Implementation Plan of Arsenic Mitigation for Water Supply (IPAM-WS)

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Ministry of Local Government, Rural Development and Co-operatives

Implementation Plan of Arsenic Mitigation for Water Supply (IPAM-WS)

Minister
Ministry of Local Government,
Rural Development & Cooperatives

মন্ত্রী
স্থানীয় সরকার, পল্লী উন্নয়ন ও
সমবায় মন্ত্রণালয়

MESSAGE

I am delighted to learn that the Local Government Division has formulated the "Implementation Plan of Arsenic Mitigation" for the Water Supply and Sanitation Sector, and taken initiative for printing and publication of the document.

Universal access to arsenic free safe drinking water within the purview of sustainable development is a priority area of the Government. This initiative of the Local Government Division, in line with this objective, is undoubtedly praiseworthy. This document lays out a clear pathway for ensuring safe water supply for all through arsenic mitigation activities. This document will ensure an integrated and consistent arsenic mitigation program, and will contribute to the attainment of Vision 2021 and Sustainable Development Goals.

Although the document is highly technical, it is easily understandable. This document describes different important issues, such as awareness building and public participation, screening of water sources. water quality testing, establishment and management of data repository, institutional capacity development, selection of technologies, integrated monitoring and surveillance, and research and development. This will strengthen coordination among different organizations involved in arsenic mitigation activities, and facilitate smooth functioning of arsenic mitigation programs.

We are pleased to learn that this document has been developed through an extensive participatory, approach, taking into consideration opinions of diverse stakeholders from grassroots level to policy level. The primary users of this document would be sector policy makers, program planners, and professionals involved in formulation and management of programs. This could be used as a guiding document by the professionals who are directly involved with development of action plan for safe water supply. It is important to note that common people would be benefited most through the implementation of this document.

I take this opportunity, to sincerely thank all, who were involved in the formulation of this document. including the consultant, working committee, area-specific sub-committees, technical support committee, arsenic mitigation thematic group, LCG sub-group, sector professionals, national water supply and sanitation forum, and above all the Local Government Division. I strongly believe that, through our concerted efforts, we would be able to ensure sustainable water supply services in the country through supply of arsenic-free water.

Khandker Mosharraf Hossain, MP

Senior Secretary
Local Government Division
Ministry of Local Government,
Rural Development & Cooperatives
Government of the People's Republic of Bangladesh

Preface

Continued efforts coupled with policy support of the Government provided a strong ground for the WASH sector to render its services for the wellbeing of the people of the country. Candid mention of the national policy for safe water supply and sanitation (1998) is necessary time and again for all stakeholders to always remain aligned with the aspiration set forth in this vital document. In quest of comprehensive and consistent development towards achieving the goal of providing safe water and sanitation for all the Sector Development Plan (SDP FY 2011 – FY2025) for the water supply and sanitation (WSS) sector in Bangladesh is a very important planning document. Among others, it has precisely identified the Arsenic Mitigation as an important Thematic Front.

It is worthwhile to mention here that the water supply coverage which was increased to 97% in the 90s, dropped down to 74% due to arsenic contamination in groundwater first detected in 1993. With concerted efforts by the government this appalling situation is being redressed. Programs and projects undertaken so far have significantly increased the water supply coverage which has increased to 87% in 2015. This reflects the efforts and drives deployed by the government in taking care of the concern and overcoming the issue.

Nevertheless government's efforts is not only continuing but also has put this issue high on its agenda to ensure universal access and sustainable development of arsenic safe water for its population. The document `IPAM-WS' is intended to portray the pathway of arsenic mitigation in water supply. This has been prepared with lessons learned so far encompassing prevailing challenges and potentials. With this document a consistent, harmonized and well coordinated drive would be possible which will lead to a sustainable solution in arsenic mitigation in the country. I am sure, the stakeholders would be greatly benefitted from the efforts undertaken by the government in this regard.

I am happy with the proactive role of my colleagues of the water supply wing of Local Government Division especially the Additional Secretary (Water Supply) and Joint Secretary (Policy Support) and would like to thank them for their continued support.

I greatly appreciate the tremendous efforts of the former Project Director of Policy Support Unit(which has been transformed as Policy Support Branch) and his team, consultant deployed for this specialized assignment and sector professionals in streamlining the preparation and accomplishment of this praiseworthy task. I am confident, these efforts will take us a long way in fulfilling our aspiration in this arena.

Dr. Zafar Ahmed Khan

Acknowledgement

Arsenic menace in the country became apparent in the decade of 90s. Since then, significant development took place in policy perspective of arsenic mitigation. Documents like, National Policy for Safe Water Supply & Sanitation, National Policy for Arsenic Mitigation, Sector Development Plan etc. are worth mentioning. All these have significant role in setting pace in the development of WASH including arsenic mitigation.

Although achievements are there, the general perception in the sector is that the progress towards arsenic mitigation needs to be accelerated. Based on a review exercise undertaken in 2009, the sector stakeholders felt that the Implementation Plan for Arsenic Mitigation (IPAM) earlier prepared, should be revised. In response to the initiative from the Local Government Division (LGD), the IPAM revision process has been approved by the Cabinet Division. The Local Government Division (LGD) of the Ministry of Local Government Rural Development and Cooperatives (MoLGRD&C) has been entrusted with the responsibility of preparing the revised IPAM-WS.

Because of the complexities and multifarious dimension of the subject the exercise has rather been extensive and stressful. Contributions and supports from all concerned made it possible to accomplish the task and bring out the document, IPAM-WS, to this stage.

I would like to take the opportunity to express my sincere gratitude and profound regards to Dr. Zafar Ahmed Khan, Senior Secretary, Local Government Division, for his guidance and support to finalize this strategic document for printing and publication.

I sincerely acknowledge the tireless efforts made by the consultant Sk. Abu Jafar Shamsuddin, PEng. who made his highest degree of contribution in the development of the document.

I am grateful to Ms. Zuena Aziz, former Director General, MEI Wing , LGD; Mr.Akram Al Hossain, Former Additional Secretary (Water Supply), LGD; Mr. Md. Mahbub Hossain, Additional Secretary (Urban Development), LGD and also the former Project Director, Policy Support Unit (PSU), Kazi Abdul Noor for their cordial support and cooperation in fulfilling the initiative.

I gratefully acknowledge the contributions of the members of the working committee for IPAM-WS development and the members of the sub-committees under the working committee. I also acknowledge the contributions of the members of the technical support committee, members of the Arsenic Mitigation Thematic group, LCG sub-group for WSS, various development partners, sector professionals and sector institutions. Particular mention of UNICEF Bangladesh for their support in printing and publication of this document is gratefully acknowledged.

I would be failing in my duty if I do not acknowledge the tremendous efforts of former Assistant Project Director of PSU Mr. Md. Mohsin and former Asst. Project Director, PSU; present Joint Secretary (Policy Support Branch), LGD, Md. Abdur Rauf towards successful completion of the Task.

Roxana Quader
Additional Secretary (Water Supply)
Local Government Division

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Preamble

Arsenic menace in the country is well perceived by the government and the sector stakeholders. Post 2000 era, particularly in its earlier span observed a significant development in policy perspective. The National Policy for Arsenic Mitigation (NPAM 2004) emerged and also the Implementation Plan for Arsenic Mitigation (IPAM 2004). Since 2004, knowledge of arsenic contamination, its risk and mitigation options have improved significantly. There are achievements, lessons, challenges as well as opportunities evident from various interventions over the years. Although there were success and achievements it is a well established perception that IPAM-2004 needs revision to address the emerging challenges while capitalizing on the opportunities that are evident.

In this backdrop, Local Government Division (LGD) of the Ministry of Local Government Rural Development and Cooperatives (MoLGRD&C), in accordance with the decision from the Cabinet of Ministers of Government of Bangladesh, took up the task of revising the Implementation Plan for Arsenic Mitigation for Water Supply (IPAM-WS). The Policy Support Unit (PSU) of LGD is administering the revision exercise.

Nature and Purpose of the document

The document 'IPAM-WS' portrays the pathway of arsenic mitigation in water supply. It builds upon a comprehensive framework for consistent and harmonized interventions maintaining pace towards sustainable development in arsenic mitigation.

It is worthwhile to mention here that the target group of this document for its immediate use, entails decision makers, policy and program planners, professionals engaged in program formulation and management. Professionals directly contributing in developing action plans need to refer to this document as a guide. It goes without saying, that the sector in general and the people in particular eventually would be the recipient of its services.

Salient features of IPAM-WS

Chapter-1 provides introduction while the following sections briefly discuss various aspects with quick references for clarifications for the intended readers.

Chapter 2- Emergence of IPAM-WS

This Chapter provides the rationale for IPAM-WS based on lessons and challenges emanated so far. It clarifies the conceptual understanding about arsenic policy vis-a-vis IPAM. It also tries to capture the opportunities that are evident in addressing apparent challenges.

Challenges which are evident:

- Multi-dimensional nature of arsenic contamination and mitigation;
- Water safety rights & responsibility yet to be assigned;
- Absence of data repository and its management;
- Lack of coordination in administering mitigation program; and
- Absence of large-scale water quality monitoring and surveillance system.

Opportunities which are apparent:

- Supportive policy, strategy and sector documents;
- Sector institutions at national and local level;
- Innovations and technological advancement;
- Need for consistent and harmonized programs are well recognized;
- Development of supporting planning tools; and
- Emergence of Evidence Based Models.

Chapter 3 – Components of IPAM-WS

On the premise of the situation reflected in the previous chapters the proposed implementation plan will have multifarious facets. The vital point is that the proposed implementation plan does not focus on installing Safe Water Devices (SWD) only, but also addresses a number of important pertinent requirements. The following areas are entailed within IPAM-WS domain. For most of the areas, for consistent and harmonized interventions, a framework approach has been developed.

Awareness building and community mobilization:

Awareness building among sector stakeholders is to be initiated and carried out with full force mostly at the initial phase of the program. The WASH sector has acquired knowledge and skill in undertaking this activity. Associated promotional materials, tools, IEC-BCC materials, etc. are already developed, available and in practice. However, these may need review, updating and customization for specific use and application.

Screening, Testing WQ and Building Capacity:

'Screening and testing for water quality (WQ)' for all existing water points appears to be the single most important task prior to going for any kind of planning initiative. Full scale screening and testing WQ is required not only for IPAM-WS but also for providing baseline data for country wide 'WQ Monitoring & Surveillance Program' for its design and putting it to function.

Building Data Repository and its Management:

One of the weak areas identified in the sector is the absence of a well established 'Data Repository'. Although a huge data was generated during BAMWSP era under NAMIC, its operational management had limitations which prevented its access to the potential users.

Strengthening Institutions:

Effective implementation of Arsenic mitigation program will require institutional strengthening at two levels, (i) national level and (ii) local level. These are explained in section 3.1.4, some of which appear as determinants, demanding immediate attention.

Technology selection:

Area-wise Technology Mapping & its Application:

Area-wise 'Technology Mapping' coupled with 'Risk Substitution Principle' are important tools and substantial knowledge on these have already been acquired by the sector. The MIS-GIS Unit of DPHE is producing valuable dynamic documents as planning tools. Union-wise water technology mapping exercise is ongoing and largely completed, enriching the repository. The dynamic nature of the document allows it to update periodically, incorporating appropriate information.

Introducing Water Safety Plan:

Water Safety Plans (WSPs) take a holistic approach to water quality management from the catchment to the point of use. It is the 'Action Plan' where provision for introducing WSP is to be made by respective implementing organization in line with its ADP. Necessary guidelines will be provided by AICC for including WSP in the Action Plans.

Local level planning and implementation:

The 'Local Level Planning and Implementation Process' is vital in the entire arsenic mitigation plan. This will bring about actual development in providing arsenic safe water at grassroots level, i.e., village. For smooth and effective operation of the process, all other pertinent areas/issues need to be addressed properly. Some of these are quite significant and appear as determinants for avoiding the risk of failure of the overall mitigation program. Union Parishad (LGI) strengthened through appropriate skill is expected to be competent and take the lead role in initiating the process with assistance from NGOs, and technical support from local UZ office of DPHE. These are adequately clarified in section 3.1.7.

Comprehensive monitoring and surveillance:

A well designed and functional 'Monitoring and Surveillance Program' is essential not only as an integral part of Water Safety Framework (WSF) but also as a prime requirement to oversee the performance of arsenic mitigation and management programs in the country. With all water points having unique Geo Code based ID and the MIS-GIS Unit of DPHE getting itself engaged in developing nationwide water point mapping, it will now be easier to support a comprehensive monitoring and surveillance program. Upcoming arsenic mitigation programs should patronize establishing a strong monitoring and surveillance program for effective execution of IPAM-WS.

Studies, Research and Development:

Complexities of the subject and enormous knowledge gaps in arsenic mitigation signifies the importance of 'Research and Development (R&D)' in IPAM-WS. The prevailing arsenic contamination situation, challenges in appropriate mitigation options, aquifer management, arsenic-rich sludge management etc. are the areas to be addressed.

Scope and Time frame of IPAM-WS:

It is to be conceded that the assessment of the spatial distribution of arsenic contamination is rather a continuous and dynamic process. With time and continued efforts more and more clarity will be brought in and the exact geographic extent along with population affected will be known. These two parameters are vital in formulating intervention programs at a particular time horizon. In line with the Sector Development Plan (SDP 2011-2025), the execution of the proposed IPAM will culminate in 2025. Considering the multifarious activities, physical extent, complexities and the fact that some activities are time-consuming, the entire program implementation will be phased in three terms, i.e., Short Term (2015-2018), Mid Term (2015-2020), and Long Term (2015-2015).

Translating IPAM-WS into Reality

Indicative time bound major activities and budget provisions

Emerging projects and programs of varied nature steered by different stakeholders, but conducive to the overall concept and framework of IPAM-WS as elaborated in Chapter-3, will need pertinent basic information. In order to facilitate formulation of either projects or programs, indicative time-bound major activities with budget provision are provided in Table I-1 in Annex-I.

Program formulation and planning process

For any stakeholder the prime requisite is to have an approved document meeting GoB planning process. There may be a good number of projects and programs but these are to be formulated conducive to IPAM-WS to facilitate consistency and uniformity in interventions. Meaning that, with time, various projects and programs will be generated entailing activities in line with IPAM-WS to bring outputs towards meeting envisaged objectives to overcome arsenic problem. Like the formulation phase, these documents will be required to meet implementation and monitoring protocol as well, which are well established and in practice. Table II-1 in Annex-II provides the major stages involved.

Process Action Plan of IPAM-WS

The Process Action Plan (PAP) is important and necessary to guide and monitor the execution of IPAM-WS. This entails the major tasks which have direct impact on the smooth execution of IPAM. Any unnecessary delay and deviation, at any stage for any task, once identified need to be addressed. Monitoring and keeping track on PAP need to be a continuous process. In a way PAP sets the road map for IPAM-WS to proceed.

Financing Implementation

The proposed comprehensive arsenic mitigation program as envisaged in IPAM-WS would require a total of about 24,440 million BDT till year 2025. Table 3.7 provides various 'mitigation program' wise cost involvement along with approximate population to be served and SWDs to be installed. The requirement of BDT 24,440 million for execution of the entire IPAM-WS by 2025 is only 2.08% of the public sector contribution to total investment provision in WASH, and 1.67% of total investment provision in WASH by (Public Sector + Private Sector + NGOs).

Chapter 4 - Comprehensive Framework of IPAM-WS

The Comprehensive Framework of IPAM-WS gives a complete and integrated picture. In fact, it incorporates all facets in a logical sequence. It is the pictorial version of the algorithm of IPAM-WS. Figure 4.1 presents the comprehensive framework of IPAM-WS. Every arsenic mitigation program coordinator or manager should hold this framework by heart. It keeps the Program Coordinator or Manager appraised of the stages of individual facet and allows him/her to see if problems are encountered in its implementation. It helps to focus on the areas which need to be addressed to ensure that the overall process is moving ahead and the individual facets are contributing to the comprehensive whole.

Chapter 5 - Risk and Assumptions

Assumptions are made confidently on the foundations of the lessons learned. Risks will flash whenever IPAM-WS operation is not allowed to proceed in line with the lessons learned. If risk prevails it will jeopardize the sustainability of arsenic mitigation and will hamper achievements of the objectives of the IPAM-WS.

Chapter 6 - Conclusions

With policy support in place, line ministry and sector lead agency earmarked, the execution of IPAM-WS is expected to be rather smooth. Intra-sectoral coordination should also be effective with existing Arsenic Management Division upgraded and AICC constituted and put to function. The sector through AICC should have a forwarded looking vision for the scenarios beyond year 2025, i.e., after the proposed IPAM-WS. Higher service levels and a shift in arsenic contamination level aligned with WHO guideline value of 10 ppb may be the prime elements for the next IPAM-WS.

