracted are used for irrigation and less than 5% is used as drinking water. Nation-wide studies reveal that the problem of arsenic is of an enormous magnitude engulfing almost the entire country. Arsenic contamination of groundwater is as much a health and environmental issue as it is a water supply issue. There is yet no strong evidence to suggest that arsenic in groundwater adversely impacts agriculture, crops and livestock. Studies are underway to determine whether or not there is any impact of arsenic on agriculture and food chain.

The Implementation Plan to address arsenic must, therefore, be multi-sectoral with components on water supply, health and agriculture sectors. This Implementation Plan will be the overall framework for the related sectors. The relevant ministries and agencies may formulate and administer the sectoral components with the co-ordination taking place through the Secretaries' Committee on Arsenic and with technical support and advice from the National Committee of Experts on Arsenic.

A. WATER SUPPLY

2. Present Status

2.1 Screening

There is a distinct regional pattern of arsenic contamination. The greatest contamination is in the South and Southeast and the least contamination in the northern most and in the uplifted areas of north and central regions of the country. However, there are several occasional highly contaminated hot spots in generally low contaminated regions of the country. Variability of arsenic concentration within short distance makes it difficult to predict the level of concentration of a given well even when the concentration of the adjacent wells are known. These conditions make testing of each and every tube well essential before implementing or even designing any mitigation programmes. However the scarcity of water testing facilities including adequate field test kits with required efficiency made this task ever more complicated.

So far screening program have been completed in 67 *upazilas*, which includes testing of 1.4 million tube wells for arsenic and examination of 17 million people for visible symptoms of arsenicosis. Testing of production wells in 100 municipalities with piped water supply, has been completed. It is expected that the screening of all tube wells and survey of patients will be completed in 268 potential arsenic contaminated *upazilas* in a few months time (*Annex-A*). With a view to avoiding duplication in the screening program the 268 contaminated *upazilas* have been divided among different government and donor assisted projects and non-government organisations.

The results from 67 *upazilas* show arsenic contamination in about half of the tube wells screened. The range of contamination of tube wells among these *upazilas* varies between 1% and 98%. There are more than 1400 villages where all the tube wells, the prime source of safe drinking water supply, are contaminated with arsenic.

2.2 Mitigation

Provision of arsenic safe water for people after screening of wells has been the greatest challenge. So far the success in providing mitigation options has been limited. Uncertainty about the effectiveness of alternative water supply technology options; inappropriate institutional arrangements; and confusion over the service delivery mechanism inhibit progress on arsenic mitigation. Nonetheless the last few years yielded useful lessons on different aspects relating to arsenic mitigation that will help future programmes.

3. Plan for Implementation of Arsenic Mitigation Program

3.1 Screening and Monitoring:

Information about location and extent of arsenic contamination of ground water is the primary requisite for undertaking any mitigation initiatives. Screening of all tubewells in potentially arsenic contaminated areas is, therefore, an essential activity that should precede any mitigation initiatives. Lack of adequate information about the causes of occurrence of arsenic in ground water and the temporal variability of its the concentration in wells, necessitate a regular follow up screening of tube wells that have been presently identified as arsenic safe and marked green. Regular testing and monitoring of ground water of at least 2% of the green tube wells including the irrigation wells should be undertaken on a six-monthly basis and testing capacity must be built at the local level for the purpose. Laboratory facilities to cross check field results should be available at the *upazilas* levels and the private sector should be encouraged and promoted in testing of tube wells.

3.1.1 Test Kit Development

The National Committee of Experts on Arsenic shall advise on a mechanism for evaluation of all existing test kits and recommend measures for development of local test kits through public/ private initiatives so that testing can take place at the community level without intervention of government agencies. Ultimate aim shall be the development of a digital or at least an analogue arsenic meter.

3.1.2 Development of Laboratory Facilities

Laboratory at the *upazilas* health centres should be upgraded to deal with water quality parameters including arsenic and bacteriological testing. Laboratory facilities must be developed at *upazila* levels through public/private initiatives and must be linked in a network with the seven existing DPHE laboratories and four DOE laboratories. Making arsenic-testing equipment tax-free may provide incentives for private entrepreneurs. The DPHE laboratories should be equipped with necessary instruments, chemicals and trained personnel. Government should formulate and enforce effective regulatory instruments for certification and accreditation to assure that these laboratories meet the minimum standards of equipment and performance.

