Policy Support Unit

FINAL

MODALITIES FOR A DEDICATED RESEARCH & DEVELOPMENT FUND FOR WASH SECTOR

Submitted By

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Sector Policy Support Project of the Water Supply and Sanitation Sector in Bangladesh Phase –III

Final

Modalities for a Dedicated Research and Development (R&D) Fund for WASH Sector

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Foreword

(To be prepared by PSU)

Acknowledgement

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Acronyms & Abbreviations

ADB	Asian Development Bank
ADP	Annual Development Program
APSU	Arsenic Policy Support Unit
ART	Arsenic Removal Technology
ARU	Arsenic Removal Unit
AusAID	Australian Agency for International Development
BADC	Bangladesh Agricultural Development Corporation
BAMWSP	Bangladesh Arsenic Mitigation Water Supply Project
BCCSAP	Bangladesh Climate Change Strategy and Action Plan
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
CHT	Chittagong Hill Tracts
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
DSK	Dushtha Shasthya Kendra
DSP	Deep Set Pump
DWASA	Dhaka Water Supply and Sewerage Authority
FGD	Focused Group Discussion
FSM	Faecal Sludge Management
GoB	Government of Bangladesh
GSB	Geological Survey of Bangladesh
HYSAWA	Hygiene, Sanitation and Water Supply
IEC	Information, Education and Communication
IG	Infiltration Gallery
IPAM	Implementation Plan for Arsenic Mitigation
IRP	Iron Removal Plant
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
MGDs	Millennium Development Goals
MIS	Management Information System
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
MoP&ME	Ministry of Primary and Mass Education
MoST	Ministry of Science and Technology
MoU	Memorandum of Understanding
MoWR	Ministry of Water Resources
NAMIC	National Arsenic Mitigation Information Center
NAMIP	National Policy for Arsenic Mitigation & Implementation Plan
NFWSS	National Forum for Water Supply and Sanitation
NGO	Non-Government Organization
NPSWSS	National Policy for Safe Water Supply and Sanitation
NSS	National Sanitation Strategy
NWMP	National Water Management Plan
NWP	National Water Policy
O&M	Operation and Maintenance
PPP	Public Private Partnership
PPR	Public Procurement Rules
PPSWSS	Pro-Poor Strategy for Water and Sanitation Sector
Prodoc	Project Document
PRSP	Poverty Reduction Strategy Paper
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
RWSG-SA	Regional Water & Sanitation Group – South Asia of the World Bank
RWS	Rural Water Supply
RWSS	Rural Water Supply and Sanitation
SACOSAN	South Asian Conference on Sanitation
SDF	Sector Development Framework
SDP	Sector Development Plan
SST	Shallow Shrouded Tubewell
SWAp	Sector Wide Approach
TAPP	Technical Assistance Project Proposal
TOR	Terms of Reference
UfW	Unaccounted for Water
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
WC	Working Committee
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 R&D Perspective: Sector Context

In quest of achieving the goal of providing safe water and sanitation for all, the Government has developed and introduced the Sector Development Plan (SDP FY 2011 – FY2025) for the Water Supply and Sanitation (WSS) Sector in Bangladesh. The SDP is now in place and a binding document to provide guidance for comprehensive and consistent development of the sector. The document has all pertinent facets addressing issues related to sector financing, planning, coordination, monitoring and evaluation. Among others, it has precisely identified Research and Development (R&D) as an important "Thematic Front".

It is to be conceded that 'Research and Development (R&D)' bears significant importance for minimizing the prevailing knowledge gaps in Water, Sanitation and Hygiene (WASH)[1] sector. Over the years' different agencies and institutions of the sector conducted researches and studies on social and technological fronts of water and sanitation sector. A number of technologies have been identified to mitigate the chemical and bacteriological problems prevailing in groundwater and surface water. Different studies were conducted to find out low-cost technologies for sanitation. A number of issues were identified based on the outcome of social researches to ensure community participation, gender parity and ensure behavioral change for hygiene promotion. However, the practical application of the research outcome was not ensured desirably in many cases. The issues regarding the cost effectiveness and user acceptability of the newly developed technologies were hardly considered. Often the viability of the research outcome under different geographical context was not addressed. Continuous R&D initiatives are needed for addressing the existing and emerging challenges in the WSS sector, including viable water supply option in salinity affected coastal areas and Faecal Sludge Management (FSM) in both urban and rural areas. Hard to reach areas need extensive R&D to provide appropriate solutions. In Bangladesh climate change impacts pose formidable challenge to the WSS sector. It has the potential to jeopardize our achievements of the past in terms of national coverage. The impacts associated with global warming in the water resource sector demand the development of appropriate coping mechanism.

Even prior to SDP, recognizing the importance of R&D, the Government included it in the various national and regional policies, strategies and other related documents. The National Policy for Safe Water Supply and Sanitation (NPSWSS 1998) recommends "improvement of the existing technologies and conduct of continuous research and development activities to develop new technologies". The Policy further stresses "close linkages between research organizations and extension agents/implementing agencies". R&D also figures prominently in the National Sanitation Strategy (NSS 2005) where it has been considered a strategic element for sustainability of the national sanitation program. The National Policy for Arsenic Mitigation (2004) also emphasizes the need to conduct coordinated R&D to understand "the impact of arsenic on water supply, health, food and agriculture". All these express the

[1] WASH: Water Supply, Sanitation and Hygiene. The abbreviation WSS stands for Water Supply & Sanitation. Where is it mentioned as WASH or WSS sector it is basically conveying the same meaning.

pressing need for continued R&D in WSS sector. However, research activities in the WSS sector in Bangladesh are so far fragmented and limited to only few organizations.

Although policy support for R&D is there and evident from various documents, the ground reality is different. It is evident that there exist a lot of challenges relating to R&D in the WASH sector. There is limitation of fund to undertake researches as well as shortage of personnel with skills in research. Lack of institutional support and dearth of equipment are other limitations. Lack of research fund hinders development of modern research facilities and skilled researchers. Further, effective coordination and proper dissemination do not always take place. In a way, the R&D activities are not well managed in a professional way to take the sector forward, primarily because of insufficient funding.

In this backdrop, now it is the demand of time to create a Dedicated[2] R&D Fund to create opportunities for supporting continued research in WASH sector in a comprehensive manner.