Acronyms & Abbreviations

ADB	Asian Development Bank
ADP	Annual Development Program
AICC	Arsenic Implementation Coordination Cell
AMD	Arsenic Management Division
AAN	Asia Arsenic Network
APSU	Arsenic Policy Support Unit
ART	Arsenic Removal Technology
IART	Iron Arsenic Removal Technology
AusAID	Australian Agency for International Development
BAMWSP	Bangladesh Arsenic Mitigation Water Supply Project
BCSIR	Bangladesh Council of Scientific and Industrial Research
BDT	Bangladesh Taka
BUET	Bangladesh University of Engineering and Technology
BWDB	Bangladesh Water Development Board
CBO	Community Based Organization
CIDA	Canadian International Development Agency
CLTS	Community-Led Total Sanitation
CSA	Coastal Saline Area
DALY	Disability-Adjusted Life-Years
DANIDA	Danish International Development Assistance
DFID	Department for International Development
DGHS	Director General of Health Services
DoE	Department of Environment
DPHE	Department of Public Health Engineering
DPP	Development Project Proposal
DRA	Demand Responsive Approach
DSP	Deep Set Pump
DWASA	Dhaka Water Supply and Sewerage Authority
EMP	Emergency Mitigation Program
FGD	Focused Group Discussion
GoB	Government of Bangladesh
GSB	Geological Survey of Bangladesh
HYSAWA	Hygiene, Sanitation and Water Supply
IEC	Information, Education and Communication
IG	Infiltration Gallery
IMED	Implementation Monitoring & Evaluation Division
IPAM	Implementation Plan for Arsenic Mitigation
ITN-BUET	International Training Network Centre, BUET

JICA	Japan International Cooperation Agency
JMP	Joint Monitoring Program
LCG	Local Consultative Group
LGD	Local Government Division
LGED	Local Government Engineering Department
LGI	Local Government Institution
LLP	Local Level Planning
MDGs	Millennium Development Goals
MIS	Management Information System
MoA	Ministry of Agriculture
MoEF	Ministry of Environment and Forest
MoF	Ministry of Finance
MoH&FW	Ministry of Health and Family Welfare
MoLGRD&C	Ministry of Local Government, Rural Development and Co-operatives
MoU	Memorandum of Understanding
MoWR	Ministry of Water Resources
NAMIC	National Arsenic Mitigation Information Center
NAMIP	National Policy for Arsenic Mitigation & Implementation Plan
NaMIS	National Management Information System
NFWSS	National Forum for Water Supply and Sanitation
NGO	Non-Government Organization
NMP	Normal Mitigation Program
NPAM	National Policy for Arsenic Mitigation
NPSWSS	National Policy for Safe Water Supply and Sanitation
NWP	National Water Policy
O&M	Operation and Maintenance
PAP	Process Action Plan
PEC	Project Evaluation Committee
PMP	Priority Mitigation Program
Prodoc	Project Document
PSB	Policy Support Branch
PSF	Pond Sand Filter
PSU	Policy Support Unit
QHRA	Quantitative Health Risk Assessment
RAAMO	Risk Assessment of Arsenic Mitigation Options
R&D	Research and Development
RHS	Rainwater Harvesting Systems
RW	Ring Well
RWS	Rural Water Supply
RWSS	Rural Water Supply and Sanitation

SDP	Sector Development Plan
SPEC	Special Project Evaluation Committee
SST	Shallow Shrouded Tubewell
SWAp	Sector Wide Approach
SWD	Safe Water Device
TAPP	Technical Assistance Project Proposal
TOR	Terms of Reference
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Fund
UWSS	Urban Water Supply & Sanitation
VERC	Village Education Resource Center
VSST	Very Shallow Shrouded Tubewell
WARPO	Water Resources Planning Organization
WATSAN	Water and Sanitation
WASA	Water Supply and Sewerage Authority
WASH	Water, Sanitation and Hygiene
WHO	World Health Organization
WSP	Water Safety Plan
WSP-WB	Water and Sanitation Program of World Bank
WSS	Water Supply and Sanitation

Chapter 1

Introduction

1.1 Background

In quest of comprehensive and consistent development towards achieving the goal of providing safe water and sanitation for all, the Sector Development Plan (SDP FY 2011 – FY2025) for the Water Supply and Sanitation (WSS) Sector in Bangladesh is in place for providing guidance. Among others, it has precisely identified Arsenic Mitigation as an important Thematic Front. As such its presence in SDP is well built.

Arsenic menace in the country became apparent much earlier than the formulation and formal appearance of SDP. Prior to that, significant development took place in policy perspective. The National Policy for Arsenic Mitigation (NPAM) and Implementation Plan for Arsenic Mitigation (IPAM) were formulated and approved by the Government in 2004.

Although achievements are there, the general perception in the sector is that the progress towards arsenic mitigation was rather slow and needs attention. A review exercise was undertaken in 2009 with support from Water and Sanitation Program of the World Bank which was discussed in a workshop and in the National Forum for Water Supply and Sanitation (NFWSS). The sector stakeholders felt that IPAM 2004 should be revised.

The IPAM revision process has been approved by the Cabinet for Ministers of GoB in response to the initiative from the Local Government Division (LGD). Now, there will be four IPAMs for four distinct sectors, which are Water Supply, Health, Agriculture, and Water Resources, in short, IPAM-WS; IPAM-H; IPAM-Ag; and IPAM-WR. The relevant ministries were requested to prepare the respective revised IPAM according to the need and satisfying the present situation.

In this context the Policy Support Unit (PSU) of LGD of the Ministry of Local Government Rural Development and Cooperatives (MoLGRD&C) is preparing the revised IPAM-WS.

1.2 Purpose and Structure of the Document

The document 'IPAM-WS' is intended to portray the pathway of arsenic mitigation in water supply. The overall document is segmented in six distinct chapters. Chapter-1 provides introduction and rationale of IPAM-WS.

Chapter-2 is about the context of emerging IPAM-WS, its rationale, lessons emanated so far and a shift in conceptual understanding in arsenic policy vis-a-vis IPAM.

Chapter-3 tells about various facets of IPAM-WS and it covers its essential features. In addition to the planning issues there are many elements covering the entire domain of the subject. All these are to be well appreciated for effective dealings with the subject. It talks about preparatory elements, viz., awareness building, screening & WQ testing, establishing data

repository, capacity building and strengthening institutions. With all these supporting elements it presents the ways of developing local level planning and implementation, based on demand responsive approach. Need for R&D and the scope and financing of IPAM are also discussed in this chapter.

The most important segment in the document is the Chapter-4, which portrays the pathway of the arsenic mitigation approach. It provides a complete framework of a dynamic process with rational linkages among various elements of IPAM-WS. It is evident that an in-built driving force steers the process to proceed and remain functional. The development of Local Level Action Plan (LAP) based on Demand Responsive Approach (DRA) and its implementation keeps the process moving. The functional framework gradually helps achieve the objective of IPAM-WS. Coordination and reporting are included in this chapter.

Chapter-5, under 'Risk & Assumptions' categorically mentions pertinent areas where utmost attention are needed to bring out success and prevent failure.

Finally, Chapter-6 presents Conclusions.

Chapter 2

Context of Emerging IPAM-WS

2.1 Introduction

This Chapter provides the rationale for IPAM-WS based on lessons and challenges emanated so far. It clarifies the conceptual understanding about arsenic policy vis-a-vis IPAM. It also tries to capture the opportunities that are evident in addressing apparent challenges.

2.2 Lessons emanated so far

It was 1993, when for the first time the issue of arsenic contamination came up in the discussions. Since then the subject moved on at different pace at different time horizon. Involvement of a wide range of stakeholders from 'research and academic' institutions to government and non-government organizations, development partners and private sectors are notable to mention. The activities were rather discrete, disjointed and uncoordinated. Nevertheless, the sector experienced a large hue and cry which drew attention of the policy planners and decision makers. This period may be classified as pre 2000 era.

Post 2000 era, particularly in its earlier span observed a significant development in policy perspective. The National Policy for Arsenic Mitigation (NPAM 2004) emerged and also the Implementation Plan for Arsenic Mitigation (IPAM 2004). Since 2004, knowledge of arsenic contamination, its risk and mitigation options have improved significantly. There are achievements, lessons, challenges as well as opportunities evident from various interventions over the years. Although there were success and achievements, it was a well established perception among sector stakeholders that IPAM-2004 needed revision to address the emerging challenges while capitalizing on the opportunities that were evident.

Since 1993 enormous lessons have been learnt. However, the following sections describe the key lessons and findings. Prime challenges which are preventing continued development in arsenic mitigation as well as the opportunities have been highlighted.

2.2.1 Status of Arsenic Contamination

There are various ways of presenting the contamination scenario. The following paragraphs provide pertinent information relating to arsenic contamination at different times.

One way of countrywide depiction is by percentage of household drinking water exceeding standards in practice. Figure 2.1 shows the percentage of households with water containing more than 50 microgram per liter arsenic, the drinking water standard for Bangladesh. A similar figure (Figure 2.2) provides a comparative picture which shows the percentage of households with water containing more than 10 microgram per liter arsenic, the WHO drinking water guideline value for arsenic.

These two figures show the general geographic extent of arsenic contamination in Bangladesh in 2009. As of now, all these information hold good for the purpose of the program planners and decision makers. With development program's intervention the spatial distribution of arsenic will change which will persuade future structure of the program.

The implications of the two figures are quite significant. Adopting WHO guideline value may not be pragmatic for a couple of planning cycles. This requires requisite infrastructure development, institutional capability and appropriate financing, as well as an overall management structure of intervention programs. However, this aspiration may be seen as the long term goal and put to consideration under way forward thinking.

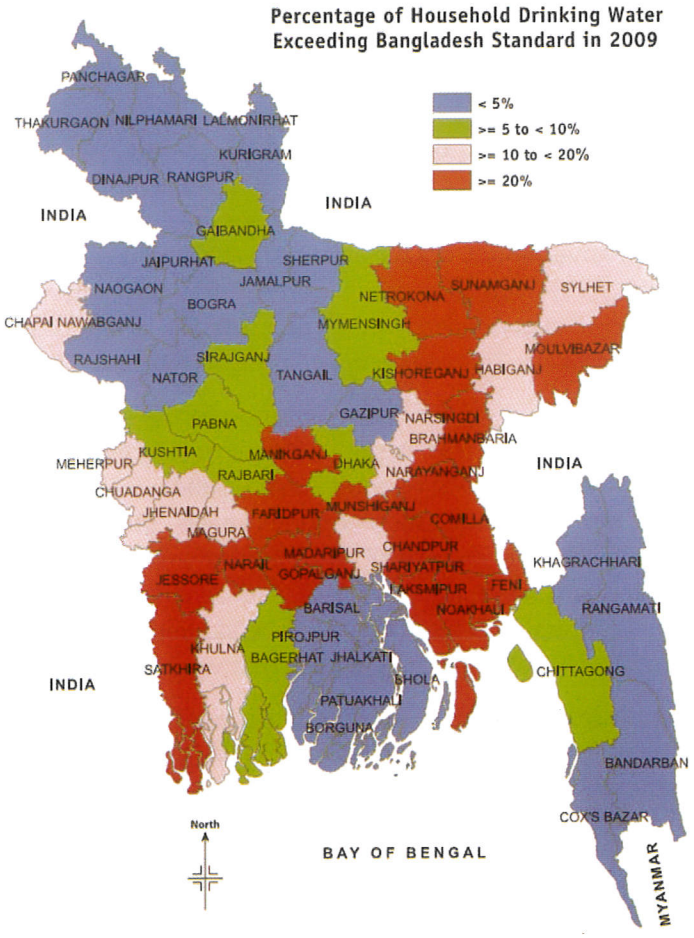

Figure 2.1: Map showing Arsenic contamination of household drinking water in Bangladesh in 2009 depicted by the Bangladesh Bureau of Statistics (BBS) and UNICEF Multiple Indicator Cluster Survey data (n=13,423). The map above shows the percentage of households with water containing more than 50 microgram per liter arsenic, the drinking water standard for Bangladesh. (Cartographer Mahfuzur Rahman Khan).
Source: Towards an Arsenic Safe Environment in Bangladesh, World Water Day, 22 March, 2010

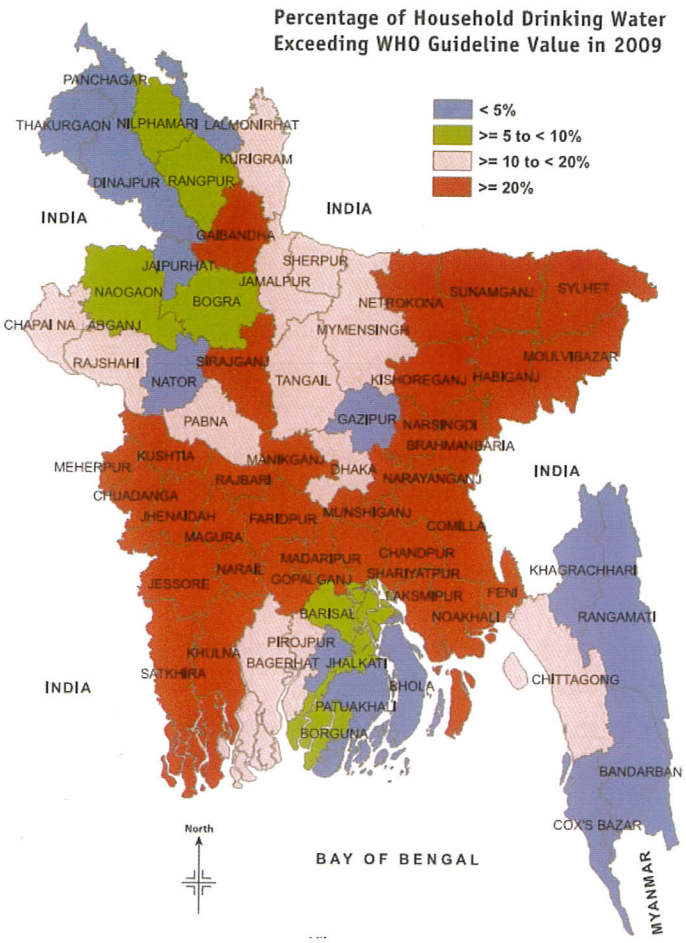

Figure 2.2: Map showing Arsenic contamination of household drinking water in Bangladesh in 2009 depicted by the Bangladesh Bureau of Statistics (BBS) and UNICEF Multiple Indicator Cluster Survey data (n=13,423). The map above shows the percentage of households with water containing more than 10 microgram per liter arsenic, the WHO drinking water guideline value for arsenic. (Cartographer Mahfuzur Rahman Khan).
Source: Towards an Arsenic Safe Environment in Bangladesh, World Water Day, 22 March, 2010

Screening of all (about 5 million) wells in 272 upazilas in 2000-03 under BAMWSP and subsequent DPHE surveys of 1000 wells in each of the remaining 192 upazilas found that the total proportion of unsafe wells was around 20%.

Recent information says that about 3.9 million households in Bangladesh consume water with arsenic concentration of above 0.05 mg/l (MICS, 2013 report). Arsenic contamination reduces national water coverage by 12.6% (MICS, 2013 report). It also can be noted that the water supply coverage increased to 97% in the 90s, dropped down to 74% due to detection of arsenic contamination in groundwater in 1993. Now with the programs and projects undertaken by the government the water supply coverage again increased to 87% in 2015 (WHO-UNICEF Joint Monitoring Programme Report, 2015).

2.2.2 A Few Pertinent Observations

Apart from the status of arsenic contamination there are a few pertinent observations which are useful in getting a clear picture relating to arsenic issue.

a. Pertaining to Technologies:

The following are the important observations:

- The concept of 'safe water' has evolved, and the issue of risk substitution investigated.
- Deep wells accounted for more than 80% of arsenic mitigation interventions.
- Dug wells and pond sand filters can provide safe water if properly maintained, but carry microbiological risks[1], and their relative contribution to the overall mitigation is small.
- Four arsenic removal technologies (Sono, Read-F, Alcan and Sidko) have been issued provisional licences, but the technology verification process has been far too slow and no new technology has emerged in recent time.
- Rural piped water systems have had mixed success. Single use piped systems have not been widely adopted.
- Around 5% of surveyed water points are wrongly marked as arsenic safe (<0.05mg/l) and 8% non-functional (DPHE/UNICEF, 2014).
- Correction for Water Quality parameters, non-functionality and seasonality significantly increases actual investment for the water point (DPHE/UNICEF, 2014).
- Innovative technology, Managed Aquifer Recharge (MAR), piloted and scaled up in saline affected coastal areas, could be a solution to arsenic mitigation where no other technologies are feasible.

b. Pertaining to Water Quality Testing:

The following are the important observations:

- Laboratory facilities have been enhanced significantly, but the benefits have yet to be realized.
- Field test kits have been improved and used by LGIs and communities to test wells.
- No progress has been made in developing a locally-manufactured arsenic field test kit.

c. Pertaining to Data Repository and Management:

The following are a few among others:

- Although a huge amount of data has been generated, data management and dissemination have been poor.
- NAMIC created a database of the 5M wells tested by BAMWSP, but did not collect other data, and NAMIC ceased operating when BAMWSP closed.

[1] The dangers of substituting arsenical for microbial risks have been spelled out in the Risk Assessment of Arsenic Mitigation Options (RAAMO) study.

d. Pertaining to the number of Installed Water Points:

Present information tells us the broad-based stakeholder wise water points as follows:

- Privately installed Water Points[2] : 10 million (83.5%)
- Govt. installed Water Points : 1.5 million (12.5%)
- NGOs and Others installed Water Points : ≈ 0.5 million (4%)

The absolute numbers are quite high and these are further segregated into various technologies.

e. Pertaining to Union Parishad the Lowest Tier of LGIs:

Increasing role of Union Parishads (UP)[3] is becoming visible. Although the existing WatSan Committee is led by the chairman of UP, by and large, their role was rather as passive recipient of services. This scenario is slowly changing and in some ongoing programs (DPHE-Danida, JICA-AAN, DPHE-Unicef, HYSAWA etc.) examples are becoming evident of their playing a greater role.

f. Pertaining to awareness building and training in arsenic affair:

Awareness building and training, particularly at grassroots level is a prime need and the sector has the capacity to render such services. All that required is a 'structured and well organized program' with back up support of logistics, management and resources.

2.3 Challenges that are Surfacing

A couple of challenges become evident in arsenic mitigation arena, which are to be acknowledged and addressed with due importance. These are discussed in subsequent paragraphs.

2.3.1 Multi-dimensional Issue

Experience accrued so far concludes that arsenic mitigation has multifarious fronts and therefore, somewhat complex in nature. Among various aspects, importantly it entails: (i) institutional; (ii) technological; (iii) social and gender; (iv) planning, monitoring and evaluation; (v) research and development; (vi) capacity building; (vii) data management; (viii) intra and inter-sectoral coordination; (ix) reporting and accountability, etc.

2.3.2 Water Safety Rights & Responsibility

As of now, 'water safety rights & responsibility' is not delineated and established, leaving rooms for ambiguity in fixing accountability. Water point installed with public resources and handed over to community leaves the liability for water safety unassigned. This puts arbitration mechanism non-functional in legal perspective.

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[2] Most of the privately owned water points are Shallow Hand Tubewells with minor exception.
[3] Union Parishad (UP) is the lowest tier of the Local Government Institutions and presently there are about 4,500 UPs.

2.3.3 Building Data Repository and its Management

Data management is fundamental for planning, designing, monitoring and evaluating mitigation interventions. Updating process should remain functional on a continuous basis with new data generated. While the database is to be protected from any adulteration, access to information by any intended users among stakeholders needs to be ensured. Although peripheral ground works have been largely organized, yet a comprehensive functional entity is to be put in place with required logistics and resources.