3.2 Technology Options

Arsenic mitigation programmes for safe water supply shall promote a range of options but shall give priority to surface water over ground water source. The programme shall follow the approved guidelines/protocols in installation of safe drinking water options. The relevant guidelines/ protocols shall be upgraded and made comprehensive enough to support construction, operation and maintenance of the different technological options. It shall endeavour to promote piped water system wherever feasible. While research to devise appropriate options are on, for the present the arsenic mitigation programme shall promote the following options:

3.2.1 Improved Dug well:

Improved dug wells with the introduction of flexible pipes with float wherever necessary to minimise the adverse affect of sand boiling will be given priority in rural areas. Facilities for entering air and sunlight and in the case of turbidity sand filter shall be provided with the dug well. The guideline recommended for construction of dug well by expert committee shall be followed (***Annex-B***). Dug well is a traditional technology for withdrawal of ground water. The water of dug well is free from dissolved arsenic and iron even in locations where tube wells show arsenic. In arsenic affected areas dug wells have been proven to be safe, acceptable and popular source of alternative water supply. In many areas dug wells had traditionally been in use even in the recent past.

Improved dug wells can be constructed in almost all areas in the country except in areas with loose sandy soil, in areas with more than 15 metre consolidated clay layer, in the tidal zones of the coastal areas and in areas of stony hills.

3.2.2 Surface Water Treatment :

a. Pond Sand Filter

Given the presence of a large number of ponds in rural Bangladesh with water free of arsenic, construction of community based slow sand filters is a viable alternative water supply option all over the country where perennial rivers, canals, fresh water lakes and ponds of acceptable water quality is available. Therefore, treatment of surface water with slow sand filtration,

popularly known as Pond Sand Filter (PSF)/River Sand Filter (RSF), shall be considered a suitable alternative water supply option for arsenic contaminated areas. PSF is low cost and efficiently removes turbidity and bacteria. Regular maintenance, particularly washing the filter media, is crucial for the effectiveness of PSF. The guideline recommended for construction of PSF/RSF by expert committee shall be followed (*Annex-C*).

b. Larger Scale Surface Water Treatment

For large-scale water supply, surface water treatment from flowing rivers, large water bodies by appropriate treatment plant shall be encouraged.

3.2.3 Deep Hand Tube Well

Experts believe that mapping of the aquifers is an essential pre-requisite to any decision on the long-term development of ground water in arsenic affected areas. Where the shallow contaminated aquifer is separated from a deeper aquifer by substantially thick impervious layer, water from the deeper aquifer could be tapped for drinking water as a short-term measure. There are areas where water may be available in aquifers--deeper than the contaminated shallow aquifer. However there is no reliable data or information about the characteristics of the aquifers, or the existence of any impermeable layer separating the deeper aquifer from the contaminated upper aquifer. In these areas Pond Sand Filters and Dug wells will be tried first. If these options are found to be technologically not feasible, deep hand tube wells could be tried in those areas following the 'Protocol for Sinking Deep Tubewells in Arsenic Contaminated Areas' (*Annex-D*). However, deep hand tubewell can be installed in the coastal areas of Bangladesh having proven safe aquifer.

3.2.4 Rainwater Harvesting:

Rainwater harvesting is basically a household-based technology. It has good potential for water supply all over the country specially in salinity affected areas. In areas where alternative water sources are not easily available the potential of rainwater harvesting as alternative source of safe water supply has good prospect. Some NGOs and with the help of Unicef, DPHE have been promoting the development of various rainwater harvesting technologies in the country. In the context of arsenic problem and taking into account the cost and other limitations of long term storage of rainwater, the Local Government Division have been promoting a new approach to rainwater harvesting in arsenic contaminated areas. This approach aims at persuading people to drink rainwater at least in the rainy season.

Being a household based option it is recommended that the government's role in rainwater harvesting should be limited to promotional activities.

3.2.5 Arsenic Removal Technology:

Many organisations, local and foreign are involved in testing and marketing arsenic removal options. The dearth of reliable technology for arsenic removal has made Bangladesh a fertile ground for testing and implementation. These technology options fall in to two main groups – household and community level. The difference is in the cost and volume of water treated.

While the marketing of the removal options should be through the private sector the government shall do the following:

Shall not allow marketing of any such technology without proper testing and validation from Bangladesh Council for Scientific and Industrial Research(BCSIR). Before validation BCSIR shall submit all the technical and scientific data/information to a panel of experts for verification. This panel of experts shall be formed by the secretaries committee on arsenic from the national committee of experts on arsenic and from relevant experts in this field. For the purpose of validation BCSIR shall develop and follow necessary protocols approved by the National Committee of Experts on Arsenic.