1.2 Initiative from the Policy Support Unit & the Study

The context as elaborated in the preceding section and the expectation to institute a 'Dedicated R&D Fund' necessitates a high level professional input to develop pertinent documents with requisite norms and procedures, which is to be pursued primarily by Policy Support Unit (PSU)[3] and in general by other concerned stakeholders.

Policy Support Unit (PSU) under the Local Government Division (LGD), in line with the understanding as mentioned in the preceding section, entered into an agreement with a Consultant[4] on 30 December 2013 to develop a pertinent document which is expected to facilitate instituting a 'Dedicated R&D Fund for WASH sector'. The primary recipient of this document is the PSU, which will use it for setting dialogue, appraising potential stakeholders and eventually bringing them on board as a contributor, rather a partner, of this particular arrangement to encourage and support necessary R&D in the sector. In addition to PSU, sector organizations and potential researchers will also have the opportunity to use this document.

The overall objective of this assignment was to develop modalities for a Dedicated R&D Fund that will create opportunities for interested researchers and research institutions to carry out R &D activities for WASH Sector.

The envisaged comprehensive modalities for Dedicated R&D Fund will encompass but not limited to the following:

- Explaining scope, opportunities, sources, fund management system, organizational setup and governance mechanism.
- Exploring ways of fund generation, its utilization and accountability.
- Identifying mechanisms for wider participation of stakeholders in fund generation including the private sector.
- Setting a broader outline of R&D activities addressing the emerging issues in WSS sector.

[2] Dedicated: Specialized and designed to be used for one particular purpose. Here it is for research in WASH.
[3] PSU : Earlier, such responsibilities were bestowed upon Unit for Policy Implementation (UPI) which was updated in scope and get-up as PSU.
[4] Sk. Abu Jafar Shamsuddin, PEng., Sector Professional

1.3 Approach and Methodology

1.3.1 Setting up Study Organogram

The pre-eminent task of the assignment was to get a clear perception about the study organogram. Although a lone Consultant is predominantly involved in undertaking the assignment, yet the organizational part of the entire affair was not quite simple. Besides PSU, the Consultant maintained regular contacts and interactions with the members of the 'Working Committee' formed to support the consultant and the 'Technical Support Committee', which is already in place by an administrative order of the Local Government Division (LGD) of the Ministry of Local Government, Rural Development and Cooperatives (MoLGRD&C). The Technical Support Committee is responsible for technical aspects of the sector under the guidance of the National Forum for Water Supply and Sanitation (NFWSS). Apart from that, senior professionals, managers, decision makers, researchers, academicians from a wide range of sector organizations were considered even more important by the Consultant in carrying out the assigned task.

1.3.2 Constituting the Working Committee

In accordance with the proposal from PSU, a 10 member Working Committee (WC) was constituted through an Office Order from LGD of the Ministry of LGRD&C on 12 January 2014. The Committee comprised of experienced sector professionals. The primary responsibility of this committee was to provide technical input through comments, observations and suggestions to the evolving document steered by the Consultant.

1.3.3 Building Database with Secondary Sources of Information

Pertinent documents which have the potential to provide information towards enriching the output of the assignment have been consulted as part of the assignment. Among them the following documents are worth mentioning:

- National Policy for Safe Water Supply and Sanitation (NPSWSS), 1998;
- Environmental Sanitation Campaign, LGD, 2007;
- Sector Development Plan, for Water Supply and Sanitation Sector in Bangladesh, (SDP-2011-25);
- National Cost Sharing Strategy for Water Supply and Sanitation in Bangladesh, 2012;
- National Strategy for Water Supply & Sanitation: Hard to Reach Areas in Bangladesh, 2012;
- National Water Management Plan (NWMP), 2004;
- National Water Act 2013;
- National Sustainable Development Strategy, 2013;
- Bangladesh Climate Change Strategy and Action Plan (BCCSAP), 2009;
- Annual Developments Programmes (ADP) of GoB; and
- Major research undertakings in the recent years.

1.3.4 Methodological Process

The Approach & Methodology are segmented and described as 'broad based' and 'specific front of the assignment' in the following sub-sections.

For effective participation of the members of the Working Committee, the Consultant shared the draft version of his thoughts on the 'Approach & Methodology' to be pursued to carryout the assignment with the Committee. All write-ups were circulated to the members through email for their comments, observations and suggestions prior to the formal meeting. At the very outset, the Terms of Reference (TOR) for this assignment was also communicated to them to facilitate their understanding of the provisions vis-à-vis the proposed Approach & Methodology. Similarly, the draft Work Plan was also shared. All these were done in quest of getting the WC members involved and creating scope to avail their inputs in to this study.

a. Broad Based Approach

The Consultant adopted a broad based approach to smoothly proceed with the tasks. This is briefly described below:

Scoping of the WASH: A kind of 'scoping and surfing' pertaining to R&D was launched primarily focusing on the available secondary sources of information at the outset of the assignment. This effort provided a better understanding of the WASH sector and its operation and also helped assimilation of useful information of the stakeholders particularly the GoB agencies, Development Partners, local and international NGOs, Local Government Institutions, Semi-govt. Authorities, Academics, Research and Training Institutions, and private sector entrepreneurs.

Adopting Full Scale Participatory Process: From the very beginning and during the course of the assignment the Consultant extensively applied the Participatory Process. Beyond the immediate recipient of the services of this assignment, i.e., the Policy Support Unit (PSU), this technique was extended to other stakeholders pertinent to R&D affair. In quest of introducing participatory process it was kept in the centre of thoughts to have the key personnel of the Working Committee and Technical Committee well acquainted with this technique.

Adopting Consultative Process: It is well acknowledged that information from secondary sources is useful but not rich enough to draw conclusions. To supplement the information database, a series of intensive dialogues were initiated and conducted between the Consultant and the 'focal persons' vis-à-vis the senior personnel of respective sector organizations. Sector organizations involved in this process included government and non-government organizations, multi and bi-lateral development partners, academic, research and training institutions.