2.3.4 Coordination of Mitigation Program

Primarily two levels of coordination are necessary for effective implementation of arsenic mitigation program. One is inter sectoral, i.e, among Water Supply (WS), Health (H), Agriculture (Ag) and Water Resources (WR) sectors involving four ministries, MoLGRD&C, MoH&FW, MoA and MoWR. The other is intra-sectoral, i.e, within Water Supply sector under the Local Government Division (LGD) of the MoLGRD&C and its line organizations. Coordination mechanism needs to be candidly spelt out.

2.3.5 Large-scale Water Quality Monitoring and Surveillance System

Existence of a large number of (about 12 million) of water points poses a few questions about establishing an effective water quality monitoring and surveillance system. Are there requisite WQ testing facilities? Who is accountable for WQ testing? Building capacity in this respect and design of a pragmatic surveillance program are the tasks ahead prior going for actual operation.

2.4 Opportunities and Potentials

In contrast to challenges and limitations, the sector has observed enormous potentials and opportunities as well. All these can bring changes in positive direction in arsenic mitigation program in the country. The following sub-sections mention the areas identified so far.

2.4.1 Supportive policy, strategy and sector documents

It is important to note that the sector activities are now well guided where arsenic issue is not an exception. In fact, arsenic mitigation is a GoB priority, which can capitalize further on the established national documents that are conducive to its aspiration. The following documents are worth noting:

- National Policy for Safe Water Supply & Sanitation (1998);
- National Policy for Arsenic Mitigation (NPAM 2004);
- Implementation Plan for Arsenic Mitigation (IPAM 2004)
- Sector Development Plan (SDP 2011-2025);
- Bangladesh Water Act 2013;
- National Water Supply & Sanitation Strategies (2014); and
- Other established guiding documents in force.

2.4.2 Sector institutions at national and local level

A large number of institutions are involved with arsenic contamination and mitigation issues in the country. These include government and non-government organizations, local government institutions (LGIs), development partners, private sector, academic and research institutions and individuals.

Local level presence of government and non-government organizations up to Upazila[4] is there. Union Parishad (UP) is the important local government institution and critical actor in arsenic mitigation. This is the lowest administrative tier of the government. Along with academic and research institutions and private sector, while this states a strong institutional base a lot more need to be done. Respective roles and responsibilities need to be delineated apart from institutional strengthening. However, it is clear that Lead Sector Agency is MoLGRD&C through DPHE.

2.4.3 Innovations and technological advancement

Over a period of four decades the sector has gained a treasure of technological development through innovations, studies, pilot interventions, which is continuing within the purview of R&D, a continuing process, dynamic in nature. The sector is now endowed with a number of technologies which are important in arsenic mitigation.

The following are among popular technologies drawn from a long list entailing a good number of variations. These are seen in application in the sector.

- Shallow Hand Tubewells – suction mode
- Deep Hand Tubewells – suction mode
- Deep Hand Tubewells – Force Mode
- LWT Technology – Tara Handpump[5]
- SST (Shallow Shrouded Tubewell)[6]
- VSST (Very Shallow Shrouded Tubewell)[7]
- IART (Iron-Arsenic Removal Technology)[8]
- MAR (Managed Aquifer Recharge)
- PSF (Pond Sand Filter)[9]
- Small Scale Piped Water Supply System
- Rainwater Harvesting System
- Improved Ring Well
- ART (Arsenic Removal Technology)

[4] Upazila (UZ) is a bangla word for sub-district and presently the total number is 460.
[5] TARA Hand-pump: It is a deep-set force-mode hand-pump developed in Bangladesh to combat the effect of declining water table issue
[6] SST: Shallow Shrouded Tubewell. It's an innovative technique of abstracting groundwater from a thin lens of water in a shallow aquifer of very poor transmissibility.
[7] VSST: Very Shallow Shrouded Tubewell. It's an innovative technique of abstracting groundwater from a very thin lens of water in a very shallow aquifer of very poor transmissibility.
[8] IART: It's an innovative design of removing iron and arsenic from iron-arsenic rich-groundwater in rural context.
[9] PSF: It's an innovative approach of limited application of slow-sand-filtration concept using pond water. It was first initiated in early eighties, which went through a series of developments.

2.4.4 Consistent and Harmonized Programs

It is worthy to note here that the need for well coordinated, consistent and harmonized programs is now more pronounced than ever before. With supportive sector documents, as mentioned in section 2.4.1, in practice, particularly SDP which is a binding document, upcoming WASH development programs are likely to be consistent and harmonized. Sector stakeholders are committed and obliged to remain aligned with SDP.

In addition to general aspiration of harmonized interventions the sector coordination arrangement will play a contributory role in attaining satisfactory harmonization. Similarly M&E programs can also be consistent.

2.4.5 Development of Supporting Planning Tools

Though delayed, the recent initiative to establish National Water Point database is a milestone achievement. This may still be at its embryonic stage but the breakthrough has been made. The DPHE's MIS-GIS unit is striving to get the following document made available to the program planners particularly those who will be preparing Action Plans:

- GEO Code based Unique Water Point ID;
- Union Wise Technology Mapping; and
- Nation Wide Public Water Point Mapping.

It is expected that each of the water points in the country will have respective unique ID number. Associated information will be provided against each water point. Since all these will be GIS based, it will be possible to depict spatial distribution of various parameters through mapping.

In preparing a Local Level Action Plan the Union Wise Technology Mapping Document will become an useful source of information.

2.4.6 Evidence Based Model

Encouraging local level models are appearing leading to 'Arsenic Safe Village'.

With technical and financial support from UNICEF as a collaborative effort with DPHE, an 'arsenic safe model village' concept was tried out in five severely affected Upazilas (with >80% of the existing water points containing >0.05mg/l of arsenic) of Comilla, Brahmanbaria and Narail districts. The concept has been proved successful. By the end of 2014, a total of 126 villages had been declared *'Arsenic Safe Village'*. An underpinning factor to the success was its focus on entire communities rather than individual water points. A five step arsenic mitigation protocol has been developed for application with the following key elements:

- Site-specific feasibility assessments;
- Alternative water point selection;
- Arsenic-Safe Water Options;
- Water quality testing; and
- Caretaker training.

In western part of the country in Jhikargacha Upazila, JICA-AAN has been striving to develop a Model for Safe Water Supply Services by Local Government Institution (Union Parishad – UP).

The concept of getting UPs playing a greater role in such services is conducive to the policy stand of the government as evident in various policy and strategy documents. The Pilot intervention in Jhikargacha, a severely arsenic contaminated UZ, entails the following essential features of the envisaged model.

- LGI (UP) takes the lead role;
- Strengthened WASH unit by engaging a 'Pani Paridarshak-PP'[10];
- Awareness building and community mobilization;
- WQ testing and screening by PP on payment basis;
- Local level planning for SWD[11] using GIS mapping;
- Construction of SWD with external assistance (DPHE, NGOs);
- O&M of SWD by user community through PP on payment basis; and
- Monthly remuneration to PP by UP from revenues generated.

The pilot project (JICA-AAN) revealed that revenue generated through service charges is good enough to pay monthly remuneration to 6 out of 8 PPs engaged in 8 Unions. It is expected that break even will be attained for other two unions as well.

Both these models have the potentials for scaling up in a phased manner or through extended pilot programs for large application. Lessons will then allow refining the course if necessary.

2.5 Policy Stand and Guidance for IPAM-WS

As mentioned in the Background in Section 1.1, there will now be four IPAMs. The overall National Policy for Arsenic Mitigation (NPAM) will therefore be translated into realities through four sectoral IPAMs which are IPAM-WS, IPAM-H, IPAM-Ag, IPAM-WR. Figure 2.3 shows sector-wise implementation plans for arsenic mitigation. This particular document discusses the IPAM-WS.

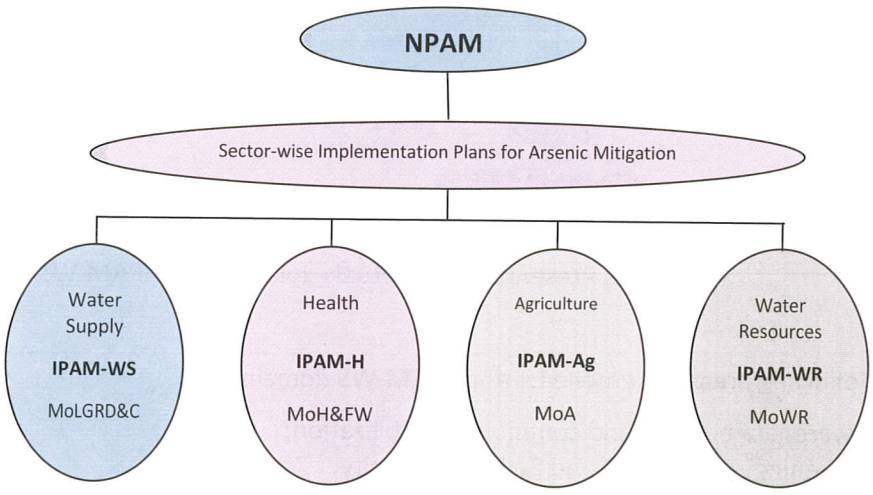

Figure 2.3: Sector-wise Implementation Plan for Arsenic Mitigation.

[10] Pani Paridarshak is basically a mechanic competent with O&M of water points and health & hygiene promotional knowledge

[11] SWD stands for safe water device. It is a water point, with site specific appropriate technology, yielding safe water for domestic use.

Chapter 3

Various Components of IPAM-WS

3.1 Facets of IPAM-WS

On the premise of the situation reflected in the previous chapter the proposed implementation plan will have multifarious facets. It is important for the Action Planners to follow this conceptual framework and go for micro-level planning prior actual field implementation. The IPAM does not focus at installation of SWDs, but there are a number of pertinent requirements which are to be addressed as well. Figure 3.1 presents a conceptual explanation.

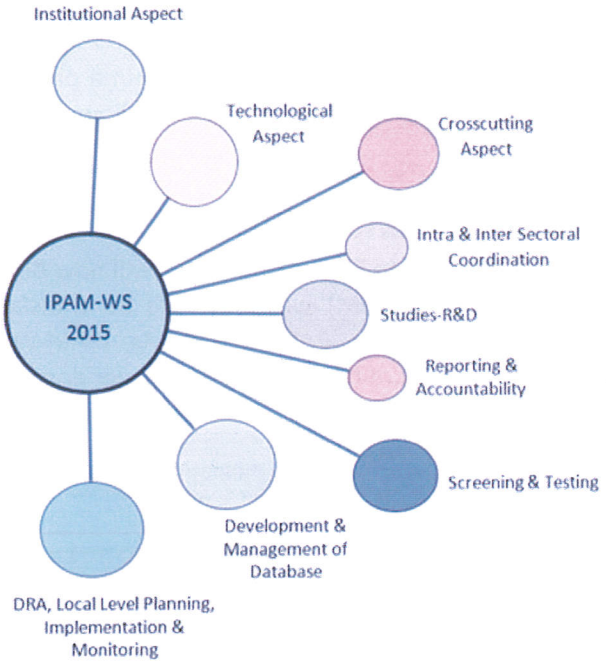

Figure 3.1: Presents a conceptual explanation of IPAM-WS

The following areas are entailed within IPAM-WS domain:

- Awareness building and community mobilization;
- Screening, Testing WQ and Building Capacity;
- Building Data Repository and its Management;
- Strengthening Institutions;
- Technology selection;
- Introducing Water Safety Plan;
- Local level planning and implementation;
- Comprehensive monitoring and surveillance;

- Delineation of Water Safety Rights & Responsibilities;
- Studies, Research and Development;
- Scope and Time frame of IPAM-WS;
- Financing Implementation;
- Intra and Inter-sectoral Coordination; and
- Reporting and Accountability.

As a logical sequence, 'Intra and Inter-sectoral Coordination' and 'Reporting and Accountability' are put separately in Chapter 4.

3.1.1 Awareness building and community mobilization

Awareness building among sector stakeholders is to be initiated, carried out with full force mostly at the initial phase of the program. The WASH sector has acquired knowledge and skill in undertaking this activity. Associated promotional materials, tools, IEC-BCC materials etc. are already developed, available and in practice. However, these may need review, updating and customization for specific use and application.

IPAM-WS envisages two levels of interventions, category-I at national and regional levels, which entails policy planners, decision makers, program managers and sector professionals. Structured Orientation Courses are to be organized and administered by national level institutions for this category. Category-II is for grassroots and local level stakeholders which include community members, community based organizations (CBOs), informal institutions (II), and Union Parishads (UP) the lowest tier of the local government institutions (LGI). For Category-II Structured Courses, upon review of various communication approaches and tools including course contents, are to be organized and administered by local level institutions, preferably NGOs.

Social mobilization (SocMob) is of paramount importance for the successful implementation of all upcoming arsenic mitigation programs. Traditionally, grassroots community members were the passive recipient of the services planned and implemented in a supply driven mode. Likewise, the LGIs had an insignificant role in getting communities organized to assume greater responsibility. IPAM-WS foresees a stronger role of LGIs in community mobilization and local initiatives.

Through awareness building process, the communities in general and LGIs in particular will have clear perception about: (i) arsenic contamination, (ii) accessing information and mitigation services, (iii) cost-sharing strategy for capital Investment and O&M, and (iv) 'local level planning' based on 'demand responsive approach (DRA)[12].

Awareness building among sector stakeholders is to be seen as a program in itself. Figure-3.2 depicts a framework which is to be followed is designing a complete program for execution with required resource allocation. The central level broad-based programming is to be done with directives from Arsenic Implementation Coordination Cell (AICC)[13].

[12] DRA: Communities have to demand for improved services, play the lead role in the project, choose which facilities they want and how they want to manage them.
[13] AICC: For clarification see Section 3.1.4b.

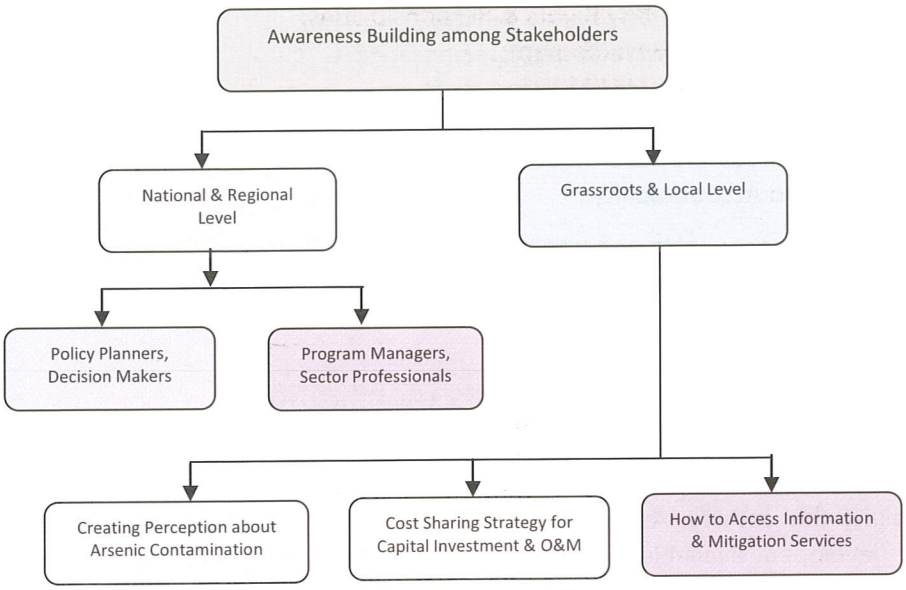

Figure 3.2: Showing Awareness Building Framework

3.1.2 Screening, Testing WQ and Building Capacity

Screening and testing for water quality (WQ) for all existing water points appears to be the single most important task prior to going for any kind of planning initiative. Although the screening and WQ testing data during BAMWSP era and subsequent stages provide a useful basis for general planning purpose, yet quality of data and pertinent activities are questionable. Marking of those tubewells as red or green in consideration of Bangladesh Standard (up to 0.05 mg/l of arsenic content) does not exist. Moreover, about 60 percent of the tubewells as of now remain outside the purview of WQ testing and not incorporated in the database. The current statistics indicate that there are about 12 million tubewells, which include the following:

- Privately installed Water Points : 10 million (83.5%)
- Govt. installed Water Points : 1.5 million (12.5%)
- NGOs and Others installed Water Points : ≈ 0.5 million (4%)

Full scale screening and testing WQ is required not only for IPAM-WS but also for providing baseline data for country wide 'WQ Monitoring & Surveillance Program' for its design and putting to function. In addition to arsenic, other water quality parameters (bacteriological, manganese, iron, salinity) should be considered. The following three basic tasks are to be accomplished:

Capacity building for WQ testing:

- Building Laboratory Facilities;
- Building Field Testing Capacity;
- Promoting for Manufacturing Field Kits Locally; and
- Regular Structured Training Courses.

GEO Code Based Unique Water Point ID:

This Unique ID is necessary to facilitate building GIS based: (i) Nationwide Water Point Mapping; (ii) Area Wise Technology Mapping. This unique ID can be assigned to each individual water point at the time of field screening program.

Full scale Program for Screening and Testing WQ:

Figure-3.3 depicts a framework which is to be followed in designing a complete program for execution with required resources allocation. The central level broad-based programming is to be done with directives from Arsenic Implementation Coordination Cell (AICC)[14].