Before permission is granted for marketing, proper legal procedures for consumers' protection must be in place. All agencies/companies/manufacturers must be made liable for any kind of failure of the unit, adverse affect to any user and environmental damages caused by the technology used. An agreement ensuring consumer protection and legal liability of the proponent should be made between the proponent and the validating agency (BCSIR).

National Committee of Experts on Arsenic shall develop detailed protocols regarding sludge and spent media removal and continually monitor such removal options by the public sector agencies (DPHE, DOE, LGIs) shall be ensured.

Arsenic removal technologies should not be considered as appropriate options until there has been formal validation of the technology options. There are several issues relating to the safety of these technologies, in terms of chemical and biological water quality, and to the disposal of the liquid and solid sludge(Annex – E). It is best to wait until these issues are better understood.

After the validation of a given technology it is for the private sector to develop marketing and, distribution networks. The role of the government shall be limited to validation of the options and making provision of legal instruments for consumer safeguards against all adverse affect resulting from the use of the options.

3.2.6 Piped Water Supply System

The long-term goal should be to introduce piped water supply systems both in the rural and urban areas preferably based on surface water treatment plants. For the rural areas government shall facilitate testing and piloting of small-scale piped water supply systems based on improved dug well, Pond Sand Filter or other surface water and safe ground water sources.

3.3 Provision of Alternative Water Supply

Given the fact that any effective 'treatment' for arsenicosis is yet to be developed and supply of arsenic safe drinking water is the principal way of addressing the problem, the government shall ensure that the affected community have access to safe water. Those already showing signs of disease from arsenic exposure will get special attention.

The wide variation of arsenic contamination from one village to another makes a phased response to arsenic mitigation imperative. Villages with more than 80% of the tube wells contaminated are obvious hot spots that need immediate attentions. These areas shall come under emergency response. The villages with arsenic concentration between 40% and 80% shall be under medium-term response. The long-term response shall include the whole country and shall aim at providing long-term sustainable water supply options.

3.3.1 Emergency Response

The government shall focus on ensuring at least one safe source of drinking water within a reasonable distance on an emergency basis. This shall be termed as “Emergency Water Supply Program in Severely Arsenic Affected Areas”. In upazilas, where screening has already been completed, the emergency water supply program should be commenced without any further delay. In other areas this program should start immediately after the screening is complete. For the emergency response improved dug well, pond sand filters will be tried first and deep tube wells following the protocols shall be adopted as the last option. The emergency response shall be completed in one year. The emergency response will take pressure off all stakeholders and time will be available to develop a considered and comprehensive approach to the supply of safe water to the people in the longer term.

Criteria

For the “Emergency Water Supply Program in Severely Arsenic Affected Areas” following criteria shall be followed:

Selection of Villages: Villages that have more than 80% of the tube wells contaminated shall fall under the emergency response. Pockets of high arsenic contamination or high number of arsenicosis patients in a village of otherwise low arsenic contamination may be allowed emergency response as exceptions. In villages, where more than 20% of the tubewells are safe awareness should be raised for drinking water only from safe tubewells.

Mitigation approach: The emergency response to arsenic mitigation shall be based on a supply driven instead of demand driven approach. The community and local government institutes will be actively engaged in site selection and will take responsibility of O&M of the facilities provided. Emergency response shall not subsidize to any individual household services.

Service Delivery: Speed is the essence of the emergency response and a demand driven approach, although good for long-term sustainability is usually time consuming. Therefore, in the emergency phase the delivery of facilities shall be supply based.

Service Level: Emergency response shall ensure at least one safe water source for 50 families taking into consideration the available safe hand pumps in a village and the new safe facilities installed. Emergency phase will deal with only community facilities. If feasible, supply of drinking water through pipes from improved dug wells, Pond Sand Filters or safe deep tubewells shall be considered on pilot basis.

Cost Sharing: It is a usual practice in the government to provide emergency response without any cost-recovery and the same principle has been followed for tubewells after floods, cyclones etc. Likewise, for the present emergency response there shall be no cost sharing for the capital cost of facilities. However the operation and maintenance cost shall be borne by the community and one of the nearest households will be selected as the caretaker family. It will also be the responsibility of the women member of the respective Ward of the Union Parishad to ensure that these public water sources are properly maintained.