Analyzing Historical Development: While the Consultant strived to gradually build the information base, in parallel, he applied the simple but robust L-A-W Model of Reviews. This involved taking a close inquisitive look at the historical development of the sector with particular focus on R&D arena, analyzing and then drawing lessons for future potential application. It is true that the various policy and strategy documents of WSS sector in the present time reflect the element of R&D with importance. But it is equally true that requisite funding for continued and comprehensive R&D is not in place. This situation has obvious

adverse implications on other pertinent matters relating to R&D. R&D skills and interests in general, are not of high level and meaningful coordination among organizations are often at low profile.

b. Specific Front of the Assignment

Planning and Design Framework of the Assignment : In order to carry out the assignment smoothly and systematically maintaining a logical sequence, it is essential to have a proper 'Planning and Design Framework'. This has greatly facilitated development of the 'Work Plan and Schedule' conducive to this framework.
Implementation of the Assignment: Then the tasks of carrying out the assignment. At this stage all pertinent matters were set. Clear ideas about processes and the 'Planning and Design Framework' were in place. A detailed work plan emanated within the purview of the above framework was put to implementation. Implementation of the assignment proceeded accordingly and this draft report was prepared for consideration.

1.4 Organization of the Report

The report is comprised of five chapters. It has been a constant effort to contain the report within only a few essential chapters, simple and flowing in a logical sequence.

Chapter-1, Introduction, provides the context, objective and methodology followed to accomplish the assigned task. Chapter-2 provides a kind of surfing exercise over the WASH sector keeping the central thought hovering over R&D activities. This effort strives to pick up significant observations over the WASH affairs, which have undergone a significant transformation. This Chapter also includes lessons drawn pertaining to R&D. Chapter-3 discusses about the challenges to keep R&D moving.

Chapter-4 is in fact the most important one. It is precisely focused around the 'Dedicated Research & Development Fund for WASH sector'. It covers the overall modalities pertaining to R&D Fund. To elaborate a little more, it encompasses: 'Institutional Framework'; 'Process of Building up the Fund'; 'Access to R&D Fund'; 'Dissemination & Documentation'; 'Functional R&D and the PAP'; 'Governance Mechanism'; etc.

Chapter-5 presents overall conclusion. Various standardized formats and references are attached as Annexes to this document.

Chapter 2
Surfing Research & Development Activities

2.1 Development of WASH and the Role of R&D

2.1.1 Historical Development & Scenarios

The Water Supply and Sanitation (WSS) sector, now popularly referred to as Water, Sanitation and Hygiene (WASH), has a well documented history since independence of the country. Concentrating more on Rural Water Supply (RWS) in the earlier planning cycles (1973-78; 1978-80) it later gained gradual importance in Rural Sanitation (RS). There has been a shift in the programme name as well, 'Rural Water Supply and Sanitation (RWSS)' in the successive two planning cycles. The RWS programme could draw attention for its performance not only in Bangladesh but also in the region and beyond.

From late seventies the sector started ensuring people's participation, a soft-ware element, in its initiatives! From early eighties sanitation programmes were getting importance and place in national development programme. In RWSS the technologies were 'suction mode hand-pump' for water supply and 'water-seal pit latrine' for sanitation. The Village Sanitation Division-II (VS-II) of DPHE was dedicated for R&D and capacity building in sanitation front focusing on the development of low-cost sanitation technology. It was VS-II, which pioneered the design of the first version of the water sealed latrine. Of course this earlier version went through a process of further development. Until mid-eighty it was primarily public sector intervention through Department of Public Health Engineering (DPHE) with assistance from UNICEF. Interestingly, pertinent R&D and incorporation of soft-ware elements though very limited were actuated at that time through these public sector programmes. In quest of sustainability, the concept of self-help for operation and maintenance (O&M) of hand-pumps, revolving-fund for sanitation growth, incorporation of health education, etc. were tried out under the purview of R&D. Initiatives, drives and potentials were very much there but resource allocations were insignificant, which was considered as a deterring factor for its (R&D) growth.

The International Water Supply and Sanitation Decade (IWSSD, 1980-90), declared by the United Nations (UN) induced some momentum in WSS sector in Bangladesh like in other developing countries of the world. However, there was no significant increase in investment profile in WSS sector both in rural and urban areas. Limited sector investments kept R&D activities limited to on-going initiatives led by DPHE with assistance from Unicef.

Groundwater table declining phenomenon was first noticed in early eighties when again with technical assistance from Unicef, DPHE through its R&D initiative and pilot intervention came up with first version of TARA[5] pump. Later on, this technology went through many

[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.

phases of improvements with support from other development partners, eg., the RWSG-SA[6] of the World Bank.

Similarly, through public sector initiatives DPHE along with Unicef developed the first versions of Pond Sand Filter (PSF)[7], Shallow Shrouded Tubewell (SST)[8], Very Shallow Shrouded Tubewell (VSST)[9], Iron Removal Plant (IRP)[10], Rainwater Harvesting System (RHS), Twin Pit Latrine, etc. Although such studies started in early eighties, these were considered as a continued process of innovations and many other stakeholders came up with their programmes for further development. Resource constraints were always a prime concern. In sanitation arena, the Village Sanitation Programme through Village Sanitation Centres had a good impact to communicate the message through demonstration.

The demonstration effect of public sector programme played a crucial role, which the private sector picked up well particularly in RWS. The nation and the world witnessed the sparkling growth of RWS in this country.

2.1.2 Sector Organizations & their Role

Until 1990, large scale programmes were basically those of DPHE-Unicef, where Danida and SDC had a strong participation, but in an indirect way. Both Danida and SDC contributed in RWSS programme through Unicef. However, gradually an increased number of stakeholders joined hand in such activities, which could be put under study and research perspective. In Urban Water Supply and Sanitation (UWSS) front, Dutch Aided, ADB Aided and JICA Aided programmes started their activities in the decade of '80s. These programmes entailed studies and reviews in support of their respective initiatives. WHO's presence in the form of technical assistance was there in the sector since early seventies. In common terms such activities could be viewed as R&D in a very limited scale.

The following sections describe the significant roles played by different the stakeholders. For clarity they are clustered as: 'Public and Semi-autonomous Sector'; 'Academic and Research Institutions'; 'NGO Sector' and 'Bilateral and Multilateral Development Partners and UN Agencies'.

a. Public and Semi-autonomous Sector:

DPHE, Dhaka WASA, Chittagong WASA are mandated institutions in the public and semi-autonomous sectors for the implementation of the WSS programmes.