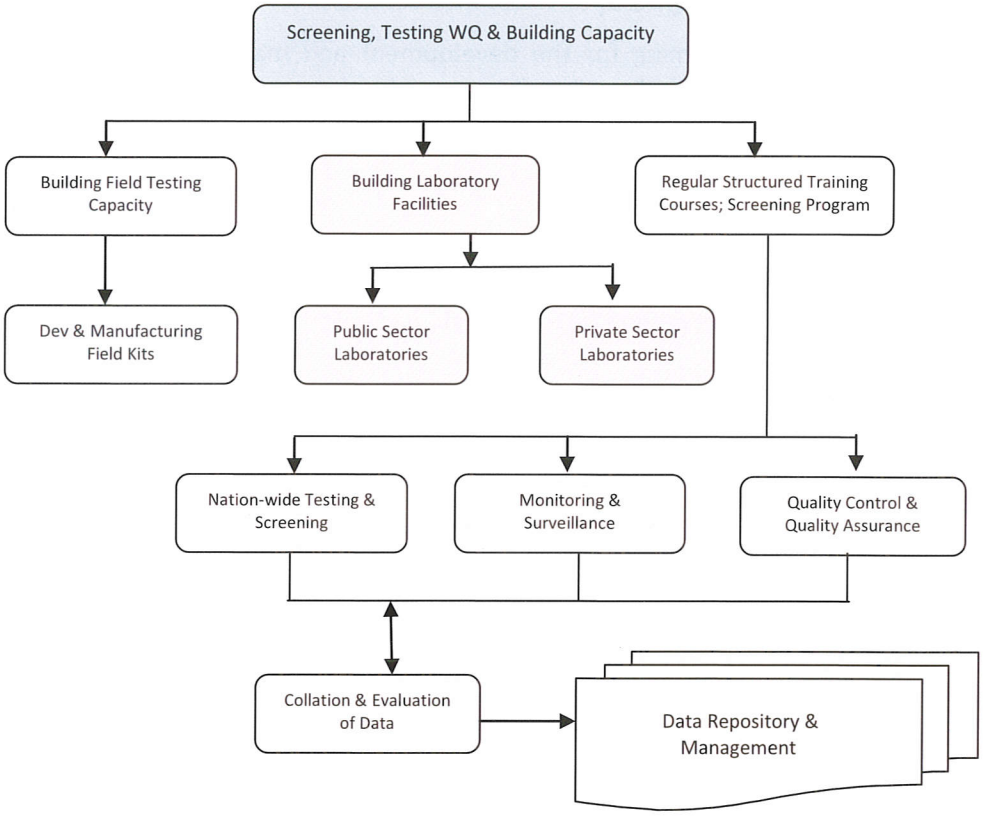

Figure 3.3: Showing Framework of Screening, Testing WQ & Building Capacity

3.1.3 Building Data Repository and its Management

One of the weak areas identified in the sector is the absence of a well established Data Repository. Although a huge data was generated during BAMWSP era under NAMIC its operational management had limitations which prevented its wide spread use.

[14] AICC: For clarification see Section 3.1.4b.

In quest of overcoming such limitations and for supporting implementation of upcoming arsenic mitigation programs along with other WASH development programs, DPHE has established a Data Repository named HAWQ[15] Database under its MIS-GIS Unit.

The nationwide screening and WQ testing data will enrich the above Data Repository. It will greatly facilitate establishing a National Water Point database with unique water point ID. Various types of mapping and analytical outputs could be generated from the database to meet the needs of program planners, researchers and sector professionals.

Since the proposed Data Repository will be Web-based it can be linked with the WSP/World Bank's 'Open Data Platform' as well as NaMIS, the National Water & Sanitation Database maintained by PSU. These collaborative arrangements open up opportunities for harmonized monitoring and evaluations (M& E) of sector interventions.

The broad-based programming for the development and management of DPHE based Data Repository is to be done with directives from Arsenic Implementation Coordination Cell (AICC)[16] with necessary resources allocation.

3.1.4 Strengthening Institutions

Effective implementation of Arsenic mitigation program will require institutional strengthening at two levels, (i) national level and (ii) local level.

I. National Level

a. *Water Quality Testing & Laboratory Affair*:

This includes GOs-NGOs-Academic-PS for water quality testing and laboratory development. Both hardware and software related supports need to be assessed, organized and provided. Arrangement for manufacturing Field Kits is to be made. Joint venture collaboration between internationally reputed company and its local associates may be a pragmatic solution in this respect instead of striving for developing Field Kits anew. Apart from screening and WQ testing for arsenic mitigation program there is a requirement of routine water quality testing and site inspection under nationwide 'Water Quality Monitoring and Surveillance Program'. Based on the number of water points that ought to be tested, an earlier assessment provide reference observes the requirement is of the order of 10-20 thousands field kits a year. This scenario also justifies the need for local level manufacturing.

b. *Establishing Arsenic Implementation Coordination Cell (AICC)*:

For effective coordination of arsenic mitigation programs within WASH sector, the Local Government Division (LGD) should establish AICC within its agency DPHE. The existing 'Arsenic Management Division (AMD)[17]' under revenue set up is functioning within DPHE. This division (AMD) at present is suffering from inadequate manpower, logistics and resources. At its present

[15] HAWQ database:Hardware And Water Quality (HAWQ) Database managed by the Department of Public Health Engineering (DPHE) with technical support from UNICEF.
[16] AICC: ibid.
[17] AMD: Arsenic Mitigation Division within DPHE, under its revenue set up.

strength, the required services cannot be rendered towards management and coordination of upcoming arsenic mitigation programs in the country.

The multi-dimensional facets and complexities of arsenic mitigation will require a well built system of coordination mechanism. The WASH sector is bestowed with a good number of organizations involved with, inter alia, activities pertaining to arsenic mitigation. The horizon of the organizations' platform entails government and semi-govt. organizations, local government institutions, NGOs, private sector, research & academic. In addition to that, there are multilateral and bilateral development partners as well.

It is rather a common perception, as evident from various studies and reviews that the sector suffers from uncoordinated efforts. Absence of harmonization results in mismatch, overlapping, wastage of resources and inconsistency in sector activities. It is therefore essential that coordination within sector institutions be established. The Local Government Division through its Sector Lead Agency, DPHE could play this coordination role. Such unique place is already in existence in DPHE with its entity as AMD. However, its present capacity is not conducive to the envisaged services it is expected to render.

Therefore, the AMD is to be upgraded and strengthened to be consistent with and responsive to the aspiration of appropriate management of arsenic related programs. As the coordination role is to be rendered encompassing the entire WASH sector it is logical to upgrade its status to the level as 'Arsenic Management Wing' headed by a professional to the rank and status of an Addl. Chief Engineer. The proposed AICC will take its place within the Arsenic Management Wing of DPHE.

The process of upgrading and establishing Arsenic Management Wing is to be initiated by DPHE and LGD with urgency. The proposal should entail the scope and extent of the Wing.

Getting AICC on board: Since the process of upgrading may take time, it is to be seen that the execution of IPAM-WS does not hamper. As interim arrangement the LGD and the Chief Engineer, DPHE should look in to the possibility of equipping the existing AMD with additional manpower and resources from the present set up of the organization. The Chief Engineer may be given the leverage of mobilizing such manpower through executive orders. At present there is a necessity of at least four graduate engineers and four hydrogeologists. The proposed AICC within the jurisdiction of AMD may be constituted, with executive order from the Chief Engineer, drawing members from Planning Circle, Groundwater Circle and AMD. In addition to DPHE, members for AICC may be inducted from NGO and Development Partners as deemed necessary.

c. *Strengthening MIS-GIS Unit of DPHE*:

Technical support from MIS-GIS unit is imperative for effective, efficient and smooth implementation of any development program in WASH sector. Upcoming arsenic mitigation programs will greatly depend on the MIS-GIS Unit of DPHE. The Unit is managing the HAWQ Database which is going to be enriched with enormous primary data from screening, monitoring and surveillance activities. Assigning geo code based ID to each individual water point and the venture for generating various types of nationwide water point mapping is a massive step in the right direction. The unit is at its embryonic stage and needs to be consolidated further with continued assistance and strengthening initiatives.

d. *Restoring and strengthening R&D Division of DPHE*:

The sector lead agency, DPHE has a historical contribution to the WASH sector in the country. Many technological innovations have been greatly facilitated by this organization. Earlier, there was an R&D division functioning with project support, which was discontinued leaving no specific office or division to look after R&D.

Meaningful execution of IPAM-WS will call for a numerous number of researches and studies. As envisaged in 'Dedicated R&D Fund'[18] it is expected that particularly in 'collaborative research areas', the participation of DPHE will be very much needed. There are huge knowledge gaps prevailing in the country in the arena of arsenic issue, be it technical, social or institutional.

In this backdrop, a full-fledged R&D division should be established with requisite manpower and other resources within DPHE.

II. Local Level

a. *Upazila office of DPHE*:

The complex nature of the arsenic mitigation issues requires a graduate engineer to lead the UZ office of DPHE. To meet the evolving needs of the water supply sector, DPHE staffing should move towards employing graduate level staff at upazila level to better carry out their decentralized roles in planning, monitoring, training and advocacy.

b. *LGI - Union Parishad*:

As such there is no WASH Cell within UP at present but it is a necessity to set up, nourish and assist its grooming. There is an evidence-based development in this respect in JICA-AAN project in western part of the country in Jhikargacha upazila. The UP Chairman, Secretary, Computer Operator and one 'Pani Paridarshak' comprise the WASH Cell. Union Parishad engages the Pani Paridarshak from its own revenue generated from service charges. The model is apparently functioning which needs to be consolidated further with assistance and strengthening. Extended piloting and mainstreaming is suggested where possible.

This WASH Cell of UP is expected to provide local leadership in community mobilization and guide local level planning, implementation and monitoring with other local stakeholders. This cell and its associated local stakeholders need to acquire knowledge on the following areas:

- Awareness Building among user community;
- WQ Testing with Field Kit, Technology Options for arsenic mitigation;
- Local Level Plan based on Demand Responsive Approach (DRA);
- Cost Sharing for capital investments and O&M; and
- Reporting – Liaison with UZ Office of DPHE.

The skill transfer to LGI i.e., Union Parishad's WASH Cell is to be carried out with a careful programmatic approach. Regional and local level GOs and NGOs will undertake the actual skill

[18] Dedicated R&D Fund: In principle LGD has approved the concept and mechanism of the proposed dedicated fund. It is expected that the dedicated fund will ensure continued financing of R&D undertakings in WASH sector.

transfer. Figure 3.4 provides a framework for strengthening institutions with particular focus on skill transfer to LGIs with directives from Arsenic Implementation Coordination Cell (AICC).

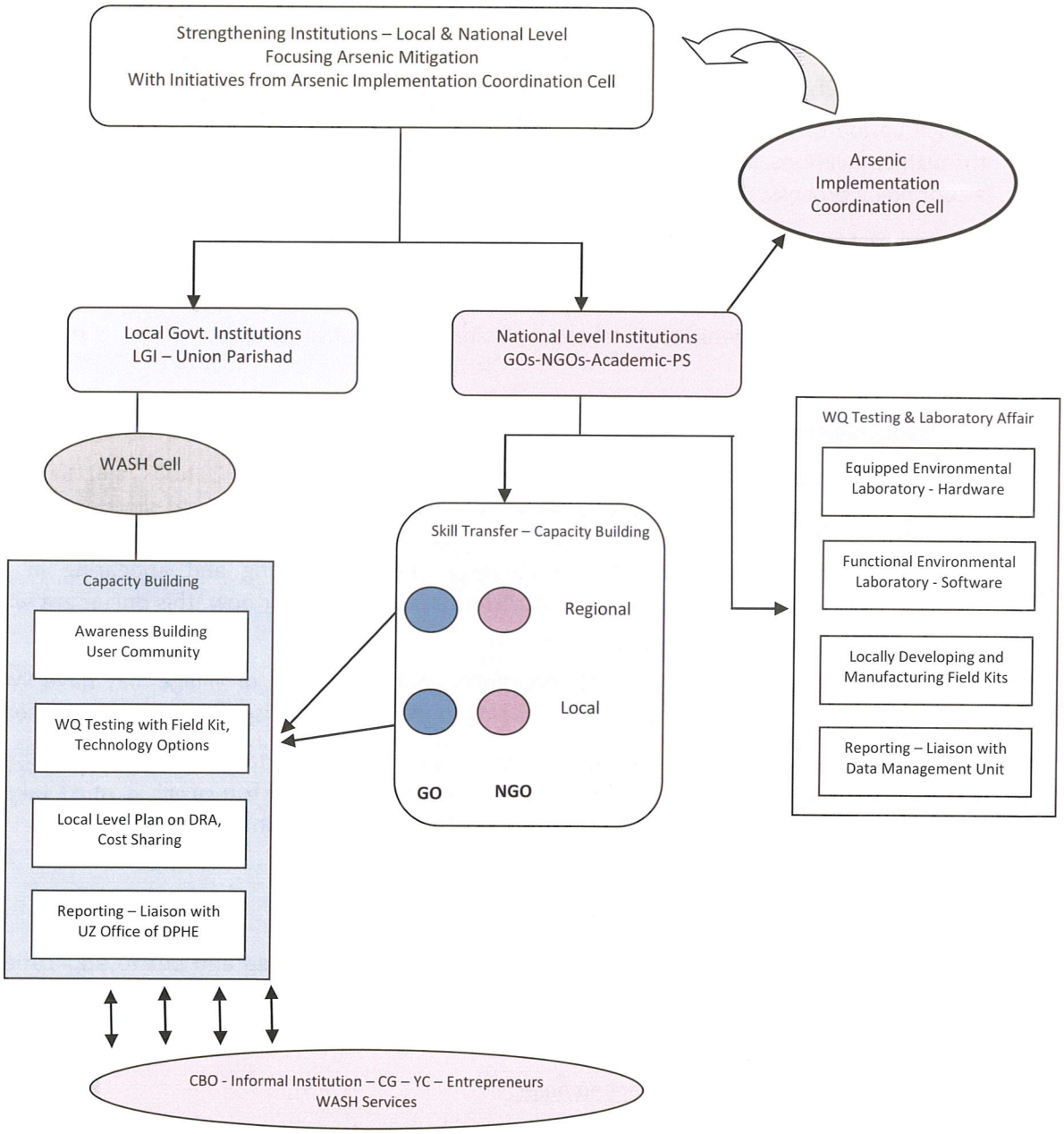

Figure 3.4: Showing Framework of Strengthening Institutions

3.1.5 Technology selection

As Technology is going to play a significant role in mitigation programs, it is important, that appropriate understandings and clarifications are provided on the terminologies at the outset.

a. *Prime condition as regard Water Source*:

As regard water source, at a particular geographic location, the prime conditions that need to be met are: (i) it must be safe, and (ii) the availability is perennial and sustainable[19].

b. *Scenarios of WS Technologies*:

Over a period of four decades the sector has gained a treasure of technological development through innovations, studies, pilot interventions, which is continuing within the purview of R&D, a continuing process, dynamic in nature.

Accrued sector experience clearly demonstrates that a single technology cannot be generalized over a large geographic area. Natural water resources regime, hydrogeological situations, aquifers & lithological profiles, water quality etc. play a critical role in deploying an appropriate technology at a micro-geographic area, e.g., Union or even of village size.

c. *Technological Options and Safe Water Device (SWD)*[20].

A clear perception at the outset is necessary as regard 'Technological Options' and 'Safe Water Device (SWD)'. While it is important to understand all the technological developments and maintain all-out repository, the action-planner is primarily focused on SWD while preparing an arsenic-mitigation action-plan. The terminology SWD is evolving and appearing in some documents. This may be replaced if a better choice is available. For now, this document will use SWD.

The simple deduction is that, a small geographic area, viz, Union, or village may have SWD or SWDs as opposed to a whole range of Technologies available and discussed in the entire sector.

The SWD should not only be safe from microbial and chemical contaminants but should be able to produce safe water on a perennial and sustainable basis. On top of all, it must take into account of the Risk Substitution Principle as discussed and applied in RAAMO[21].

d. *SWD and Water Safety Plan*:

Along with SWD 'Water Safety Plan (WSP)' needs to be introduced and put to application for delivering safe and potable water.

e. *Inventory of Water Supply Technologies*:

The following are popular technologies that are being used in the country:

Shallow Hand Tubewells – suction mode
Deep Hand Tubewells – suction mode

[19] Sustainable: Able to continue over a period of time causing little or no damage to the environment.
[20] SWD: ibid.
[21] RAAMO: Risk Assessment of Arsenic Mitigation Options.

Deep Hand Tubewells – Force Mode
LWT Technology – Tara Handpump
SST (Shallow Shrouded Tubewell)
VSST (Very Shallow Shrouded Tubewell)
IART (Iron-Arsenic Removal Technology)
PSF (Pond Sand Filter)
Small Scale Piped Water Supply System
Rainwater Harvesting System
Improved Dug Well
ART (Arsenic Removal Technology)

f. *Risk Assessment on Technological Options*:

An important study, 'Risk Assessment of Arsenic Mitigation Options (RAAMO) was carried out in 2005 with support from APSU to understand the relative health risk, risk management potential and social acceptability of the widely used technology options including DTW, DW, PSF and RWHS. The study was aimed at assessing the potential health risk through quantitative health risk assessment (QHRA).

A quantitative health risk model was developed which showed that there was significant health risk substitution for DWs and PSFs with respect to pathogens. There was much lower risk substitution in DTWs and RWHSs in relation to either pathogens or other chemicals. DTWs had the highest aggregate water safety followed by RWHSs, while disease burdens from DWs and PSFs were unacceptably high.

Disease burden increased significantly for the DWs and PSFs in wet season with greater deterioration of microbiological water quality.

g. *Area-wise Technology Mapping & its Application*:

Area-wise 'Technology Mapping' coupled with 'Risk Substitution Principle' are the tools and knowledge already acquired by the sector. The MIS-GIS Unit of DPHE is producing valuable dynamic documents as planning tools. Union-wise water technology mapping exercise is ongoing and largely completed enriching the repository. The dynamic nature of the document allows it to update periodically, incorporating appropriate information.

The Action Planners will be the prime users of this document while finalizing the local level arsenic mitigation plan. Apart from that, program planners, managers, researchers will find this document useful. Gradually its application and use will be seen at the local level institutions, viz., upazila and union parishad. This will greatly facilitate undertaking initial feasibility at the local level while developing a plan.

Use and application of Area-wise Technology Mapping will be guided by AICC. At the time of reconciliation between the local level plan initiated at the local level (UP/UZ) and the national level plan, this document will be closely consulted. Action Planners of respective organizations will thus finalize preparation of respective ADPs. The overall process of technology selection will be overseen by AICC ensuring consistent implementation of mitigation programs.

3.1.6 Introducing Water Safety Plan

Water Safety Plans (WSPs) applies a holistic approach to water quality management from the catchment area to the point of use. A Water Safety Plan is thus an improved risk management tool designed to ensure the safety of drinking water through risk management approach that encompasses all steps in water supply from catchment to consumer. In Bangladesh, the WSP was initiated as a pilot program in the rural water supply system in 2005. Gradually, technology-specific WSPs, monitoring tools, and sanitary inspection tools were developed. In 2008, the urban water supply systems started implementing the WSPs in urban areas.

Providers of arsenic mitigation technologies (SWDs) should introduce WSPs at the earliest practical date, and with highest priority given to those technologies prone to bacterial contamination. Providers must ensure both low arsenic concentrations and microbiologically safe water.

O&M of Water Systems: WSP has inbuilt mechanisms of ensuring smooth operation and maintenance of water systems. It is the 'Action Plan' where provision for introducing WSP is to be made by respective implementing organization in line with its ADP. Necessary guidelines will be provided by AICC for including WSP in the Action Plans.