Site Selection: Under the overall supervision of the women member for the respective Union Parishad, the Ward Arsenic Mitigation Committee, which is responsible for over seeing the implementation of the screening program, shall produce a map of the villages under the Ward, showing the location of red and green tubewells, safe government tubewells, wells with high arsenic concentrations and of patients. The representatives of the supply agency should then discuss the location of the safe source with the community, particularly the women, taking into account the information in the map and the technically feasible locations for the source. The location should then be agreed and the map sent to the supplying agency for final approval. During site selection, local conditions should be taken into consideration and it must be ensured that the water sources are easily accessible by women. Location of the existing safe water sources, distance from homesteads the facility means to serve, concentration of patients and access of poor to the facility shall be the considered in selecting the site for the new facility.

Institutional Arrangement: Different projects and agencies engaged in arsenic mitigation in different parts the country shall be required to accommodate their mitigation approach to this implementation plan. If any project becomes unable to accommodate the national action plan or implement the national emergency water supply program, DPHE shall implement the emergency program in the area.

Apart from implementing the emergency water supply component of its Arsenic Mitigation projects, DPHE, being the mandated government organization for rural water supply and having a countrywide network of personnel, shall be made responsible for coordinating the overall emergency water supply program at the central level. DPHE shall also monitor the progress of implementation against targets and hold regular review meetings. It shall also be the focal agency for providing necessary technical information and advice for implementation of the emergency program.

The Union Parishad, through the Union Arsenic Mitigation Committee and Ward Arsenic Mitigation committee shall oversee and coordinate the emergency water supply program in the Union. It shall be the responsibility of the Union Parishad to ensure that the criteria for site selection are followed properly and to keep the Upazila Arsenic Committee and UNO informed about the updated status of the emergency water supply program.

Third Party Audit: There shall be provisions of third party physical audit to verify whether criteria for service delivery, site selection etc. are properly followed before installation of any safe sources in any given village. The local administration could be involved in this activity. Random audits will be done by national level research and development organisation like BIDS, ITN (BUET) and university departments.

Preparatory activities to be under-taken on an emergency basis:

- A quick review and collation of various sample survey and blanket screening results to determine the magnitude of the arsenic problem in the country in terms of number of contaminated districts/upazillas, percentage of contaminated tubewells, number of patients identified. A working group with representatives from DPHE, NAMIC-BAMWSP, DGHS, BWDB, WARPO, BUET, NIPSOM, DCH and any other relevant organization could be formed for the purpose and be given specific time limit to prepare a report.
- All organizations/ projects engaged in screening program should be asked to prepare a data base of villages with more than 80% contaminated tubewells, showing number of families, number of safe tubewells (government and private). This database will be required to work out the number of safe water sources to be provided under the emergency program.
- An emergency support program to make the non-working dug wells working again. This will require some repair/improvement of the non- working dug wells (e.g. replacing the clogged suction pipe with a flexible pipe with a float, making provisions for sufficient aeration etc.), random testing of water quality, determining type and dose of disinfecting agent to be used and dissemination necessary information to the users of the dug wells. Sustainable Environment Management Program (SEMP) under Ministry of Environment and Forest will provide assistance in this regard. This program will ensure supply of safe water to the community in question and provide valuable information and guidance for the emergency program.
- A quick appraisal of the locally developed field test kits to ascertain their effectiveness and if required recommending measures for further development of these kits. A small sub-committee of the National Committee of Experts may be entrusted with the responsibility.
- Preparation of an agreed package of messages for awareness campaign and ensuring that no contradictory messages are disseminated, particularly through any mass media.

3.3.2 Medium-Term Response

The medium term arsenic mitigation programme shall be completed within a period of three years and adopt the following criteria:

Selection of Intervention Areas: Villages that have more than 40% and less than 80% of the tube wells contaminated shall fall under medium term response.

Mitigation Approach: The medium term response to arsenic mitigation shall be based on a demand-based instead of a supply-based approach. Communities shall be given information on the sustainability and cost involved and choice of a range of technology options. The demand-based approach implies active involvement of the community in decisions that affect their lives and devolution of responsibility to the LGIs. Arsenic mitigation programmes shall

not subsidise individual household services, but shall conduct social mobilisation and awareness campaigns.

Cost Sharing: Sharing of capital cost for community services shall consider the affordability of people and type and cost of the technology options. The total cost of operation and maintenance shall be borne by the users.

Service Level: Community facility shall be provided at the rate of one water point for a cluster of 25 to 30 households

Site Selection: The community that shall use the facility shall select the site for the installation of the facility. The site shall be such that it facilitates the access of the poor.

Institutional Arrangement: The local government institutions, particularly the Union Parishad, shall play more effective role in the medium term water supply program.