Government Agencies: National Policy of Safe Drinking Water and Sanitation 1998 recognizes DPHE as the key implementing agency. This government department is under the Ministry of Local Government and Rural Development and cooperatives. Earlier, with project

[6] RWSG-SA: Earlier known as 'Regional Water and Sanitation Group – South Asia' which later on changed to WSP of the World Bank.
[7] 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.
[8] 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.
[9] 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.
[10] IRP: It's an innovative design of removing iron from iron-reach-groundwater in rural context. The system was first initiated in mid-eighties with aeration, sedimentation and filtration components fitted with a hand-pump.

support it had its own R&D wing which is not in existence now. Water and Sewerage Authorities (WASAs) in Dhaka, Chittagong, Khulna and Rajshahi provide WSS services in the metropolitan areas of these cities. WASAs are semi-autonomous bodies with management entrusted to the boards and report directly to MoLRD&C. Dhaka WASA has charge of water supply, surface drainage and sewerage. Chittagong, Khulna and Rajshahi WASAs in absence of sewerage only deal with water supply.

The research activities of DPHE were vested with its R&D section, which was functioning with project support for quite a good number of years. With development partners like Unicef, Danida, World Bank and JICA it was involved in research and innovations in technological as well as social issues. DPHE has been conducting Research and Development activities to improve existing technologies, develop cost effective alternative technological options (including PSF and RWHS) to provide water in the problematic areas. Since mid eighties, DPHE has been monitoring the fluctuations of groundwater table using a measuring network having one tube well in each union of the country. DPHE also conducted research to develop technology to cope up with declining water table.

In Coastal Saline Areas (CSA) the major problem encountered in tube well was salinity of excess in concentration. Besides this, in some places no suitable aquifer was available. In the early nineties, a detailed hydro-geological map of the CSA was prepared showing different problem areas.

It is to be conceded that through a long and continued process of studies with support from various technical assistance and development projects DPHE could generate an important information base pertaining to R&D. All these could fairly be clustered into broad areas of issues:

a) Issues of Declining Water Table;
b) Issues of Water Quality Problem primarily in the coastal region;
c) Issues of the Absence of Suitable Water Bearing Formation; and
d) Issues of Arsenic Contamination of shallow aquifer.

In order to address the issues from the implications of the above phenomena continued efforts and activities were undertaken. Some of these are important and mentioned below.

<u>Declining Water Table Problem</u>:

- Water table monitoring.
- Identification of the implication of declining water table.
- Development of TARA Pump.
- Introduction of Mini TARA[11] & Extended Piston in 1.5 inch dia.
- Development of TARA- II and 'TARA DEV'[12] Hand Pump.
- Conversion of 'Indigenous DSP'[13] into TARA.

<u>Water Quality including Arsenic Contamination:</u>

- Water quality mapping.
- Coastal map updating.
- Exploratory drillings in the Saline Problem Areas.
- Exploratory drillings to locate Iron Free (<5ppm) aquifer.
- Exploratory drillings in arsenic affected areas.

[11] Mini TARA: It is essentially a TARA pump with its mini-size deep-set pumping elements fitted in an existing 'Shallow Hand Tubewells' which become non-functional due to declining water table.
[12] TARA DEV: It is a hybrid kind of handpump with TARA and AFRI DEV pump elements
[13] Indigenous DSP: These are locally developed pumps based on deep-set force-mode principle.

- Rain Water Harvesting System
- Development of PSF
- Development of SST
- Monitoring of VSST
- Modification and improvement of IRP
- Piloting ARU
- Study on removal of hardness from groundwater
- Study on groundwater pollution from pit latrine.

Absence of Suitable Water Bearing Formation:

- Stony layer penetration.
- Geo-electrical investigation in the Chittagong Hill Tract Areas.
- Development of Spring.
- Development of Ring Well (RW)[14].
- Study on Infiltration Gallery (IG).

By and large, all these activities greatly contributed to generation of knowledge, although in real sense these activities did not follow strict research protocols. WASH interventions through development programmes have been significantly benefited from all these research oriented activities. However, quality documentation and publications from these activities are rather few.

Local Government Engineering Department (LGED) has the mandate of infrastructure development of local government bodies in urban and rural areas. The department implements limited WSS activities as components of infrastructure projects. Under its secondary towns' infrastructure development projects, LGED carried out the drainage, sanitation, WS and SWM development in its working area. LGED also tried out new innovation in mid nineties by combining 'small bore sewerage system' with 'biogas plant' and looking for a possible solution of sanitation for the slum dwellers.

Semi-Government Bodies: Dhaka WASA and Chittagong WASA do not have any R&D section or significant level of coordination and linkage with R&D activities of other agencies. The WASA in the recent decades facing the challenge related to its obsolete drainage. The ever increasing demand with the rapid urbanization encompasses formidable challenge to the water supply, sanitation and drainage services. Alternative sustainable mechanism need to be developed for coping with the present situation of water and drainage as the impact of climate change (specially with intense rainfall or GW lowering) add additional stress to the present system. The BCCSAP emphasize on the improvement of urban drainage system under the pillar of research and knowledge development as a part of adaptation.

Local Government Bodies: City Corporations (CCs) in the 11 major cities have the responsibility of SWM. The 'Dhaka North City Corporation (DNCC)' & 'Dhaka South City Corporation (DSCC)' and nine other CCs are in charge of SWM, surface drainage and implementation of on-site sanitation. Likewise, such responsibilities are bestowed upon respective pourashavas[15] in the country. None of these organizations have R&D oriented activity.

BCSIR under the Ministry of Science and Technology carry out research on arsenic mitigation technologies. Earlier, its research division was renovated and strengthened with the financial

[14] RW: Ring Well. It's an innovative technique first introduced in late seventies to draw water available at a depth beyond 25 feet. The elements of the system are: lined perforated dug well, fitted with indigenous deep-set force mode hand-pump.
[15] Pourashava: It's a Bangla word for municipality

assistance of Bangladesh Arsenic Mitigation and Water Supply Project (BAMWSP) of DPHE. Analytical research division with developed laboratory facilities was created at BCSIR. Its involvement with WASH related researches is not visible.

b. Academic and Research Institutions

Budget earmarked for R&D in the public universities is very limited compared to the present need. Several public universities around the country have the opportunity to carry out technical research on WSS through Environmental Science or Engineering Department. Usually, the researches or studies are conducted under post graduation programme or through research and consultancy wing in collaboration with national, regional or global institutions.

ITN Centre, BUET (ITN-BUET) was established at BUET and is working for building capacity of the sector. In line with this aspiration, research is considered to be an important agenda of ITN Centre. ITN-BUET with its own funding or in collaboration conducted researches on both social and technological issues. The major sociological research area include: community participation, development of effective communication material, socio-economic and gender response to WASH challenges, and institutional arrangement of WASH.