3.1.7 Local level planning and implementation

I. Significance of local level initiative

The 'Local Level Planning and Implementation Process' is vital in the entire arsenic mitigation activities. This will bring about actual development in providing arsenic safe water at grassroots level, i.e., village. For smooth and effective operation of the process, all other pertinent areas as mentioned in the preceding sections need to be addressed properly. Some of these are quite significant and appear as determinants for avoiding the risk of failure of the overall mitigation program.

II. Initiation of local level plan (LLP)

Union Parishad (LGI) strengthened through appropriate skill transfer as mentioned in Section 3.1.4.IIb is expected to be competent and take the lead role in initiating the process with assistance from local NGOs, and technical support from local UZ office of DPHE.

The following steps are to be adopted:

a. *Working-out Demand Responsive Plan*:

- Collect and review background information (UP) – local & Data Repository
- Community consultation and demand assessment (UP/NGO)
- Conduct site-specific initial feasibility (UP/NGO)
- Develop village-wise LLP based on DRA (UP/NGO)
- UP Compiles village-wise proposed LLPs (UP/Local Arsenic Committee)
- Submission of Union/Village-wise LLPs to DPHE HQ through its UZ office (UP)

III. Reconciliation of local level plan with national level plan (NLP/ADP)

a. *Working-out reconciliation exercise*:

- Review proposed Local Level Plan
- Review indicative National Level Plan (yearly/ADP)
- Consult Data Repository
- Reconciliation of LLP with NLP in line with ADP provision

IV. Selecting technological options (SWDs)

a. *Working-out Technology Selection and building Action Plan*:

- Site-specific feasibility
- Select Technology Option (SWD) – consult Union-wise Technology Mapping
- Incorporate Water Safety Plan
- Build Action Plan in line with ADP

V. Implementation of action plan in line with ADP

a. *Working-out Implementation of Action Plan*:

- Phased approach
- Compliance with DPHE Specifications
- Construction/supply of SWD by enlisted contractors
- Monitoring and quality assurance of the different steps of construction/installation at every site

VI. Water quality testing

a. *Working-out 3 tier Water Quality testing*:

- Field testing using Field-Kit
- Laboratory testing at DPHE Lab
- Testing by independent third-party lab. (10% of total SWD per Union)

VII. Training & awareness raising – caretaker/user Community

a. *Working-out training and awareness raising*:

- New SWD handed over to caretaker/user community
- Training on simple operation and maintenance of SWD, Water Safety Plan, hygiene promotion

VIII. Record Keeping

a. *Working-out updating register maintaining*:

- Entry of new SWD with assigned unique ID in the register maintained at UP-WASH Cell
- Commissioning date
- Water quality with date of testing

IX. Algorithm of Local Level Planning & Implementation

a. *Fundamental steps in sequence*:

- Initiation of local level plan (LLP)
- Reconciliation of local level plan with national level plan (NLP/ADP)
- Selecting technological options (SWD)
- Finalizing action plan
- Implementation of action plan in line with ADP
- Water quality testing
- Training & awareness raising – caretaker/user Community
- Record Keeping

Figure 3.5 presents a framework for developing local level plan compatible with national level plan, ADP. It is of generic nature and respective implementing organizations can customize it to suit their individual program requirements.

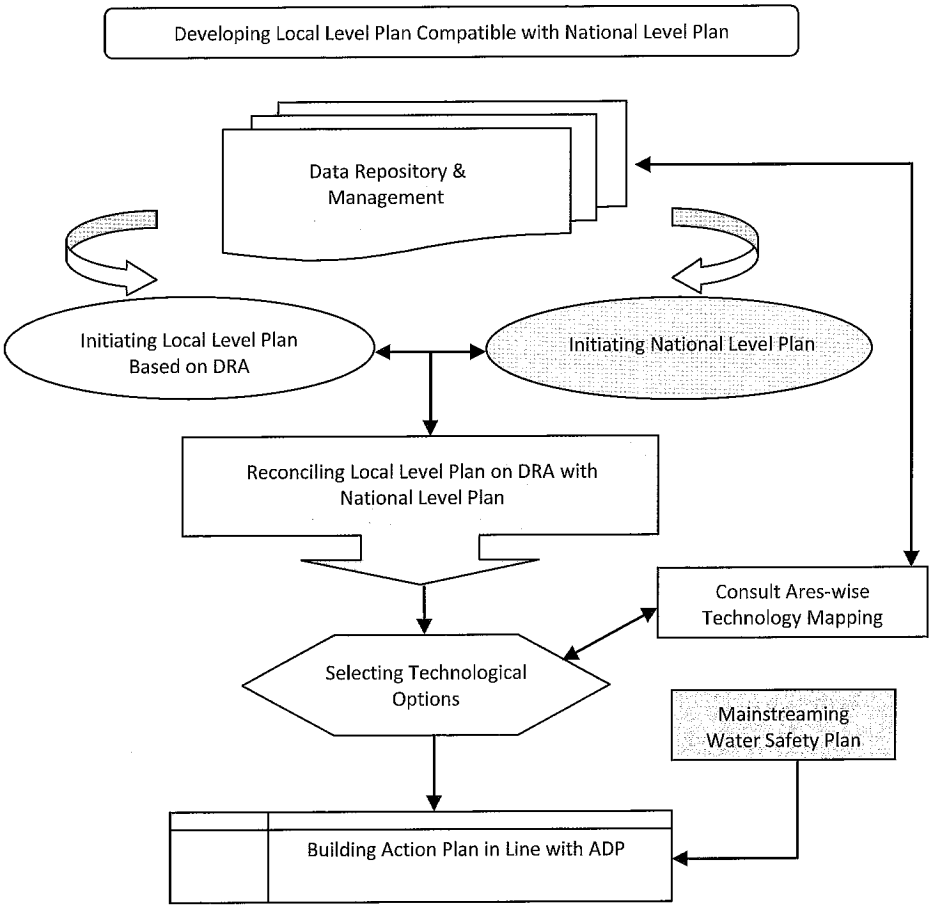

Figure 3.5: Showing Framework of Development of Local Level Plan

3.1.8 Gender aspect and consideration

Experiences accrued in gender aspect and its consideration pertaining to WASH development in general and arsenic mitigation in particular provide basis for incorporation of the issue in IPAM-WS. Community mobilization, local level planning, technology selection, systems' O&M are the areas where gender issue need to be given due importance.

3.1.9 Operation and Maintenance of SWD

Operation and maintenance (O&M) is a normal feature in any WASH program. However, in IPAM-WS this particular aspect will be taken care of through an in-built mechanism. Incorporation of WSP as indicated in Section 3.1.6 will provide operational monitoring and fixing problems identified in the system.

3.1.10 Comprehensive monitoring and surveillance

A well designed and functional 'Monitoring and Surveillance Program' is essential not only as an integral part of Water Safety Framework (WSF) but also as a prime requirement to oversee the performance of arsenic mitigation and management programs in the country. With all water points having unique Geo Code based ID and the MIS-GIS Unit of DPHE getting itself engaged in developing nationwide water point mapping, it will now be easier to support a comprehensive monitoring and surveillance program. Upcoming arsenic mitigation programs should patronize establishing a strong monitoring and surveillance program for effective execution of IPAM-WS with guidance from AICC.

3.1.11 Studies, Research and Development

Complexities of the subject and enormous knowledge gaps in arsenic mitigation signifies the importance of 'Research and Development (R&D)' in IPAM-WS. The prevailing arsenic contamination situation, challenges in appropriate mitigation options, aquifer management, arsenic-rich sludge management, etc. are the areas to be addressed. The prime tasks in this front are:

- Establishing linkage with the Dedicated R&D Fund
- Establishing linkage with the R&D Thematic Front
- Striving for innovations and technological development in arsenic mitigation
- Arsenic-rich sludge management
- Identifying appropriate service delivery mechanisms
- Disseminating and Mainstreaming R&D Outcomes
- Documenting R&D Findings.

The issue of arsenic-rich sludge management is pronounced more than ever before. The proposed sludge management protocol is yet to be developed. One on the major limitations in the promotion of Arsenic Removal Technologies (ART) is the appropriate management of arsenic-rich sludge generated.

Figure 3.6 provides a framework for arsenic-rich sludge management. It is expected that continued R&D will bring out solutions in this respect. Appropriate solutions once available may be applied for the areas concerned through incorporation in the action plan.

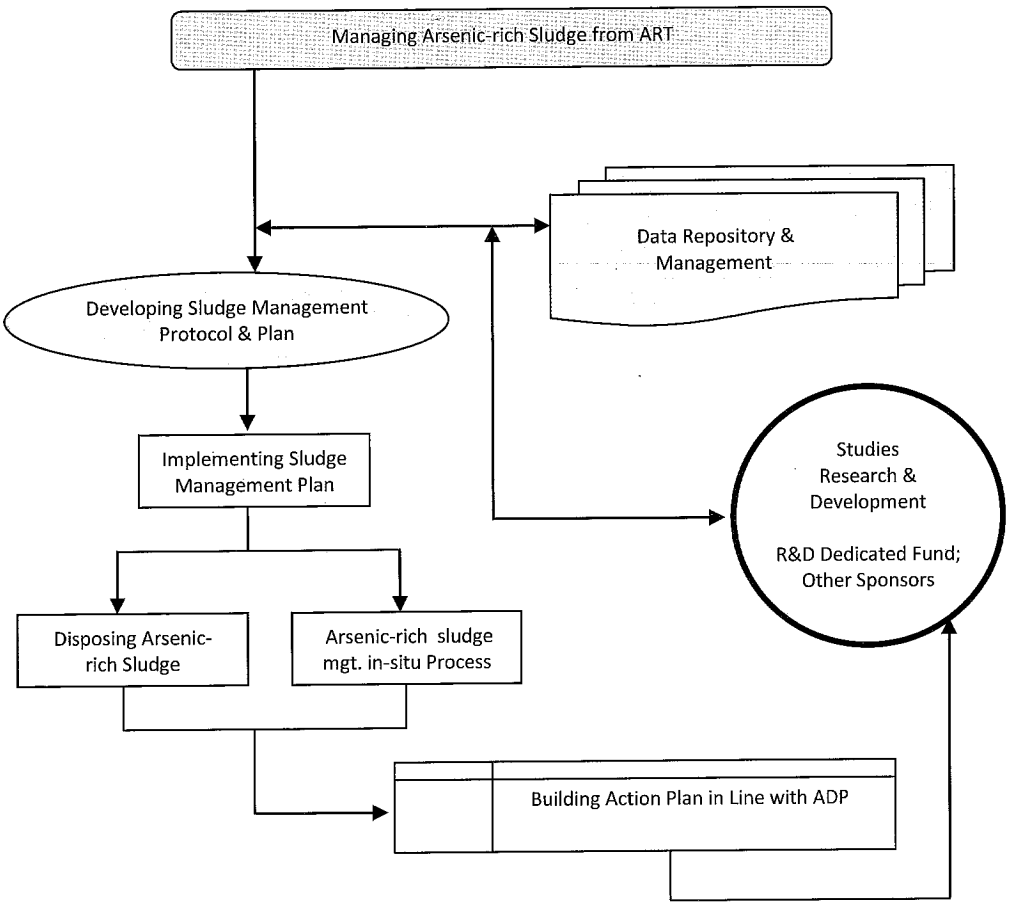

Figure 3.6: Showing Arsenic-rich Sludge Management Framework

3.2 Delineation of Water Safety Rights & Responsibilities

It is essential that the 'water safety rights & responsibility' is delineated and established. This will not only avoid ambiguity in fixing accountability but also establish a functional arbitration mechanism from legal perspective when situation demands. As per traditional practice water points installed with public resources are handed over to community leaving the liability for water safety unassigned. For example, as of now, marking either red of green for containing arsenic above or within Bangladesh standard of 0.05mg/l is nobody's responsibility from legal perspective.

Pertaining to 'drinking water' the four major stakeholders are: (i) users, (ii) owners, (iii) local government, and (iv) central government. Water Safety Rights & Responsibilities may be assigned as follows:

- Users: have the Right to *know* the safety of all water they consume
- Owners: are obliged to *mark* the safety of water from their drinking water assets
- Local Government: shall *ensure* that 100% of drinking water assets are marked
- Central Government: will *check* that NO drinking water asset is incorrectly marked.

The Local Government Division (LGD) is required to initiate the process of inclusion of this point in Bangladesh Water Act with the right authority. The process may take time and for the interim period LGD may issue administrative circular in this respect.

3.3 Scope and Time frame of IPAM-WS

3.3.1 Broad Based Scope

a. *Conceptual understanding about scope and extent*:

The following section provides conceptual understanding pertaining to the scope and extent of IPAM-WS.

The preceding sections 3.1.1 through 3.1.11 elaborate different areas of IPAM to be addressed. Each one is unique in contributing towards effective formulation of area-wise action plans through which actual arsenic mitigation will take place.

Background information as of now provides the scope of the envisaged mitigation program. By and large this is an acceptable proposition to proceed with the planning exercise. The countrywide program of assigning unique ID code number to each of the water points and full-scale screening and water quality testing will provide updated version of the spatial distribution of arsenic. It is expected that the MIS-GIS unit of DPHE from time to time will process and release fresh information for central Data Repository. The information is likely to be detailed up to village level once the proposed nationwide screening program is completed.

It is to be conceded that the assessment of the spatial distribution of arsenic contamination is rather a continuous and dynamic process. With time and continued efforts more and more clarity will be brought in and the exact geographic extent along with households affected will be known. These two parameters are vital in formulating intervention programs at a particular time horizon.

The following exercises and considerations are essential for the calculation of the required number of SWDs, the vital element of a mitigation program:

- Categorization of arsenic contamination severity;
- Prioritization for mitigation intervention;
- Service level targets

b. *Categorization of arsenic contamination severity*:

Categorization of arsenic contamination severity by areas preferably by villages is necessary for program implementation based on equity. The scenario varies widely. There are villages where a

high percentage of the water points contain arsenic exceeding Bangladesh standard of 0.05 mg/l. In contrast, there are villages with high percentage of water points within Bangladesh standard. There are mixed scenarios in between.

With the progress of the nationwide 'screening and water quality testing' the MIS-GIS Unit will be required to do village-wise analytical exercise and do the 'classification' with guidance from AICC. The classifications may be presented in a tabular form as shown in Table 3.1.

Table 3.1 : Categorization of arsenic contamination severity

Present Arsenic Contamination (Exceeding 0.05mg/l)		Present Safe Water Coverage (10 HH/SWD)	Classification	Categorization for Program Intervention
> 80%	+	< 20%	Top Priority Areas	Emergency Mitigation Program
>= 80%	+	>= 20 to < 40%	High Priority Areas	
>= 60 to < 80%	+	>= 20 to < 40%	Medium Priority	Priority Mitigation Program
>= 40 to < 60%	+	>= 20 to <60%		
>=20 to < 40%	+	>=20 to <80%	Low Priority	Normal Mitigation Program
< 20%	+	>=20 to <80%		

For clarity in program implementation three categories of mitigation programs are suggested as follows:

- Emergency Mitigation Program
- Priority Mitigation Program
- Normal Mitigation Program.

However, the Data Repository needs to maintain categorization of arsenic contamination severity in details for the use by policy and program planners, researchers and other stakeholders who may require such information.

c. *Prioritization for mitigation intervention*:

All required mitigation interventions are important. It is a standard practice to make plausible segregation in the entire program for effective implementation. This is necessary from equity, management, mobilization of logistics and resource flow perspectives. For clarity the proposed arsenic mitigation program is segregated into three categories, i.e., (i) Emergency Mitigation Program, (ii) Priority Mitigation Program, and (iii) Normal Mitigation Program. The extent of these three categories will be evident precisely after the nationwide full-scale screening and subsequent exercise in MIS-GIS Unit.

d. *Service level targets*:

The aspiration of the National Water Supply and Sanitation Policy is to attain a service level of 50 persons per water option, which is 10 HH per option. Considering a number of present

challenges the pragmatic proposition suggested in IPAM-WS is to attain by 2025 a service level of 20 HH per Safe Water Device. Development works will continue and the service level can be improved further in future. Table 3.2 presents phase wise service level targets.

Table 3.2 : Phase wise service level targets

	Short Term 2015-2018	Medium Term 2015-2020	Long Term 2015-2025
Emergency Mitigation Program	20 HH/SWD	20 HH/SWD	20 HH/SWD
Priority Mitigation Program	50 HH/SWD	20 HH/SWD	20 HH/SWD
Normal Mitigation Program	50 HH/SWD	50 HH/SWD	20 HH/SWD

e. *Requirement of SWDs as mitigation option*:

Assessment of village-wise requirement of SWDs is an exercise to be carried out through a continuous process in MIS-GIS Unit of DPHE and duly endorsed by AICC of Arsenic Management Wing (present AMD of DPHE).

Although developing a village wise list is the primary focus, the exercise will by default provide district, upazila and union wise summarized figures of SWDs respectively. Similarly Mitigation Program wise picture will also be evident. Table 3.3 provides example of village wise assessment of the requirement of SWDs.

Table 3.3 : Example of village wise assessment of requirement of SWD

Phase: Short Term 2015-2018 Category of Mitigation Program : Emergency Mitigation Program District:----------Upzila----------Union----------				
Name of Village	Households	Requirement of SWD	Existing number of SWD	Additional number of SWD

Therefore, village wise requirement of SWDs as mitigation option will be known precisely for:

- Short Term 2015-2018;
- Medium Term 2015-2020; and
- Long Term 2015-2025.

It is worthwhile to note that such information, i.e. village wise requirement of SWDs as mitigation option will also be known to:

- Emergency Mitigation Program;
- Priority Mitigation Program; and
- Normal Mitigation Program.

f. Households and geographic areas under consideration:

For the present planning purpose, information available as of now will be used. The broad based scope is set in terms of the following two parameters:

- Geographic areas of consideration; and
- Households needing mitigation.

Geographic areas involved: As discussed earlier, Section 3.1.2 is pertinent here to be emphasized. Nationwide 'screening and testing for water quality (WQ)' for all existing water points needs to be accomplished mandatorily. Full scale 'screening and testing WQ' is required not only for IPAM-WS but also for providing baseline data for countrywide 'Monitoring and Surveillance Program'. Moreover, to feed the envisaged 'Data Repository' an essential element of IPAM-WS, this countrywide activity is put high on agenda. Geographically, it covers the entire country.