3.3.3 Long Term Response

The long-term response to arsenic mitigation shall consider the same criteria as under Mid-term response. The difference being that in this phase arsenic mitigation programmes shall promote proven and sustainable technology options. This phase shall include many of the technology options promoted during the mid-term response. The activities towards long term response shall be initiated immediately.

The long-term response shall also include piped water supply systems for the rural areas.

3.4 Urban Water Supply

As per the Bangladesh Bureau of Statistics (BBS) there are over 500 urban centres. Except for the old pourashavas most of these urban centres have little or no urban attributes. Arsenic mitigation programme shall consider only those centres having municipalities as urban. The non-municipal urban areas shall be treated as rural and the procedure for addressing arsenic in rural areas shall prevail. There are presently 274 pourashavas of which only 100 have piped-water supply in the urban core only.

Pourashavas with Piped Water Supply

The screening of production tube wells in all these municipalities have been completed. However the screening of hand tubewells is yet to be undertaken.

In municipalities where production wells are safe but hand tubewells in the peripheries are mostly unsafe, pipeline network shall be extended to the affected areas.

In municipalities where production wells are contaminated the possibility of switching over from groundwater to treated surface water shall be actively explored and given priority. If surface water is not immediately available in adequate quantity, sinking of production tube wells at safe aquifer shall be considered. In case a safe ground water source is also not

available; transporting safe water from distance surface/ground sources shall be considered. If none of the above options are technically feasible, as a last resort, treatment of arsenic contaminated water with proper sludge management programme can be tried.

Pourashavas without Piped Water Supply

Screening of all tube wells in potentially contaminated municipalities with out piped water supply is going to be completed soon.

Piped water supply based on surface water treatment shall be a priority in pourashava areas. Where surface water cannot be made available in adequate quantity, piped supply from improved dug wells on neighbourhood basis shall be preferred option. In case safe ground water source is also not available, transporting safe water from reasonable distance surface/ground sources shall be considered. If none of the above are technically feasible, sinking of tube well at safe aquifer shall be considered.

The long-term goal of the government shall be to cover the whole areas of all municipalities through piped water supply from treated surface water source.

3.5 Research and Development

Research and Development (R&D) are of paramount importance in filling gaps in knowledge and information. The importance of arsenic demands that the government establish an Arsenic Information/ Resource Centre within DPHE that shall be the custodian of all data and information on arsenic in the country. The Centre shall keep abreast of all research on arsenic whether in the country or abroad. All research organisations or individual researchers undertaking research on arsenic in Bangladesh shall be required to share the research findings with the Centre. Local Government Division shall formulate necessary regulatory instrument to facilitate the work of the Centre.

National Committee of Experts on Arsenic shall identify institutions/ agencies for Research and Development activities in diverse fields of arsenic mitigation. Such activities shall be initiated, among others, in the following fields.

Field Test Kit

- Development of an accurate and reliable field kit for measurement of arsenic at the village level.

Alternative Water Supply Options

- Improvement in Dug Well technology;
- Effect of sanitary protections and continuous withdrawal of water on arsenic content of dug wells;
- Improvement in Pond Sand Filters technology;
- Improvement in Rainwater Harvesting methods;
- Development of a combined roughing and slow sand filter for surface water treatment in Bangladesh;

- Development of cheap and affordable piped water supply methods;
- Small scale water treatment plants;
- Study on the existing water treatment plants in operation in Bangladesh; identification of problems in the design of appropriate water treatment technology;

Studies on Deep aquifer

- Investigation on impact of groundwater withdrawal on different aquifer;
- Research on protection of arsenic safe aquifer;
- Proper sealing methods in deep tube wells so that arsenic contaminated water from the upper aquifer cannot mix with the arsenic safe water of the lower aquifer of the deep tube wells;
- Mechanism of recharge of deep aquifers and possibility of contamination of deep tube wells in arsenic affected areas;
- Investigating into source and release mechanism of arsenic in groundwater;
- Mapping of arsenic safe aquifers in Bangladesh;
- The use of Isotope hydrology to investigate the source of arsenic, residence time and interrelation among water bodies may be continued as is being undertaken by BAEC;
- Research on possible in-situ intervention;

Research relating to Arsenic removal Technology

- Development of effective, affordable and environment friendly arsenic removal technology for the use in rural areas of Bangladesh;
- Leaching characteristics of arsenic rich sludge under different conditions and possible contamination from arsenic rich effluents produced by arsenic removal technologies;
- Disposal of arsenic contaminated sludge and spent media.