ITN-BUET also conducted pure technological researches. The major areas include development of community based arsenic, manganese and iron treatment technologies; It carried out researches to enhance the performance of alternative technologies like PSF and RWHS and the surface water treatment technologies. ITN-BUET also considers the water conservation aspect in its research agenda through the utilization of industrial waste water and using water saving appliances. The major researches on the sanitation sector include exploring suitable options for low-lying areas, evaluation of ecological sanitation options, faecal sludge management (FSM), etc. ITN-BUET has also conducted several water quality surveillances in the interventions areas of the national NGOs around the country.

In collaboration with international researchers ITN-BUET carried out multidisciplinary researches in the sector to address the issue of technology choice in areas suffering from arsenic menace. The concept of Risk Assessment in the perspective of Disability Adjusted Life Years (DALY) associated with each type of potential technologies in WS has been applied for the first time in this region. The research is well known as Risk Assessment of Arsenic Mitigation Option (RAAMO). The development and application of 'Quantitative Health Risk Assessment (QHRA') model is also considered as a high quality research output.

In another collaborative study, the achievement was quite interesting and useful particularly for WATSAN services in urban slums. ITN-BUET in collaboration with Tilburg University, Netherlands; University of Barcelona, Spain; and Tribhuban University of Nepal, undertook field research in Bangladesh and Nepal to find out the process of enhancing the local participation for sustainable WATSAN services in urban slums.

Quality documentation and publications of research outputs are important activities of its research front. A good number of research findings have been published and widely disseminated.

The resource pool of ITN-BUET and its close linkage with the Environmental Engineering Division of Civil Engineering Department of BUET has increased its research potential

immensely. The potential areas of research skill, interest and research management at ITN-BUET can be summarized as below:

- Environmental sanitation
- Surface water pollution Management
- Environmental Impact Assessment
- Environmental management system
- Low cost water treatment
- Low cost sanitation
- Urban storm drainage
- Solid Waste Management
- Faecal Sludge Management
- Environmental Pollution Control
- Water quality modeling
- Arsenic contamination of groundwater
- Heavy metal contamination of soil and food products
- Wastewater treatment and sludge management
- Environmental hydraulics
- Computational fluid dynamics
- Water and sewage treatment
- Environmental aspect of river improvements
- Aquatic Chemistry
- Fate and transport of chemicals in surface and subsurface waters
- Hazardous waste site remediation
- Water and industrial waste treatment
- Climate Change impacts on WASH and possible adaptation
- Climate change and water environment
- Alternate water resources in urban and rural areas of developing countries
- Groundwater pollution and Recharge
- Risk assessment of arsenic and other carcinogenic elements present in groundwater
- Water treatment for removal of Manganese and other heavy metals
- Ecology and environment
- Epidemiology in WASH perspective
- Groundwater hydrology
- GIS Application in Environmental Engineering
- Environmental remediation technologies
- Metal Fate and Transport Modeling
- NAPL[16] Contamination in Sub-Surface

The prime issue in the research front of ITN-BUET is the required financing. Excepting a few, so far, it was only possible to undertake small researches with a very limited scope. It has its Research Committee with back up support of pre-set research protocol and Quality Assurance (QA) System.

[16] NAPL: Non-Aqueous Phase Liquids

Collaborative Research Projects involving national and international academic and research institutions can produce striking outcomes specifically in complicated areas where advanced equipment is needed. There are examples in the field of arsenic research. The BUET-MIT research team was successful in making a breakthrough by identifying the cause of arsenic contamination. The team received the "Prince Sultan Bin Abdul Aziz Prize for Water, 2011-12" for solving the puzzle of arsenic contamination. BUET's extended collaboration with other universities published many papers including three in 'Science'. Similarly, Geology Department of Dhaka University in collaboration with University College London; Columbia University, USA; and other research institutions, generated a lot of knowledge and published many papers including one in the renowned journal, 'Nature'. The Bangladesh-Australia Centre for Environmental Research and University of Dhaka (BACER-DU) has been conducting research on the transfer of arsenic in the water-soil-plant continuum since 1998. Jahangir Nagar University, Rajshahi University and BCSIR in collaboration with foreign universities and organizations contributed much in the field of arsenic contamination. The 'Institute of Disaster Management and Vulnerability Studies (IDMVS) of Dhaka University' is carrying out studies for sustainability of WASH services focusing on gender and social aspects.

c. NGO Sector:

At present the NGOs are playing a significant role in the sector in both rural and urban areas. The foreign and local development partners facilitate the NGOs with the necessary financial assistance. The national NGOs and the INGOs have their own cell for R&D; they conduct study on development of appropriate and locally adaptable treatment technologies for water supply for the removal of chemical hazards (mainly arsenic and iron) down to nationally acceptable standards. They also carry out technological and social impact assessment in their working areas to ensure the effectiveness of their programmes.

National NGOs: In the NGO sector, a handful of NGOs, namely NGO Forum, BRAC, Dushtha Shasthya Kendra (DSK), VERC have been involved in both the technological and socio-economic aspects of R&D in the WASH sector for a relatively longer period of time.

NGO Forum (NGOF) for Public Health is one of the leading NGOs in the sector. Through studies NGOF carry out the effectiveness of its different programmes and it also finds out directions towards reformation of the programmes and development of new ideas and issues. Over the years NGOF conducted study on understanding communication and behavioral change in hygiene, sanitation and water.

NGOF carries out the environmental screening and impact assessment of the installed WS hardware in their programme interventions. It also performed study on the reuse of human excreta in Bangladesh. Action Research on mitigation of health & social consequences of groundwater arsenic poisoning in Bangladesh has also been its prioritized area for research.

Research capability of NGOF is increased much with the establishment of its own Environmental Laboratory. Partner NGOs are also getting services of laboratory investigations from this facility.

DSK's R&D programme focuses on innovative action research that aims to benefit poor communities both in rural and urban areas. DSK conducted research for the development of community based mini piped water supply system and sanitation options for slums over

water bodies and in low-lying areas. DSK conducted water surveillance in its programme interventions to find out community based WQ monitoring.

BRAC's R&D activities in the WASH sector are supported by its Research and Evaluation Division (RED) in the context of its ongoing Water Sanitation and Hygiene (WASH) programme, funded by the Embassy of the Netherlands, and the 'Essential Health Care Programme', which was designed to assist the Government in achieving the Millennium Development Goals.