Subsequent task of 'Categorization of arsenic contamination severity (Table 3.1)'; assumptions on 'Service level targets (Table 3.2)'; and 'Village wise assessment of the requirement of SWDs (Table 3.3)' will provide arrays of valuable information on villages and unions needing mitigation measure.

Households needing mitigation: Table 3.3 along with other information will produce updated and more precise figures of households needing arsenic mitigation measures.

These processes (discussed above) will provide updated, reliable and precise information on the 'geographical areas' and 'area specific households' needing arsenic mitigation which are the prime two parameters of the IPAM-WS.

However, for the purpose of drawing indicative plan at the outset, the following information presented in Table 3.4, available in the sector will be used.

Table: 3.4 Households and Geographic Areas

Parameters		**Extent**	**Remarks**
Households needing mitigation	:	About 3.94 million	MICS(2013) reports about 3.94 million. See clarifications in Footnote[22] below.
Geographic areas	:		
- 'Full Scale Screening & WQ Testing' 'Data Repository'		Countrywide	
- Emergency Mitigation Program	:	402 Unions HH – 1.72 million	Unions involved under different mitigation programs are further clarified in Footnote[23] below. Total households figure needing mitigation is about 3.94 million from the breakdown figures shown.
- Priority Mitigation Program	:	1010 Unions HH – 1.7 million	
- Normal Mitigation Program	:	1335 Unions HH – 0.58 million	

[22] Households needing mitigation: MICs(2013) reports 3.94 million, while there are other estimations as well. For planning purpose upon review a professional judgment applied and a figure of about 3.94 million has been suggested.

[23] Geographic areas: Unions involved under different mitigation programs in varied scale are estimated upon reviewing sector documents and applying professional judgment. Intensity of problem in 'emergency mitigation program' is highest while in other two programs is lower and only a few villages in a union may need intervention and in many cases partially. But the point is that by default the Union Parishad (UP) will be involved in the process.

3.3.2 Broad Based Time Frame

In line with the Sector Development Plan (SDP 2011-2025), the execution of the proposed IPAM will culminate in 2025. Considering the multifarious activities, physical extent, complexities and the fact that some activities are time-consuming, the entire program implementation will be phased in three terms, i.e., Short Term (2015-2018), Mid Term (2015-2020), and Long Term (2015-2015). Figure 3.7 depicts the indicative Time Frame of IPAM-WS.

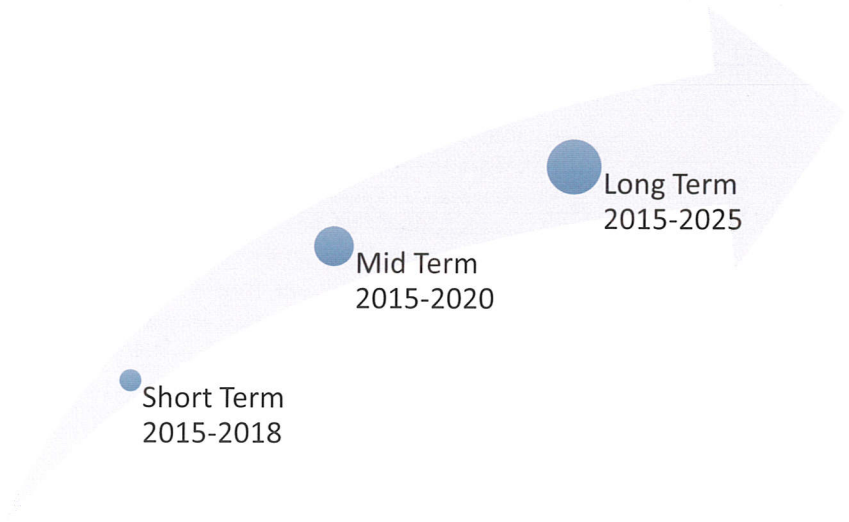

Figure 3.7: Showing Indicative Time Frame of IPAM-WS

While 'Short-Term' Measures are to be initiated, mobilized, organized and implemented within stipulated time, some of the 'Mid-Term', and even 'Long-Term' Measures will be required to be initiated at the initial stage of the Program. Similarly, some of the 'Long-Term' Measures may be needed to be initiated during Mid-Term of the Program.

The required interventions of arsenic mitigation itself e.g., installation of SWDs and associated activities of other facets of IPAM under Short Term, Medium Term and Long Term phase are pictorially shown in Figure 3.8. It is the Action Planners of respective implementing organization, be it from government, NOGs or private sector organizations and development partners, who will prepare the detailed action plan of their own.

Figure 3.8: IPAM-WS Implementation Timeframe

a. *Major item of activities within Short Term*:

Activities pertaining to awareness building among sector stakeholders and community mobilization as elaborated in section 3.1.1 are to be initiated and undertaken within Short Term phase to be completed by 2018.

In parallel, 'Strengthening Institution' as mentioned in section 3.1.4 is to be initiated from the very beginning with particular focus on UP and its WASH Cell, upgrading the existing Arsenic Management Division (AMD) of DPHE and formation of Arsenic Implementation Coordination Cell (AICC).

In parallel, preparation and execution of countrywide 'screening and water quality testing' as explained in section 3.1.2 should be started and accomplished within this phase. Data Repository and its management are also associated with the screening program and accordingly need to be put in place.

The process of developing Local Level Plan (LLP) as detailed in section 3.1.7 should be initiated in the emergency areas. This is the most critical part of the entire arsenic mitigation program. The 'emergency mitigation program' should be implemented with all out efforts.

b. *Major item of activities within Medium Term*:

Upgrading AMD to a level of Arsenic Mitigation Wing, establishing functional AICC as mentioned in section 3.1.4 should be accomplished during Mid-Term.

Water quality testing, capacity building and data management should continue. Local level planning and implementation for the 'priority mitigation program' areas are to be undertaken.

Necessary studies and R&D activities should be identified and undertaken with particular attention on arsenic-rich sludge management.

c. *Major item of activities within Long Term*:

Local level planning and implementation of arsenic mitigation under 'normal mitigation program' areas should be undertaken as a long-term activity.

During this phase, activities initiated in earlier phases are to be followed up.

3.4 Towards Translating IPAM-WS into Reality

This section discusses the process of translating the IPAM-WS into reality. The following sub-sections identify the requirements and pertinent clarifications.

3.4.1 Indicative time bound major activities and budget provisions

Emerging projects and programs of varied nature steered by different stakeholders but conducive to the overall concept and framework of IPAM-WS as elaborated in the preceding sections of this chapter will be the tools to get IPAM-WS set in motion.

In order to facilitate formulation of either projects or programs, indicative time-bound major activities with budget provisions are provided in Table I-1 in Annex-I. It is to be conceded that it is possible to estimate reliable figures only once the nationwide screening and scope of IPAM-WS as mentioned in Section 3.3 are completed. As regard costing, a rational proposition has been applied from concurrent sector experience. The proportion between the hardware element and all other facilitating elements is assumed to be 60% and 40% respectively, in emergency mitigation program (EMP); 65% and 35% in priority mitigation program (PMP); and for the normal mitigation program (NMP) it is 70% and 30%.

All these provisions, term-wise (Short, Medium or Long) and program-wise (Emergency, Priority and Normal) are good enough for any potential stakeholder for conceptualization and preparation of respective prodoc leading to formulation of DPPs and TPPs for implementation, meeting GoB planning process (as per examples presented in Annex-II).

3.4.2 Program formulation and planning process

Projects and Programs be it from GoB, NGOs, bi-lateral and multi-lateral Development Partners, Private Sector, Academic Institutions, etc. may wish to participate in combating arsenic issue in accordance with IPAM-WS.

For any stakeholder the prime requisite is to have an approved document meeting GoB planning process. There may be a good number of projects and programs but these are to be formulated conducive to IPAM-WS to facilitate consistency, uniformity and harmonization in interventions. This means that, with time, various projects and programs will be generated entailing activities

in line IPAM-WS to bring outputs towards meeting envisaged objectives to overcome arsenic problem. Like the formulation phase, these documents will be required to meet implementation and monitoring protocol as well, which are well established and are in practice.

Table II-1 in Annex-II, provides examples of program formulation and planning process. These are mere typical examples but essential to understand the GoB planning process pertaining to the formulation of projects or programs for interventions. It is important to note that the actual Action Plan comes at a later stage with ADP allocations against approved DPP or TPP. At present, it is not known how many investment programs will be there in IPAM-WS and who are the stakeholders and development partners. Similarly, precise information about study and research projects will be available after formulation and approval from appropriate authority. Potential stakeholders will find Table II-1 useful for understanding the GoB process and can adopt their respective strategies accordingly.

3.4.3 Process Action Plan of IPAM-WS

The Process Action Plan (PAP) is important and necessary to guide and monitor the execution of IPAM-WS. This entails a number of important tasks which have direct impact on the smooth execution of IPAM. Any unnecessary delay and deviation, at any stage for any task, once identified need to be addressed. Monitoring and keeping track on PAP need to be treated as a continuous process.

The different elements of PAP are explained and presented in Table III-1 in Annex-III. Altogether 20 important tasks are included in the PAP in the following four categories:

IPAM-WS Start-up Phase	:	PAP 001, PAP 002, PAP 003
IPAM-WS Mandatory Preparatory Phase	:	PAP 004, PAP 005, PAP 006, PAP 007, PAP 008, PAP 009, PAP 010, PAP 011, PAP 012
IPAM-WS Operation & Execution Phase - Through evolving programs and projects	:	PAP 013, PAP 014, PAP 015, PAP 016, PAP 017
IPAM-WS Coordination, Monitoring and Follow-up Phase	:	PAP 018, PAP 019, PAP 020

Each task area is given a code number, viz., PAP 00X, with task description, output/objectives, responsible organization, completion deadline, verifiable indicator, means of verification and finally remarks.

To explain further, as an example PAP 014 is cited here. Conceptualization and formulation of DPPs, TPPs etc. is a continuous nature of task. Concerned stakeholder or group of stakeholders will be involved in this activity in line with their respective institutional policy, comparative advantage, niche and choice. The Lead Stakeholder will submit the DPP or TPP as the case may be to the Planning Authority for approval. Such DPPs or TPPs may entail activities of respective preferences as indicated in Table I-1 shown in Annex-I and elaborated in Chapter 3 of IPAM-WS. It is then logical to expect that starting from the reckoning time of IPAM-WS, as time passes, more and more DPPs and TPPs including brief study and research type projects will be emerged till fag end of IPAM-WS. To keep it going, it should be overseen in totality. In this case the coordinating entity is the AICC itself.

PAP is therefore, an essential monitoring tool to ensure execution of IPAM-WS with pace and consistency in a harmonized fashion.

3.5 Financing Implementation

3.5.1 SDP provisions for WASH sector

The WASH sector is quite vibrant in terms of its activities and stakeholders' participation. The sector has observed a gradual increase in investments through national Annual Development Programme (ADP), of which, the part from public sector outlay is significant. In addition, private sector and NGOs also have provisions for investments in sector development.

Logically, all the three categories (i.e., public sector, private sector, NGO) are supposed to have potentials to finance arsenic mitigation programs. But for clarity, here the exercise will consider the public sector investment alone through ADPs.

For perspective analysis and to remain aligned with the exercises carried out in SDP it is better to use those figures at this stage. Table 3.5 shows investment costs at different scenarios. Scenario 2 has been considered for using in planning purpose. Table 3.6 shows the contributions of sector partners to total investment cost.

Table 3.5 Total investment costs at different scenarios WASH Sector

(in BDT million)

Scenarios	Short-term FY 2011-15	Medium-term FY 2016-20	Long-term FY 2021-25	Total FY 2011-25
Scenario 1	270,548	378,474	475,157	1,124,179
Scenario 2	380,410	524,021	561,089	1,465,520
Scenario 3	463,561	636,055	654,838	1,754,454

Source: Sector Development Plan (SDP 2011-2015)

Table 3.6 Contribution of sector partners to total investment cost in BDT million

Scenarios o Fund	FY 2011-15	FY 2016-20	FY 2011-25
1. Public Sector:			
Public Sector investment	210,456	288,299	232,378
Revenue from WSS utilities	88,960	144,466	209,526
2. Private Sector:			
Community contribution as cost sharing	2,108	106	70
Private household investment	69,677	70,193	85,385
Private entrepreneur	-	14,775	28,468
3. NGOs	9,209	6,182	5,264
Total (BDT million)	**380,410**	**524,021**	**561.089**
Total (US$ million)	***5,434***	***7,486***	***8,016***

Source: Sector Development Plan (SDP 2011-2015)

All these figures give a message that there are enough resources for arsenic mitigation purpose along with other WASH programs. Only a fraction of such provisions is enough for the arsenic mitigation program. The point which is clear is that, resource should not be a problem.

Then, there remains further scope to mobilize fund if it is really needed and meaningful for studies, resaerches and pilot programs to be carried out. There are development partners who may be willing to contribute and participate in the challenging areas of the sector.

3.5.2 Financial requirement for arsenic mitigation programs

The proposed comprehensive arsenic mitigation program as envisaged in IPAM-WS would require a total of about 24,440 million BDT till year 2025. Table 3.7 provides cost of various 'mitigation programs' along with approximate households to be served and SWDs to be installed. A further detail of costing is provided in Table I-1 in Annex-I.

Table 3.7 : Mitigation Program wise financial requirements

	Approximate Households to be served in million	Approximate number of SWDs	Cost in BDT million
Emergency Mitigation Program	1.72	80,840	10,509
Priority Mitigation Program	1.7	79,900	10,387
Normal Mitigation Program	0.58	27,260	3,544
Total		188,000	24,440

A comparison between financial requirements for execution of IPAM-WS and SDP provisions will provide useful picture for the decision makers and policy planners.

The requirement of BDT 24,440 million for execution of entire IPAM-WS by 2025 is only:

- 2.08% of the public sector contribution to total investment provision in WASH
- 1.67% of total investment provision in WASH by (Public Sector + Private Sector + NGOs).

It is therefore clear that it is a policy decision requirement as regard arsenic mitigation in the country. As the policy of the government is to mitigate the arsenic issue on a priority basis, this mere requirement to execute IPAM-WS, would therefore not be a problem.

3.5.3 Mechanism of resource deployment in realizing planned objectives

So far, more that 80% of the resource investments for arsenic mitigation were from public sector outlay. Resources provided to support implementation are from national allocations through Annual Development Plan (ADP). As per procedural requirement allocations through ADPs are earmarked for implementation of DPPs and TPPs.

Ongoing WASH programs and projects having water supply components should align with the activities to be conducive and consistent with the IPAM concept. This is not going to be a difficult effort. In the context of providing services to the people the objectives of these programs or projects are already quite consistent. All such efforts are not likely to bring any structural change in to these programs and projects. Executive guidelines, even orders may be

issued from the appropriate level of the respective implementing organization and line ministry to the program managers or project directors. Both government and non-government organizations can take same initiative in this respect.

Stakeholders' Convention:

It is easier for all upcoming programs and projects including those already in the pipeline to keep necessary provisions, and design the structural aspect in line with IPAM concept. It will be effective to organize 'consultation and orientation' among sector stakeholders including development partners, by LGD of the MoLGRD&C. Provisions in national Five Year Plans are also a means in this respect.

This particular task, i.e., Stakeholders' Convention is important not only to get indication of respective financial commitment but also to facilitate delineation of geographical areas and preferred activity fronts. Because of its importance it is included as PAP 003 of the Process Action Plan as shown in Annex-III of the document.

Chapter 4

Comprehensive Framework of IPAM-WS

4.1 Conceptual understanding of execution of IPAM-WS

The most important part in the document is Chapter-4, which portrays the pathway of the arsenic mitigation approach. It provides a complete framework of a dynamic process with rational linkages among various elements of IPAM-WS in entirety. It is evident that an in-built driving force steers the process to proceed and remain functional. The development of Local Level Action Plan (LAP) based on Demand Responsive Approach (DRA) and its implementation keeps the process moving. The functional framework gradually helps achieve the objective of IPAM-WS.

While chapter-3 explains and shows the way of doing things in each of the various facets of IPAM, the Comprehensive Framework of IPAM-WS gives a complete and integrated picture. It incorporates all facets in a rather logical sequence. It is the pictorial version of the algorithm of IPAM-WS. Figure 4.1 presents the comprehensive framework of IPAM-WS.

4.1.1 A guide to overall IPAM-WS management and coordination

Every arsenic mitigation program coordinator or manager should hold the IPAM-WS framework by heart. It keeps the Program Coordinator or Manager appraised of the stages of individual facet and allows him/her to see if problems are encountered in its implementation. It helps to focus on the areas, which needs to be addressed to ensure that the overall process is moving and the individual facet contributes to the comprehensive whole. In addition to this framework, a program coordinator or manager may prepare and use other monitoring tools based on critical path method.

A particular arsenic mitigation program involves a good number of organizations and actors which can be visualized from this framework. It entails software, hardware and crosscutting issues in one hand and on the other hand local level, regional and national level institutions. A continuous coordination among the organizations and actors involved within a particular program is essential and this framework plays a critical role in this respect.

4.1.2 Harmonization among independent arsenic mitigation programs

It is expected that there will be a number of independent arsenic mitigation programs from government, NGO and private organizations. Some of these may also be assisted by different development partners. It is essential that all such programs are consistent in nature.

From sector experience it is evident that in the absence of comprehensive framework the programs were planned and undertaken in an uncoordinated and inconsistent fashion. With this framework developed, it is expected that harmonization among programs will now be established and all future arsenic mitigation activities will be consistent and well coordinated.