Miscellaneous

- An evaluation of effectiveness, impact and replicability of arsenic mitigation initiatives in Bangladesh.

3.6 Institutional Arrangement

The rural drinking water sector in Bangladesh is set for a major transition. The arsenic contamination may force rural households to shift from individual to community based drinking/cooking water systems. This shift brings into question the existing institutional arrangements for and the role of different organisations rural water supply and in the management of local water resources. Institutional arrangement for implementation of the arsenic mitigation programme in the water supply sector shall take the following into considerations:

3.6.1 Local Government Institutions:

The local governments need to be directly involved in the arsenic programme and be partners in the scale-up and sustainability of water supply systems. There shall be a need to establish

some minimum in-house capacity within Union Parishads in financial management and social mobilisation.

The government has to define the nature and scope of these arrangements and provide a regulatory framework to involve the local government institutions to work in tandem with government agencies. The ongoing BAMWSP implementation procedure and other projects¹ on local management of development would provide important lessons in defining the future role of local government institutions, government agencies, civil societies and communities in delivery of water and other services to the people.

The government shall review and evaluate these initiatives; analyse and synthesise the lessons and take steps to make the necessary changes in the roles, responsibilities and authority of local government institutions. These changes to address arsenic and provide arsenic safe drinking water will also have implication in delivery of other services as wells.

Role of Government agencies: Department of Public Health Engineering (DPHE) shall play its mandated role but develop and operationalize a mechanism to facilitate effective involvement of the local government institution in service delivery and ensuring pivotal role of the community in most decision making. DPHE shall also be developed into a resource centre for promotion of safe water supply with emphasis on surface water system.

Role of Local Government Institutions (LGIs): Devolution of authority to the local level and an active role of the LGIs in water and sanitation service provisions shall be emphasised.

Role of Private sector: The private sector shall be encouraged and the government shall promulgate necessary regulatory framework.

Linkage with Universities and Research organizations: Linkage of research organisation to universities and educational institutions will add value to research.

Human Resources Development: Development of expertise within the government ministries and agencies shall be emphasised. Trained personnel shall be allowed to continue and contribute in their fields of expertise.

B. HEALTH ISSUES

4.0 Present Status

The health hazard due to the contamination of arsenic in groundwater has raised serious concern for public health. Although survey results show that the prevalence of arsenicosis in the country is still very low, experts fear that patients so far identified might be the ‘tip of an iceberg’. Survey results also suggest that there are several pockets in the country where prevalence of arsenicosis patients is alarmingly high.

¹ The Local Governance Project in Sirajganj is developing the capacity of Union Parishad. Implementation of this pilot project will provide important lessons for future re-organization of the local government.

The implementation plan regarding the health sector issue shall include the following:

4.1. Case definition, case management and national prevalence of arsenicosis patients

- 4.1.1 The case definition protocol to identify arsenicosis patients developed by the national expert committee and subsequently adopted at the WHO regional workshop in November 2002 that is now being field tested on a regional basis needs to be circulated and properly understood by doctors and relevant health workers at different levels (*Annex-F*). There shall be an action plan for national survey on prevalence of chronic arsenicosis and based on this baseline information the extent and nature of health problem caused by arsenic poisoning will be assessed and documented.
- 4.1.2 The case management protocol developed by the national experts committee was later adopted at the WHO regional workshop in November 2002 that is now being field tested on a regional basis needs to be properly understood and uniformly implemented by the health deliverers from village to upazila and up to the district to national level hospitals (*Annex-G*).
- 4.1.3 In order to train the health manpower at different levels, health workers and doctors will be identified for training.
- 4.1.4 Training manuals has been developed in accordance with case definition and management protocol and a simplified draft Bangla version for use of the field workers has also been made that will be finalised. Organisations and individuals for training shall be identified and a TOT programme shall be introduced by the Directorate General of Health Services.
- 4.1.5 An action plan for different level of health workers training shall be developed nation wide by the Directorate General of Health Services with time frame and venue.
- 4.1.6 Ministry of Health and Family Welfare through the Directorate General of Health Services shall implement the training programmes for health service providers at different levels. NGOs/private sectors can also conduct such training programmes in co-ordination with the DGHS.