Village Education Resource Centre (VERC) was established in 1977. It has played a pioneering role in developing the Community Led Total Sanitation (CLTS) model. This model is widely accepted and therefore being replicated in the country and beyond. Development and promotion of low-cost plastic pan was an important addition of VERC's R&D activity.

The International NGOs: INGOs are carrying out innovative programmes through their partner organizations (POs). WaterAid Bangladesh (WAB), Plan Bangladesh, Care Bangladesh are major INGOs working both in the rural and urban areas of Bangladesh.

WaterAid Bangladesh is a leading organization that enables the world's poorest people to gain access to safe water, sanitation and hygiene education. It is working with 21 partner NGOs around the country. Water Aid Bangladesh is engaged in piloting research activities, such as citizens' actions, and community-led water and sanitation, budget performance monitoring and formulation that aim to ensure poor people's participation in decision-making processes, etc.

Plan Bangladesh undertake evaluation programme for the assessment of performance on sociological and technological context in its programme Intervention. The organization is also piloting water safety plans around the country.

OCETA implemented the Bangladesh Environmental Technology Verification Support for Arsenic Mitigation (BETV-SAM) Project in close partnership with BCSIR and DPHE. The main activities include field inspection, verifying and monitoring the performance of arsenic removal technologies and developing and implementing WSPs for each arsenic technology.

Oxfam promoted solar power in PSF which is acceptable by the community and the demand is on the increase. Faecal sludge management during disaster situation was on Oxfam's R&D agenda.

d. Bilateral and Multilateral Development Partners and UN Agencies:

The international development partners notably WHO, Unicef, WB-WSP, DFID, UNDP, ADB, JICA have supported research oriented development. These partners have acted as advisors, stimulators, watchdogs, colleagues and evaluators. Their insights have helped in the past to undertake research on technological development, gender dimension, community participation, health promotion and hygiene education, etc.; several studies were also carried out to assess the effectiveness of the programme interventions.

When the problem of the declining water table began to emerge, DPHE with assistance from Unicef and WB addressed the challenge to extract water from below the suction level through the development of new technology. Unicef and Danida in collaboration of DPHE

facilitated to explore mitigation options of Arsenic contamination (SIDKO[17], IRPs etc) in groundwater in the affected areas. WHO Bangladesh, in partnership with the government, is continuously supporting promotion and scaling-up of 'Water Safety Plans (WSP)' in Bangladesh. In the past DFID UK through Arsenic Policy Support Unit (APSU[18]) conducted a number of studies in association with local organizations (ITN-BUET, DPHE) to undertake social and technological researches and studies on the arsenic removal technologies and water safety plans. Since the late nineties WSP-SA of WB focused on research activities on documentation of lessons on private sector in WSS, credit mechanism in WSS and innovative pilots on SWM, WS for urban poor.

All these support to research works are basically project based, where the concerned development partners are providing assistance. Outside the project framework there is no continuity of such activities. At the same time, there is no effective coordination and harmonization of R&D among the various stakeholders.

2.2 Emergence of R&D Thematic Front

2.2.1 SDP and the Thematic Concept

The SDP (2011-25) for WASH sector developed and endorsed by the Government of Bangladesh is now the path way for the sector to grow, move and eventually reach its goal. It is now a binding document for the stakeholders. The beauty of this document is in its implementation approach itself. Sector activities have been clustered based on thematic considerations. The idea is that polarization of professionals and institutions could now be possible for effective contribution on a particular thematic area.

In line with the above perception altogether 11 Thematic Fronts have been identified. These are as follows:

i. Surface Water Resource Management;
ii. Groundwater Resource Management;
iii. Water Quality;
iv. Arsenic Mitigation;
v. Water Safety Plan;
vi. Hygiene Promotion;
vii. Vulnerable Groups;
viii. Public-Private Partnership (PPP);
ix. Environment, Climate Change and Disaster Management;
x. Chittagong Hill Tracts (CHT); and
xi. Research and Development (R&D).

The first five themes are specific to water resources and water quality and the following five are cross-cutting, while CHT is considered as a separate theme because of its unique administrative, social and cultural characteristics.

[17] SIDKO Plant: It's an Arsenic Removal Plant for small scale water treatment suitable for rural and sub-urban communities.

[18] APSU: It stands for Arsenic Policy Support Unit. At the advent of arsenic menace in the country APSU played a significant role in this arena. With the emergence of Policy Support Unit (PSU) with a broader scope and responsibilities the activities of APSU automatically came under the purview of PSU.

2.2.2 R&D Thematic Front

Section 2.1 discussed various studies and research initiatives which are by and large have not been carried out through a programmatic approach, rather project based and in a discrete fashion. These were implemented sporadically by individual initiative and obviously were not consistent and cohesive. These could at best serve a lone ongoing project intervention for a brief span of time. Proper documentation was rather ignored let alone poor dissemination strategies. This particular issue has been clearly identified while carrying out the SDP exercise since 2005.

The SDP identifies R&D as a distinct thematic front. The scope of R&D entails all the thematic areas. All other thematic areas may receive services from the R&D Thematic Front in the form of study, reviews, action research or applied research.

2.2.3 Focal Institution of R&D Thematic Front

Conceptual understanding is that all the sector institutions involved with R&D, be it implementing organization, funding agency, academic institution providing intellectual input, research organization, development partner, NGO etc., may be the member of the Thematic Group. While there could be a good numbers of members a few could be in the core team. For operational purpose and to provide guidance the SDP has also identified the Focal Institution, ITN-BUET, for R&D Thematic Group which will lead the group as its chairperson.

Although SDP has identified the focal institution through its own exercise during its preparation, the consultant engaged for this particular assignment after the surfing exercise as covered in this Chapter formulated a set of criteria for selection of R&D Focal Institution.

Criteria for Selection of R&D Focal Institution

- Institution already engaged in R&D activities in WASH Sector and has over 10 years of such experiences;
- Undertake Research Publications;
- Mobilize, manage and utilize research fund;
- Establish linkage and working relations with sector organizations on WASH Capacity Building including R&D;
- Undertake study and performance evaluations of programs and projects in WASH sector;
- Undertake Research Needs Assessment (RNA) on a routine basis;
- Linkage with global Resource Centres, Institutions and undertake Collaborative Research under Link Programme;
- Mainstream technological innovations in undergraduate course curricula through curricula reorientation programme;
- Widen research spectrum from technological aspects to social, institutional, financial aspects;
- Maintain a resource pool well equipped with technical, social, institutional, financial, gender affairs of WASH arena entailing academicians and sector professionals;

- Organize technical sessions on a regular basis to share experiences, innovations, studies and reviews;
- Emphasize Action Research alongside Applied Research on WASH disciplines; and
- Facilitate undertaking researches by Postgraduate level students.