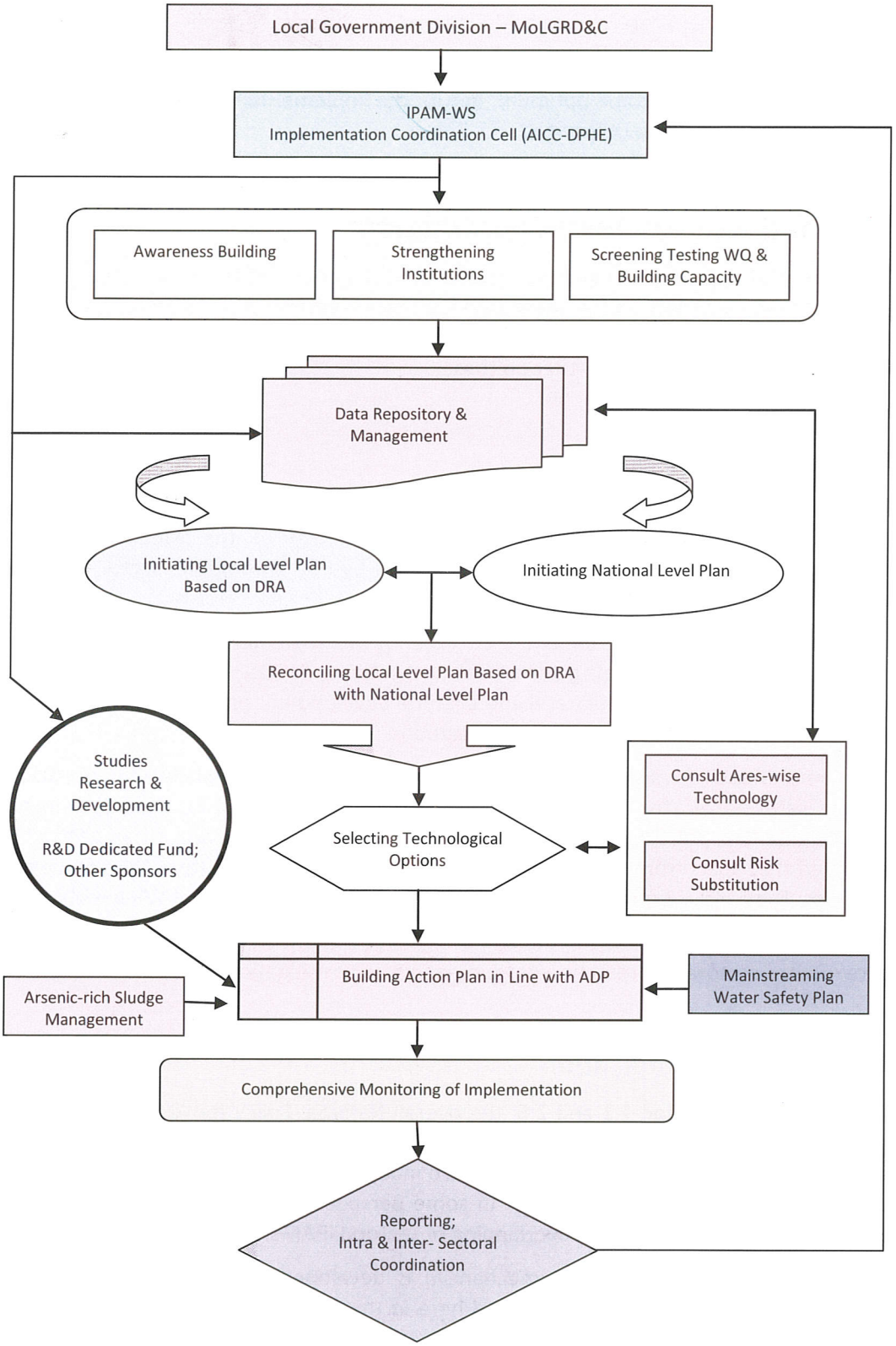

Figure 4.1 : Comprehensive Framework of IPAM-WS 2015

4.1.3 Supports optimum resources utilization

As the framework entails all pertinent facets of IPAM in a logical sequence and setting, resource utilization is more likely to be optimum. In turn the implementation of the overall IPAM-WS will ensure optimum resource utilization.

4.2 Intra and Inter-sectoral Coordination

Execution of IPAM-WS will require coordination among stakeholders at two levels. One is among the actors within WASH sector under LGD, i.e., Intra-sectoral coordination; the other is among various sectors dealing with arsenic and related issues, i.e, Inter-sectoral coordination. The following sections elaborate further on these.

4.2.1 Intra-sectoral Coordination

In accordance with the policy stand as mentioned in section 2.5 the execution of IPAM-WS is the responsibility of the Local Government Division (LGD) of the MoLGRD&C. The overall implementation will be managed and coordinated by LGD through its sector lead agency, the Department of Public Health Engineering (DPHE).

The WASH sector under the domain of LGD is endowed with many stakeholders, which includes government agencies, local government institutions, NGOs, private sector and research institutions. In addition, multilateral and bilateral development partners are also associated. The IPAM-WS includes all these types of organizations.

The Comprehensive Framework as shown in Figure 4.1 shows the placement of LGD and DPHE. Under institutional strengthening as discussed in section 3.1.4.Ib, Arsenic Implementation Coordination Cell (AICC) will be constituted. The AICC will take its place within AMD of DPHE. It is expected that apart from DPHE personnel AICC will have members from NGO and development partners. The AMD is proposed to be upgraded to Arsenic Management Wing within DPHE.

The arrangement as reflected in the comprehensive framework of IPAM-WS is expected to take care of intra-sectoral coordination pertaining to arsenic mitigation issues in the country.

4.2.2 Inter-sectoral Coordination

As mentioned in section 1.1 and 2.5, the overall National Policy for Arsenic Mitigation (NPAM) will be translated into reality through four sectoral IPAMs which are IPAM-WS, IPAM-H, IPAM-Ag and IPAM-WR. By and large, these IPAMs are independent in nature, yet there are areas where one will be dependent on the other. In some perspectives they will overlap with each other. Figure 4.2 shows pictorially the overlapping of sectoral IPAMs.

It is therefore necessary that a mechanism is developed and inter-sectoral coordination is established. Three options are discussed here in this report. These are mentioned as Option-I, Option II, and Option-III respectively.

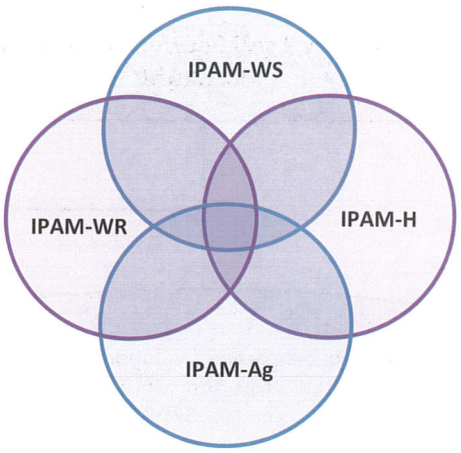

Figure 4.2: Overlapping of sectoral IPAMs

Option I – Inter Sectoral Coordination Framework of IPAMs:

Option-I is framed from a practical consideration. The existing National Water Supply and Sanitation Forum (NWSSF) headed by Secretary, Local Government Division (LGD) is the highest platform in WASH sector. It provides policy guidelines, endorses policy and strategy documents, takes major decisions pertaining to important events, activities and outputs. Unless otherwise felt necessary, the NWSSF meets once in six-months to resolve issues in accordance with set agenda. The Policy Support Unit (PSU) of LGD provides assistance in preparatory services pertaining to convening forum's meeting.

It is important to note that, NWSSF is constituted with representatives from all important stakeholders including all the four ministries made responsible for respective IPAMs. These are: Ministry of Local Government Rural Development and Cooperatives (MoLGRD&C) for IPAM-WS; Ministry of Health and Family Welfare (MoH&FW) for IPAM-H; Ministry of Water Resources (MoWR) for IPAM-WR; and Ministry of Agriculture (MoA) for IPAM-Ag.

It is a pragmatic, plausible and logical proposition to take care of the required coordination among the four IPAMs through NWSSF, particularly focusing execution of IPAM-WS. The principles to be followed for such coordination are:

- Ensuring minimal procedural requirement for coordination; and
- Ensuring minimal parameters for sharing and coordination.

The parameters for sharing and coordination which ought to be minimal could be as follows:

MoLGRD&C executing IPAM-WS	:	Villages with high % of contaminated water sources
MoH&FW executing IPAM-H	:	Villages with arsenicosis patients
MoA for IPAM-Ag	:	Villages with contaminated irrigation wells
(MoWR) for IPAM-WR	:	Aquifer yield; water stressed areas

Option-I is further clarified in Figure 4.3 which shows pictorially the Inter Sectoral Coordination Framework of IPAMs. It is simple, robust and likely to maintain pace whenever it is required to play its role. The NWSSF is already functioning and institutionally set within the ministry. Concerned desks are well acquainted with rules and procedures pertaining to its operation.

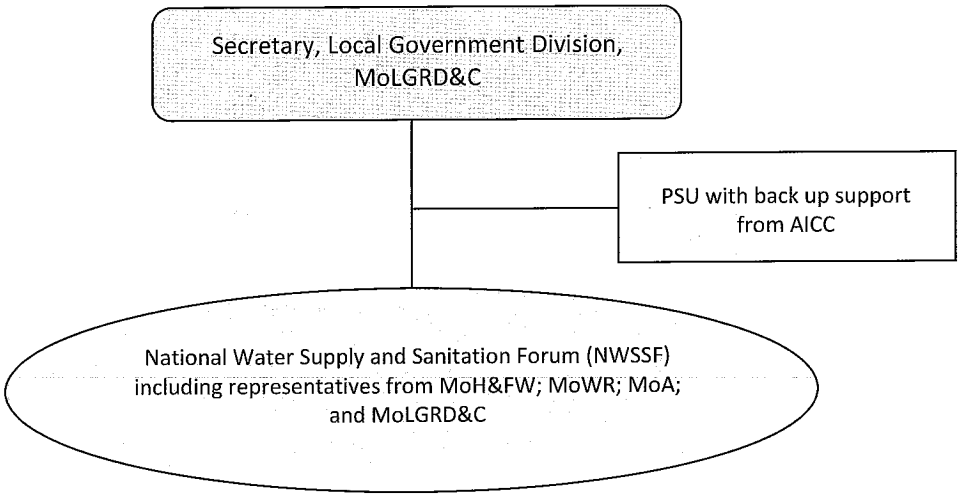

Figure 4.3: Option I – Inter Sectoral Coordination Framework of IPAMs

Option II – Inter Sectoral Coordination Framework of IPAMs:

The executive head of a sector is the Secretary of the concerned ministry. Therefore this coordination will be maintained by a high level body. Each implementation plan should be elaborated by the respective ministry, but coordinated and monitored through the office of the Principal Secretary, who will be advised by the National Arsenic Committee, and supported by an Arsenic Implementation Monitoring Unit (AIMU) to collate, analyse and report information. Figure 4.4: shows the Inter Sectoral Coordination Framework of IPAMs as Option-II.

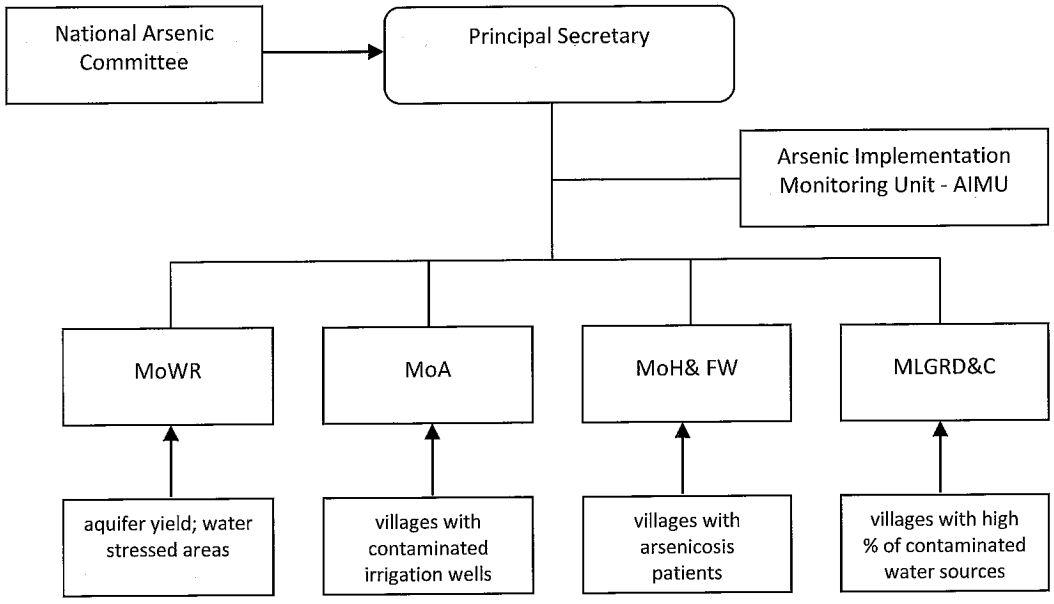

Figure 4.4: Option II – Inter Sectoral Coordination Framework of IPAMs

National Arsenic Committees:

The National Arsenic Committee will advise on policy, inter-sectoral coordination and the evaluation of the plans, but will not normally be concerned in the execution of individual implementation plans.

Arsenic Implementation Monitoring Unit (AIMU):

A small set up, with the name Arsenic Implementation Monitoring Unit (AIMU) within Policy Support Unit (PSU) is proposed to be constituted for maintaining liaison with other sectoral IPAMs. The functions of the AIMU will not replace or duplicate the routine reporting functions of the individual ministries. The AIMU will engage a competent agency to carry out the data management functions. The Principal Secretary, through the AIMU, will prepare an Annual Report for the general public explaining the current status of contamination and exposure, ongoing and planned activities, and future needs for arsenic mitigation.

Option III – Inter Sectoral Coordination Framework of IPAMs:

Option III is kept open at this stage. All the four concerned ministries, i.e., MoWR, MoA, MoH & FW, and MoLGRD&C may assign their designated representatives to undertake discussion sessions with the objectives to work out a pragmatic mechanism of inter-sectoral coordination among IPAMs. The ministry of LGRD&C may initiate the process and convene the first discussion session.

4.3 Reporting and Accountability

Transparent and comprehensible reporting is central to public accountability. There will be two types of major reporting, one for each individual IPAM and the other for comprehensive IPAMs.

4.3.1 Reporting on IPAM-WS:

All individual program implementers will prepare respective reports in support of their own program requirements. However, the comprehensive annual report for IPAM-WS should be prepared by AICC which will inter alia, essentially cover the following:

- Reporting on progress against planned expectation, and
- Reporting on lessons acquired for future application.

Individual arsenic program implementers should have respective auditing arrangement on Third-Party Principle.

4.3.2 Reporting on inter-sectoral coordination:

Reporting on inter-sectoral coordination will depend on the agreed coordination mechanism among the four concerned ministries, i.e., MoWR, MoA, MoH&FW, and MoLGRD&C.

Chapter 5

Risk and Assumptions

This section is to be read in conjunction with chapters 3 and 4 of this document. Figure 4.1, depicts the logical sequence of IPAM-WS, which has emanated from lessons accrued from the sector operations in response to IPAM-2004. Assumptions are made on the foundations of the lessons learned. Risks will flash whenever IPAM-WS operation is not allowed to proceed in line with the lessons learned. If risk prevails it will jeopardize the sustainability aspect of arsenic mitigation and will cease attaining the objectives of the IPAM-WS. The 'Assumptions' and 'Risks' identified are mentioned separately or in combination.

- Institutional capacity at national level for effective coordination of nationwide program implementation is to be given utmost priority. The present Arsenic Management Division (AMD) of DPHE is to be upgraded and a coordination cell AICC is to be constituted as spelt out within section 3.1.4.Ib. This provision will greatly facilitate coordination of the functional aspects of IPAM-WS as explained in section 4.2.1. While this can be done with minimal financial and administrative efforts, it depends on the attitude and understanding of the necessity of this cell;
- Algorithm, i.e., the logical sequence of the comprehensive framework of IPAM-WS, shown in Figure 4.1, is to be maintained. This is particularly so for the section 3.1 inclusive of sub-sections from 3.1.1 through 3.1.7.
- Institutional capacities of LGIs at Union Parishad (UP) level as elaborated in section 3.1.4.IIb are to be seen as prime requisite for effective execution of IPAM-WS right from grassroots;
- Awareness raising, Screening, Testing WQ for all water points and markings are to be mandatorily done within short-term phase; associated capacity building, establishment of testing facilities are to be accomplished at the outset;
- Well structured database, routine monitoring and professionally sound data management system need to be instituted at the outset as a primary task. This task is to be seen not as a requirement for program planners for designing future programs but also as a live support to the action planners for ongoing programs. The initiative of assigning GEO Code-based Unique Water Point ID is praiseworthy which needs full scale support for country-wide coverage, improvement and updating on a continual process. This effort is conducive to establishing a robust database system.
- Appropriate supporting tools need to be used in carrying out the exercise of technology selection. This approach is more likely to ensure a right selection at a micro-geographic unit area. The document on 'Union-wise technology mapping' is unique and extremely useful for the preparation Action Plan based on ADPs. This country-wide document is based on water quality, water table, hydrogeologic features, coupled with the application of risk assessment principles emanated from scientific research undertaken.

Chapter 6

Conclusions

With policy support in place, line ministry and sector lead agency earmarked, the execution of IPAM-WS should be smooth. Intra-sectoral coordination should also be effective with existing Arsenic Management Division upgraded and AICC is constituted and put to function.

Introduction of the Comprehensive Frameworks of IPAM-WS will greatly facilitate harmonization of implementation process of arsenic mitigation programs across the sector.

From equity perspective the 'Emergency Mitigation Program' as identified is to be implemented within Short Term Phase (2015-2018). In this respect all pertinent activities are to be planned, organized and implemented as forerunner.

The provision for investment in WASH as indicated in the SDP is quite satisfactory and the requirement for IPAM-WS is only a minute faction (<2% of SDP provision). In this context the financial allocation through ADP is to be enhanced to maintain required pace of development. The Local Government Division (LGD) is required to pursue the issue with the planning commission to increase ADP allocation for WASH sector.

There remains knowledge gap in technological front where innovations are needed. Arsenic-rich sludge management protocol needs to be developed and put to practice. Upcoming mitigation programs should establish links with the Dedicated R&D Fund to promote required studies and research.

Developing Local Level Plan (LLP) based on Demand Responsive Approach (DRA) with the initiative from LGI (Union Parishad) as elaborated in section 3.1.7 is quite challenging. It will take gestation time to groom and attain pace. But the process inculcates a sense of belongingness in the user community about the proposed water supply system. This is an essential element in achieving sustainability.

Evolving evidence based models are to be respected, if needed put to extended pilots on way to mainstreaming. This scope should not be limited to a single model rather a few potential models should be given similar opportunity. These can be put to different geographic regions for comparative assessment. Union Parishad expressing and demonstrating its commitment to engage one additional manpower to work with the proposed WASH Cell from its own revenue, will get a positive count in the demand responsive (DRA) consideration.