4.2 Identification and Management of Arsenicosis Patients

Similar to the provisions of the alternative water supply the health issues will also be dealt in the following stages:

4.2.1 Emergency Response

Directorate General of Health Services and other organizations under the Ministry of Health and Family Welfare, partners of the United Nations Agencies,, Development Partners and NGOs will implement this programme. All activities of the emergency

response phase will be completed in one year. For emergency response the following criteria shall be followed:

1. Selection of Villages: Villages that have more than 80% of the tube wells contaminated shall fall under the emergency response. Pockets of high arsenic contamination or high number of arsenicosis patients in a village of otherwise low arsenic contamination may be allowed emergency response as exceptions;
2. In the Upazilas of those villages health workers of all levels will be trained for case identification according to the approved protocol;
3. Detailed screening of the total population for case identification.;
4. Ward, Union and Upazila arsenic committees will be responsible for referring all patients for proper at different levels of health centres where patients will be treated and managed according to the approved protocol and
5. Social mobilisation and awareness campaign through all electronic and print media will done after scrutinising all available materials and selection of those found suitable.

4.2.2 Medium-Term Response

The medium term arsenic mitigation programme shall be completed within a period of three years and adopt the following criteria:

Villages that have more than 40% and less than 80% of the tube wells contaminated shall fall under medium term response and in addition Upzila and District Hospitals will be further strengthened for patient management and rehabilitation by increasing the skills of all levels of health workers.

4.2.2 Long Term Response

This will consist of the same criteria as medium term response. At this time it is expected that new and improved patient management methodologies will be developed and will be incorporated in the protocols for treatment, management and rehabilitation.

4.3 Institutional Arrangement

4.3.1 Central and Regional Level: All the medical college hospital and national level hospitals will have separate units for management of complicated arsenicosis patients (cancer cases, vascular complicity etc.).

4.3.2 District Level: All the district level hospitals will have arsenic units. The Arsenic Unit will be composed of Head of Dermatology, Head of Medicine, Head of Surgery and head of Gynaecology along with the Civil Surgeon. Apart from the management of complicated cases this unit will be responsible to maintain referred chain from upazila to district level and district level to central/regional level including specialized hospital.

- 4.3.3 Upazila Level: There shall be an arsenic unit at the Upazila level involving trained Upazila Health and Family Planning Officer, Resident Medical Officer and Medical Officer Community Health. This unit shall be responsible for patient management and maintain a referral chain for union and village. This unit shall develop and maintain an information network involving all Upazila level Officials and other stakeholders.
- 4.3.4 Union Level: At the Union level there shall be the union health team with trained health workers. Union Parishad Chairman and Members will facilitate the activities of the health workers in patient management and rehabilitation.
- 4.3.5 Role of the Private Practitioners and health care providers: Private Practitioners and health care providers should also be part of patient identification and management programme and should provide information to arsenic units and should be encouraged to utilise the referral system.
- 4.3.6 Logistic Support: Procurement of medicine, procurement of and even distribution of medical supplies shall be established. Laboratory support will be in place to facilitate patient management at appropriate level of service delivery.

4.4 Record Keeping and Monitoring

At all levels arsenic case records will be kept and updated. A monthly record of new cases/ complication shall be sent to the arsenic record cell at the office of DG, Health from union level to regional and national level hospitals. District arsenic team headed by Civil Surgeon shall develop monitoring system for case detection and case management at Upazila, Union and Ward level.

4.5 Development of Community Advocacy and Behaviour Change Communication (BCC)

At the Union level a community advocacy group with Union Parishad Chairman and Members and field level health workers will be formed. They will be responsible to inform the community about the facts of arsenicosis, mitigation options and management and treatment along with facilities for management of complication with the help of the following:

- Simple BCC materials and information materials (Some already developed and some needs to be developed).
- Trained Health Field Workers and Volunteers for interpersonal communication.
- Mass communication of continuous information flow through mass media.

4.5.1 Help line will be established for social health. The above committee at union level will also be responsible for developing and maintaining the help line for physical/social rehabilitation of arsenic victims by organizing meetings to disseminate information, organize volunteers and try to mobilize of financial resource for rehabilitation of the victims in the community.

4.6 Research and Development

- The National Committee of Experts will form a sub-committee as National Arsenic Research (Health) Co-ordination Committee. Chairman of the Scientific Review Committee of Bangladesh Medical Research Council (BMRC) will be the Chairperson of this committee and BMRC Director will be the Member-Secretary.
- This sub committee shall identify priority areas in health for research (such as case control study on patient management, research on drugs including herbal/ traditional medicine (Ayurvedic, Unani and Homeopathic) dose regression study and also study to understand course and effect of arsenic in producing various systemic complication) and shall advice the Health Ministry and Directorate accordingly.
- This sub committee shall identify and evaluate appropriate national & international institutes and individuals either singularly or jointly to undertake priority and need based research of arsenic related health issue.
- All agencies including the UN agencies and Donors shall be asked by the government to work in close coordination with this Arsenic Research (Health) Co-ordination sub-Committee in Health sector work.
- The committee will inform the National Committee of Experts and the Secretaries Committee on arsenic mitigation research activities in the health sector.
- All research findings will be properly documented for dissemination to all stakeholders.