The fresh assessment by applying the above set of criteria reaffirms the status of ITN-BUET as the Focal Institution of the R&D Thematic Group. In fact, the institution is already actively providing such services and the R&D Thematic Group is having meetings and interactions relating to its agenda.

2.3 Lessons Learned

While undertaking a surfing on R&D activities in WASH sector a number of lessons have been learnt. These are particularly important for future course of action pertaining to strengthening of overall R&D affair. It has been observed that while there are issues, there are potentials as well. Such lessons are clustered under three broad categories, viz, 'Institutional and Management', 'Dissemination and Mainstreaming', and 'Financing R&D' which are further elaborated in the following sections.

2.3.1 Institution and Management: Issues & Potentials

a. Issues:

Capacity Building for Research Undertakings: The capacity of the personnel in the sector institutions needs to be strengthened over the areas of research techniques, methodologies and research management. The present situation indicates that most of the sector organizations do not have independent research cell with competent professionals. The professionals are often outsourced during research undertakings. Most of the agencies (with few exceptions like DPHE, WASA, NGO Forum) do not have their own lab facilities to conduct technical investigations of different WSS parameters. Even if such facilities exist, it is not well equipped or the number of personnel with pertinent expertise is not adequate. The participation in the research oriented capacity building programmes of the staffs involved in R&D including the lab personnel is not adequate; it is evident from the yearly plan/accomplishments of the leading institutions involved in capacity strengthening in the sector.

Coordination among the Sector Agencies: Coordination among sector institutions in R&D affair is not evident. Organizations involved in these activities have their own independent agenda. This is not only necessary to avoid overlapping but also to allow deployment of precious resources and skills for prioritized research areas. The present experience suggests that the sector agencies lack an independent body which could play the coordination role among the stakeholders.

Inadequate Response to Sector Demand: The demand of the sector is ever changing and new issues are emerging which deserve more attention. However, the contemporary WASH issues remain practically unaddressed in most cases. Although there is a pressing need from the sector to overcome these emerging issues there is no comprehensive prioritized list of researches let alone actually undertaking the researches. This scenario can at best be

concluded as 'inadequate response to sector demand'. More ideas and experience sharing is required among the sector stakeholders to explore new area of research.

Data management: There is a lack of reliable data on the accomplished researches, studies and screening conducted countrywide by different sector organizations. Thus data management and its availability issue have been proved essential for primary information in the future researches.

a. Potentials:

National policy support is evident. The Sector Development Plan (SDP) is in place and is a binding document. Conducive strategies are being formulated. The Thematic Concept of SDP implementation establishes the much required R&D Thematic Front. The WASH sector has now R&D Thematic Group and its Focal Institution. In institutional perspective, it is now streamlined. Linkages with PSU and higher authority in an institutional framework concerning R&D will now be much clear and straight forward.

Under this arrangement Research Needs Assessment (RNA) in the context of prevailing challenges will now be a regular event. Prioritized research areas will be identified in a well coordinated fashion. Research undertakings will be managed in a structured manner which in parallel will facilitate overall capacity building in research management. Duplication and overlapping can now be avoided and precious resources and efforts could be deployed judiciously. Well coordinated and transparent Work Plan could now be prepared and followed for WASH sector.

2.3.2 Dissemination and Mainstreaming: Issues & Potentials

b. Issues:

Inadequate Documentation: A properly documented research could be a pertinent source of information and it also facilitates to explore the new areas of research. However the present practice in the sector suggests that the accomplished researches often not documented properly. Although some organizations conduct a number of researches yearly, but outcomes in the form of publication remain unavailable or inaccessible.

Assessment of the Effectiveness of the Present Research Outcome: Although different agencies of the sector conducted researches and studies on alternative WSS options and treatment technologies, however their effectiveness, user acceptability issues have not addressed properly. The sector agencies installed newly developed hardware options, which with the course of time have become non functional. Limited studies have been conducted over the sustainability issue in the interventions.

b. Potentials:

With new institutional arrangement the WASH sector has now R&D Thematic Group and its Focal Institution. It is expected that there will be more R&D activities under a well coordinated Work Plan.

The Work Plan pertaining to R&D will now entail among others the item of documentation, publication and dissemination of the accomplished researches. This effort could be used as

reference for the future researchers intending to work on the related issue or exploring the scope of extended research over the same domain. The above mentioned institutional arrangement and its coordinating body, i.e., PSU could ensure its compliance.

Such dissemination, which in a way will be wider in scale, will have great potential to facilitate mainstreaming the research outcomes in on-going and future WASH programmes of sector stakeholders.

2.3.3 Financing R&D: Issues and Potentials

c. Issues:

Inadequate budget provision for R&D: The present budgetary provision in R&D is inadequate for the sector agencies and the allocated fund is often not properly utilized. Sometimes it becomes impossible to adopt the appropriate approach and methodology due to improper allocation. Needs based research in terms of numbers and topics are quite often not possible to accommodate. Right kind of documentation, publication and dissemination of the accomplished research works obviously remain as an issue. Mobilizations of research arrangement and intellectual inputs have been found to be a significant problem. The consequence is that the expected outcome remains under achieved.

c. Potentials:

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.

The Sector Development Plan has a candid recommendation for creating a dedicated R&D Fund to facilitate the required activities in this front. The R&D Thematic front has been instituted and necessary institutional linkages and framework is now streamlined with PSU in coordination role.

A simple exercise will try to visualize the dormant potential of the WASH sector to finance required R&D. Although ADPs constitute investments from Public Sector, Private Sector and NGO, by and large at present time Public Sector Investments outweighs the other two.

Logically, all the three categories are supposed to get research benefit and hence need to finance. But for clarity alone, 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 2.1 shows investment costs at different scenarios. Scenario 2 has been considered for using in planning purpose. Table 2.2 shows the contributions of sector partners to total investment cost.