It is essential that the 'water safety rights & responsibility' is delineated and established as mentioned in section 3.2. This will not only avoid ambiguity in fixing accountability but also establish a functional arbitration mechanism from legal perspective when situation demands. The Local Government Division (LGD) is required to initiate the process of inclusion of this point in Bangladesh Water Act with the right authority.

The sector through AICC should have a forwarded looking vision for the scenarios beyond year 2025, i.e., after the proposed IPAM-WS. Higher service levels and a shift in arsenic contamination level aligned with WHO guideline value of 10 ppb may be the prime elements for the next IPAM-WS.

Annex - I

Implementation Plan of Arsenic Mitigation for Water Supply (IPAM-WS)
Indicative time bound major activities and budget provisions

Table: I-1 Major Activities and Budget Provision

Program Term	Program Type	Program Activities			Implementation		Costing In Million BDT		Prime Actors	Remarks
		Major Activities	Activity Code	Activity Type	From	To		% of Sub Total		
Short Term 2015-2018	Emergency Mitigation Program (EMP) Unions involved – 402 Households needing mitigation – 1.72 million.	Building Awareness	EMP 001	Associated supporting activities for physical installation of SWDs as mitigation measures; Software intervention	FY 2015-16	FY 2018-19	525	5%	LGD, DPHE, LGIs, NGOs	AICC Coordination
		Establishing & Strengthening Institutions	EMP 002		FY 2015-16	FY 2018-19	841	8%	LGD, DPHE, LGIs, NGOs	AICC Coordination
		Screening, Testing WQ, Capacity Building	EMP 003		FY 2015-16	FY 2018-19	1051	10%	DPHE, NGOs	AICC Coordination
		Developing Data Repository and Management	EMP 004		FY 2016-17	FY 2018-19	315	3%	DPHE	Dev Partners Assistance
		Initiate the process of Developing Local Level Plan (LLP)	EMP 005		FY 2016-17	FY 2018-19	315	3%	UZ-DPHE, NGOs, LGIs	
		Action Plan for Emergency Program	EMP 006		FY 2016-17	FY 2018-19	105	1%	AICC	Stakeholders Assistance
		Implementation – Emergency Mitigation Program (Installing SWDs)	EMP 007	Hardware Installation	FY 2016-17	FY 2018-19	6305	60%	LGIs, NGOs, DPHE	
		Other	EMP 008	Misc.	FY 2015-16	FY 2018-19	1051	10%	LGD, DPHE, AICC	Dev Partners
EMP Implementation - Sub Total I: in million BDT							**10,509**			

Program Term	Program Type	Program Activities			Implementation		Costing In Million BDT		Prime Actors	Remarks
		Major Activities	Activity Code	Activity Type	From	To		% of Sub Total		
Mid Term 2015-2020	Priority Mitigation Program (PMP) Unions involved – 1010. Households needing mitigation – 1.7 million	Strengthening Institutions to continue	PMP 001	Associated supporting activities for physical installation of SWDs as mitigation measures; Software intervention	FY 2015-16	FY 2020-21	727	7%	LGD, DPHE, AICC	
		Testing WQ, Capacity Building to continue	PMP 002		FY 2019-20	FY 2020-21	519	5%	DPHE, NGOs	AICC Coordination
		Data Repository and Management to continue	PMP 003		FY 2019-20	FY 2020-21	519	5%	DPHE	Dev Partners Assistance
		Selection of SWD, Developing Local Level Plan (LLP)	PMP 004		FY 2019-20	FY 2020-21	519	5%	UZ-DPHE, NGOs, LGIs	
		Action Plan upon Reconciliation for Priority Program	PMP 005		FY 2019-20	FY 2020-21	208	2%	AICC	Stakeholders Assistance
		Initiating, undertaking studies and R&Ds	PMP 006		FY 2015-16	FY 2020-21	104	1%	AICC, R&D Thematic	PSU,
		Managing Arsenic Rich Sludge from ART	PMP 007		FY 2018-19	FY 2020-21	104	1%	AICC, R&D Thematic	PSU
		Implementation – Priority Mitigation Program (Installing SWDs)	PMP 008	Hardware Installation	FY 2018-19	FY 2020-21	6752	65%	LGIs, NGOs, DPHE	
		Other	PMP 009	Misc.	FY 2018-19	FY 2020-21	935	9%	LGD, DPHE, AICC	Dev Partners
PMP Implementation - Sub Total II: in million BDT							**10,387**			

Program Term	Program Type	Program Activities			Implementation		Costing In Million BDT		Prime Actors	Remarks
		Major Activities	Activity Code	Activity Type	From	To		% of Sub Total		
Long Term 2015-2025	Normal Mitigation Program (NMP) Unions involved – 1335 Households needing mitigation – 0.58 million	Strengthening Institutions to continue	NMP 001	Associated supporting activities for physical installation of SWDs as mitigation measures; Software intervention	FY 2015-16	FY 2025-26	284	8%	LGD, DPHE, AICC	
		Testing WQ, Capacity Building to continue	NMP 002		FY 2020-21	FY 2025-26	177	5%	DPHE, NGOs	AICC Coordination
		Data Repository and Management to continue	NMP 003		FY 2020-21	FY 2025-26	177	5%	DPHE	Dev Partners Assistance
		Action Plan upon Reconciliation for Normal Program	NMP 004		FY 2020-21	FY 2024-25	106	3%	AICC	Stakeholders Assistance
		Undertaking studies and R&Ds, Evaluations	NMP 005		FY 2020-21	FY 2025-26	71	2%	AICC, R&D Thematic	PSU,
		Managing Arsenic Rich Sludge from ART	NMP 006		FY 2020-21	FY 2025-26	35	1%	AICC, R&D Thematic	PSU
		Intra & Inter-sectoral Coordination	NMP 007		FY 2015-16	FY 2025-26	35	1%	AICC, PSU	LGD
		Implementation of Normal Mitigation Program (Installing SWDs)	NMP 008	Hardware Installation	FY 2020-21	FY 2025-26	2481	70%	LGIs, NGOs, DPHE	
		Other	NMP 009	Misc.	FY 2020-21	FY 2025-26	177	5%	LGD, DPHE, AICC	Dev Partners
NMP Implementation - Sub Total III: in million BDT							**3,544**			
Grand Total: (Sub Total I) + (Sub Total II) + (Sub Total III): in million BDT US $ in million (BDT 80.00 to 1 US $)							**24,440** 306		**Indicative physical & financial provisions**[1]	

[1] Indicative Physical & Financial Provisions: All these provisions, term-wise (Short, Medium or Long) and program-wise (Emergency, Priority and Normal) are good enough for any potential stakeholder for conceptualization and preparation of respective prodoc leading to formulation of DPPs and TPPs for implementation, meeting GoB planning process (as per examples presented in Annex-II).

Annex - II

Implementation Plan of Arsenic Mitigation for Water Supply (IPAM-WS)

Examples of Program formulation and planning process[2]

Table: II-1 Major Stages of Planning Process

Emerging Projects & Programs	Nature (Example only)	Conceptualize; Concept Paper Prodoc.	Memorandum Understanding MOU	Project, Program Formulation – through Consultation	DPP, TPP etc. approved by GoB Planning	Financing & Implementation through ADPs	Action Plan as per respective ADP Allocation	Implementation Monitoring, ADP Progress Review – routine basis	Completion Report IMED - GoB PCR – Dev Partner	Remarks
Fully GoB Financed Investment Program	Commonly Investment Program – enhancing service coverage	Concept Paper often by GoB Sector Agencies		Often by concerned Sector Agency	DPP Approval	Allocations through yearly ADPs	Preparation of Action Plan, in line with ADP provision, by concerned stakeholders	Line Ministry's Monitoring Wing; IMED of Planning Commission	Sector Agency/ Line Ministry	AICC Coordinating
Collaborative Finance: GOB & Development Partner-A1	Comprehensive program, study, capacity building, research and investment	Prodoc by Dev Partner; Concept Paper Sector Agency	Signed by GoB, Development Partner	Often through a consultative process using workshop	DPP Approval	Allocations through yearly ADPs	Preparation of Action Plan, in line with ADP provision, by concerned stakeholders	-Do- & Joint Review Mission	Sector Agency/ Line Ministry; PCR – Dev Partner	-do-
Collaborative Finance: GOB & Development Partner-A2	Comprehensive program as above but in different geographic areas	-Do-	-Do-	-Do-	DPP Approval	Allocations through yearly ADPs	Preparation of Action Plan, in line with ADP provision, by concerned stakeholders	-Do- & Joint Review Mission	Sector Agency/ Line Ministry; PCR – Dev Partner	-do-
Collaborative Finance: GOB	Comprehensive program with	-Do-	-Do-	-Do-	DPP	Allocations through	Preparation of Action	-Do-	Sector Agency/	-do-

[2] Examples of Program formulation and planning process: These are mere examples but essential to understand the GoB planning process pertaining to the formulation of projects or programs for interventions. It is important to note that actual Action Plan comes at a later stage with ADP allocations against approved DPP or TPP.

Emerging Projects & Programs	Nature (Example only)	Conceptualize; Concept Paper Prodoc.	Memorandum Understanding MOU	Project, Program Formulation – through Consultation	DPP, TPP etc. approved by GoB Planning	Financing & Implementation through ADPs	Action Plan as per respective ADP Allocation	Implementation Monitoring, ADP Progress Review – routine basis	Completion Report IMED - GoB PCR – Dev Partner	Remarks
& Multiple Development Partner-A3	intensive Software inputs in combination with Hardware				Approval	yearly ADPs	Plan, in line with ADP provision, by concerned stakeholders	& Joint Review Mission	Line Ministry; PCR – Dev Partner	
Collaborative Finance: GOB & Multiple Development Partner-A4	Composite program involving LGIs with intensive Software & Investments	Prodoc by Dev Partners; Concept Paper Sector Agency	Signed by GoB, Development Partners	Often through a consultative process using workshop	DPP Approval	Allocations through yearly ADPs	Preparation of Action Plan, in line with ADP provision, by concerned stakeholders	-Do- & Joint Review Mission	Sector Agency/ Line Ministry; PCR – Dev Partner	-do-
Collaborative Finance: NGOs & Development Partner-A5	Composite program involving LGIs with intensive Software & Investments	Prodoc by Dev Partners; Concept Paper by NGOs	Signed by NGOs, Development Partners	-Do-	DPP Approval	Allocations through yearly ADPs	Preparation of Action Plan, in line with ADP provision, by concerned stakeholders	-Do- & Joint Review Mission	Sector Agency/ Line Ministry; PCR – Dev Partner	

Collaborative Finance: GOB & Development Partner-X1	Study, research, capacity building, strengthening institutions	Prodoc by Dev Partners; Concept Paper Sector Agency	Signed by GoB, Development Partners	Often through a consultative process using workshop	TPP Approval	Allocations through yearly ADPs	Preparation of Action Plan, in line with ADP provision, by concerned stakeholders	-Do- & Joint Review Mission	Sector Agency/ Line Ministry; PCR – Dev Partner	-do-
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Collaborative Finance: NGOs & Development Partner-Xn	Study, research, capacity building, strengthening institutions	Prodoc by Dev Partners; Concept Paper by NGOs	Signed by NGOs, Development Partners	-Do-	TPP Approval	Allocations through yearly ADPs	Preparation of Action Plan, in line with ADP provision, by concerned stakeholders	-Do- & Joint Review Mission	Sector Agency/ Line Ministry; PCR – Dev Partner	-do-

Annex - III

Implementation Plan of Arsenic Mitigation for Water Supply (IPAM-WS)
Process Action Plan (PAP)

Table: III-1 Elements of Process Action Plan

Task Code Number	Task Description	Output/Objective	Responsible	Completion Deadline	Verifiable Indicator	Means of Verification	Remarks
IPAM-WS Start-up							
PAP 001	IPAM-WS accepted for Execution	Approved Document. The IPAM-WS	LGD of MoLGRD&C	December 2015	Approved in NWSSF Meeting	Minutes of the NWSSF Meeting	PSU providing secretarial services for NWSSF meeting
PAP 002	IPAM-WS – Kick off Event; LGD organizing the event along with sector stakeholders	IPAM-WS launching	LGD/PSU/DPHE/AMD	January 2016	Launching Program schedule	Launching Prog executed	AMD/DPHE in consultation with PSU/LGD
PAP 003	Stakeholders' Convention – Delineating geographical areas; Activity areas; Indicative financial commitment; etc.	MOUs	LGD/ PSU; DPHE/AMD	January 2016	Proceedings of the convention	Proceedings circulated	Indicative financial commitment – suffice at this stage
IPAM-WS Mandatory preparatory phase							
PAP 004	Mobilization of additional professionals for existing AMD from existing provisions of DPHE	Strengthened AMD	DPHE in consultation with LGD	January 2016	Transfer and posting orders	Administrative letters issued and complied	DPHE be given the leverage
PAP 005	Create Arsenic Implementation Coordination Cell (AICC) within AMD of DPHE	Functional AICC in place	LGD / DPHE	January 2016	Functional AICC	Administrative orders from LGD	
PAP 006	Preparation and submission of proposal for upgrading AMD to a level of Wing (Arsenic Mitigation Wing-AMW) of DPHE	Proposal for upgrading AMD	DPHE/LGD	February 2016	Formal Proposal	Proposal set in motion, letters, meetings	TPP with support from Development Partner

Task Code Number	Task Description	Output/Objective	Responsible	Completion Deadline	Verifiable Indicator	Means of Verification	Remarks
PAP 007	Preparation and submission of proposal for strengthening MIS-GIS Unit of DPHE	Proposal for strengthening MIS-GIS Unit	DPHE/LGD	February 2016	Formal Proposal	Proposal set in motion, letters, meetings	TPP with support from Development Partner
PAP 008	Preparation and submission of proposal for setting up Data Repository and Management System	Proposal for Data Repository & Mgt System	DPHE/LGD	March 2016	Formal Proposal	Proposal set in motion, letters, meetings	TPP with support from Development Partner
PAP 009	Establish full fledged Arsenic Mitigation Wing (AMW) of DPHE in line with the proposal. AICC functioning within this wing.	Active AMW	DPHE/LGD/Concerned Dev Partner	June 2016	Physical existence-manpower and logistics	TPP implementation monitoring; PCR	With above TAPP support
PAP 010	Establish full fledged MIS-GIS Division of DPHE	Active MIS-GIS Division	DPHE/LGD/Concerned Dev Partner	June 2016	Physical existence-manpower and logistics	TPP implementation monitoring; PCR	With above TAPP support
PAP 011	Establish full fledged Data Repository and Management System within DPHE	Active Data Repository System	DPHE/LGD/Concerned Dev Partner	July 2016	Physical existence-manpower and logistics	TPP implementation monitoring; PCR	With above TAPP support
PAP 012	Review on functioning of AICC; AMW, MIS-GIS, 'Data Repository'	Smoothly & actively functioning units	DPHE/LGD/Concerned Dev Partner	Sept 2016 Dec 2016 Mar 2017	Review Reports	Communications pertaining fielding Missions, Wrap-up	AICC coordinating – review through external experts
IPAM-WS Operation & Execution Phase – Through evolving programs and projects							
PAP 013	Stakeholders' 1st-round consultation – expressing willingness to be involved through program/ project interventions	A number of Prodocs, Concept papers, MoUs,	DPHE/LGD – 1st round (Next-round consultations – AICC)	January 2016	Proceedings	Prodocs; MoUs	PAP 013 may be tied to PAP 003 (for the first time)
PAP 014	Formulation of DPPs, TPPs as the case may be by respective stakeholders & submission to the planning authority for approval.	A number of DPPs and TPPs	Lead Stakeholder(s) preparing & submitting DPPs/TPPs	Jun 2016 (EMP); Jun 2018 (PMP); Jun 2020	DPPs and TPPs	Minutes of PEC and SPEC of Plann Comm; Administrative orders from the	AICC coordinating

Task Code Number	Task Description	Output/Objective	Responsible	Completion Deadline	Verifiable Indicator	Means of Verification	Remarks
	[Continuous task – see footnote)[3]			(NMP)		line ministry	
PAP 015	Arsenic Mitigation Programs through approved DPPs and TPPs put to implementation	Actual arsenic mitigation on the ground	AICC and concerned stakeholders	Interventions - Reckoning 2016; Ending 2025	DPPs and TPPs	ADPs, PCRs etc.	AICC coordinating
PAP 016	Joint Reviews on Arsenic Mitigation Programs: Emergency Mitigation Program (EMP); Priority Mitigation Program (PMP); and Normal Mitigation Program	Improved situation of drinking water supply	GoB, concerned stakeholders, external experts	January 2018; January 2020; January 2022; January 2025	Joint Review Reports (JRPs)	Communications pertaining fielding Review Missions; Wrap up meetings	AICC coordinating
PAP 017	Situation Analysis & Strategy Review	Status of arsenic mitigation at time horizons	GoB, concerned stakeholders, external experts	January 2017; January 2021; March 2025	Status Report	Communications pertaining deployment of expertise	AICC coordinating
IPAM-WS Coordination, Monitoring and Follow-up							
PAP 018	Ensure intra-sectoral coordination as well as Inter-sectoral coordination as per section 4.2.1 and 4.2.2	Consistent and harmonized interventions	AICC	Routine planned reporting; and meetings	Coordination meetings	Minutes of coordination meetings	AICC coordinating
PAP 019	Monitor, review and recast PAPs	IPAM-WS being executed with pace	AICC	Routine planned review of PAPs	Reviewed and updated PAP	Minutes coordination/ review meetings	AICC coordinating
PAP 020	Auditing & Reporting on IPAM-WS Execution	Ensuring accountability on IPAM-WS execution	LGD of MoLGRD&C/ DPHE	Routine planned auditing after EMP, PMP and NMP	Technical Audit Reports	Communications and Minutes of meetings	AICC coordinating

[3] PAP 014: Conceptualization and formulation of DPPs, TPPs etc. is a continuous nature of task. Concerned stakeholder or group of stakeholders will be involved in this activity in line with their respective institutional policy, comparative advantage, niche and choice. The Lead Stakeholder will submit the DPP or TPP as the case may be to the Planning Authority for approval. Such DPPs or TPPs may entail activities of respective preferences as indicated in Table I-1 shown in Annex-I and elaborated in Chapter 3 of IPAM-WS. It is then logical to expect that starting from the reckoning time of IPAM-WS, as time passes, more and more DPPs and TPPs including brief study and research type projects will be emerged till fag end of IPAM-WS.