C. AGRICULTURAL ISSUES

5.0 Objective

The objective of arsenic programme in the agriculture sector shall be to improve understanding of impact of arsenic on agricultural environment and food chain. The possible adverse affect of arsenic in groundwater on agriculture and food chain is under investigation. In the near future arsenic related activities in the agriculture sector are likely to be on research and investigation. Professionals, researchers and institutions shall undertake research to study different phenomena.

5.1 Activities

To address the issues regarding the impact of arsenic in the agricultural sector the following activities shall be undertaken:

- Conduct research on arsenic in food chain;
- Conduct research on impact of arsenic on soil quality;
- Investigate into effect of arsenic in agri-chemicals such as fertiliser/ pesticide on agricultural environment;

- Investigate into the effect of arsenic contaminated irrigation water on agricultural product and
- Establishment of a national standard for arsenic in ground water used for irrigation and in agricultural products.

Bangladesh Agricultural Research Council shall prepare a prioritised list of studies and researches based on which all studies and researches in the country should be undertaken.

5.2 Institutional Arrangement

It is perhaps premature to talk about institutional arrangement for the implementation of the agricultural sector programme. In the long-term should arsenic prove to be a concern to agriculture the basic principle of the institutional arrangement shall be the same as for the other sectors based on partnership of local government institutions, government agencies, communities and civil societies.

D. CROSS CUTTING ISSUES

6.0 The Issues

Some issues such as creating general awareness on the arsenic problem, gender equity, and the rights of the poor, coordination cut across water supply, health and agricultural sectors. The cross cutting issues should form integral parts of projects in the relevant sectors. The following cross cutting issues shall be given priority:

6.1 Awareness

6.1.1 Coordinated awareness programs shall be undertaken focussing on raising awareness about the following:

- ◆ impact of ingestion of arsenic contaminated water;
- ◆ alternative arsenic free safe water sources and other mitigation options;
- ◆ remedial measures against arsenic poisoning.

a. **Communication Strategy:** A national communication strategy shall be developed particularly focussing on the contents and methods of communication. The strategy will also identify partners to implement intensified communication campaign based upon agreed strategy

b. Implementation of MOHFW communications campaign.

6.2 Ground Water Act

Groundwater is a national resource and a suitable Groundwater Act should be enacted to control all activities regarding groundwater, exploration, extraction and management.

6.3 Linkage with sanitation

With the increasing emphasis on the use of surface water in arsenic affected areas promotion of health and hygiene achieves paramount importance. Neglecting it may not only undo the health gains from water sanitation programme but may also pose a health challenge of a different dimension. In the implementation of the arsenic program in the rural areas sanitation issues shall be given due consideration

6.4 Support Unit

Considering the complexity and uniqueness of the arsenic problem a specialised support Unit(s) will be established to provide necessary support to the government's overall arsenic mitigation program. This support unit will primarily draw on the expertise available in relevant government agencies. Such experts shall be remunerated properly commensurate with experts working in such units in other sectors. The Unit will also emphasise on developing and sustaining necessary expertise in relevant ministries and government agencies. Trained personnel shall be allowed to continue and contribute in the field of expertise for a substantial period of time. To facilitate transfer of technical knowledge, the unit will draw on international expertise in areas where necessary local expertise is yet to be developed. The National Committee of Experts on Arsenic will identify such areas of expertise. In establishing such units, the DFID funded Arsenic Policy Support Unit (under process of establishment) may be taken into account and the terms of reference of the Unit may be revised in light of the implementation plan. The Danida funded Unit for Policy Implementation (existing) under the Local Government Division shall provide complementary support to the Unit as per above criteria in the field of arsenic mitigation.

6.5 Co-ordination

Effective co-ordination of activities both within sectors and among sector is imperative. The sector level co-ordination shall be done by the relevant ministry while the inter sectoral coordination will be done at the national level through the Secretaries Committee on Arsenic. A small inter ministerial working group could be formed to ensure effective inter sectoral linkage at the working level.

Co-ordination must include activities of all the stakeholders including the civil societies. The frame of reference for co-ordination will be National Policy for Arsenic Mitigation 2003 and the Implementation Plan for Arsenic Mitigation in Bangladesh.