Table 2.1 Total investment costs at different scenarios

(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)

All these figures give a message that there are enough resources for R&D's purpose. **One-tenth of 1%** of such provisions are much more than what R&D would require. For example, Scenario 2 in its mid-term (FY 2016-20) could potentially support R&D of about Tk. 10 crores per year.

Only public sector provisions for the same time frame could potentially support R&D of about Tk. 8.5 croes per year. The simple notion is that at this stage for R&D purposes, the amount of money to this extent would not be required. The point which is clear is that resource should not be a problem.

Table 2.2 Contribution of sector partners to total investment cost in BDT million

Sources of Fund	FY 2011-15	FY 2016-20	FY 2021-25
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)

Then, there remains further scope to mobilize fund if it is really needed and meaningful R&D can be carried out. There are development partners who may be willing to contribute and participate in this type of initiative.

Chapter 3
Challenges in Keeping R&D Moving

3.1 Conducive Environment for Active R&D

3.1.1 Good Researchers & Research Institutions

During the course of discussions the members of the working committee opined that, excepting a very few, virtually there are no research institutions dedicated to WASH arena in the country. Similarly, there is a dearth of researchers interested in undertaking such effort. Of course, there are multiple reasons for such a situation. Very poor research budget, inadequate scope, facilities, incentives and comfort are the prime reasons for the mediocre R&D scenario in the sector. The overall environment is not suitable and attractive to get researchers interested. The consequence is that good research initiatives are scarce.

Sector wide scenario is such that there is no representative institution mandated for managing and guiding a well coordinated research programme in WASH let alone its financing. The preeminent task is to have an institutional framework with clear mandate and terms of reference. The administrative and top supervisory function need to be vested on an institution suitable for maintaining liaison with the line ministry. On the other hand actual research operation is to be guided by a well reputed institution as the R&D Focal Institution.

From an institutional perspective, there needs to be a broad based programmatic approach in total R&D affair in the sector. The process should be transparent. The programme needs to be designed, planned and implemented in a coordinated fashion rather than as currently practiced by individual institutions. This practice will greatly facilitate building ownership and inculcate a sense of belongingness. Sector R&D needs to be steered from a common platform owned by the sector.

It is acknowledged that there are potential good researchers/institutions and they have the ability to deliver, but for which conducive environment is to be created. An arrangement and setting, as outlined above, is expected to provide such a conducive environment. In this context potential research institutions also need to be supported, strengthened and facilitated to get established as dynamic and vibrant institutions.

3.1.2 Need-based Research & Application of R&D Findings

Need-based research and application of research findings need to be emphasized for their impact on the prime objective of R&D, i.e., sustainable development of the WASH sector. This point was echoed by almost all the members of the Working Committee during the course of the discussions. There are emerging issues in the sector and there are specific needs in the ongoing programmes sponsored by GOB and Development Partners for which R&D initiatives are urgently needed. This scenario necessitates identification of research priorities. At any point of time there should be a live list of such research priorities to encourage and initiate new research activities in the sector. This particular task should have

a continuity to remain updated. All these researches should have linkages with the academic as well as implementing agencies. It is the implementing agencies which play the important role and help actual application of the findings. On the other side, it is the academic and research institutions which documents the knowledge base in an appropriate manner. Research outcomes also have the potential of influencing policies and strategies for continued improvement of the WASH sector.

It is the responsibility of the R&D Focal Institution to organize routine discussions, e.g., in the form of workshops with its Thematic Group members for setting appropriate agenda and pursue it. One of the prime agenda on such discussion is to analyze the emerging sector issues and ponder about overcoming those. This could lead to the development of a long list of research topics which are important, as well as prioritized list of research topics.

Application of research outcomes and findings is important from a number of reasons. A few simple questions in fact may provide the required understanding and answer. Why a particular research will be included in the work plan? Why it will be financed by the programme or by a partner institution. Can the expected outcome be mainstreamed to an on-going or future WASH project or programme? Are there enough research initiatives undertaken around this topic? Does it possess the potential to bring out an innovation? Has it got the potential to answer unaddressed questions? Is it a collaborative research fulfilling the aspiration of important institutions? Is it linked to a post graduate study? Has it got the potential to add to knowledge base? Does it posses the potential to generate evidences that could positively influence policies and strategies? Considering all these questions the research management will ensure application of the research findings.

3.1.3 Ensuring Smooth Implementation of R&D

During the course of the discussions with WC and others it was very strongly viewed that R&D is to be seen quite differently from traditional investment programmes. The very nature of the activity is to a great extent different and has specialties in its concept and operation. It has rather low importance in commercial perspective as opposed to its very high importance in contributing to the knowledge base and overcoming emerging challenges in WASH. In this backdrop WC members suggested that R&D financing and R&D activities are to be kept outside the purview of PPR. Experience tells that researchers are usually uncomfortable in financial bidding type of process particularly for research activities where they need to devote full concentration. However, assessment of quality proposal is always appreciated much therefore, there needs to be a mechanism where screening, quality assessment and the importance of a research in respect to its potential to the enrichment of knowledge base will be ensured.

It is well accepted that most of the activities in a research are by and large of academic in nature. It starts from conceptualization to preparation of a proposal following a pre-set format and guidelines. After assessment and positive response from the funding authority the research starts. It usually entails data collection and analysis, conducting laboratory/field experiments, collating and drawing conclusions, sharing the findings in quest of getting feed-back. If necessary, the researcher goes for changing the course of the research process. Workshops, seminars are often necessary to disseminate research output and clarify critical points. Then comes report writing and article/paper writing for praiseworthy publication. All these activity are far away from that of a commercial venture. Enriching knowledge of academic essence needs appreciation and patronization as well.

In this context, a number of relevant documents, e.g., 'Climate Change Trust Fund'; CEGIS Deed of Trust; ITN-BUET Trust Fund; HYSAWA Company; 'IWM Trust' have been reviewed to draw lessons which could be useful for instituting the proposed 'Dedicated R&D Fund'. But all these are in contrast with what SDP expects as a dedicated fund for R&D in WASH sector. All these organizations are of different nature and perspective. The purpose of 'R&D Fund' for WSAH sector is very specific; in fact, R&D is ongoing in the WASH sector under project support as an activity. Many sector organizations are having R&Ds under their programme. But these are carried out in a discrete and uncoordinated fashion causing overlapping or leaving important issues unaddressed. There is no coordination and harmonization in these initiatives. What SDP wants is to streamline the research management institutionally using the available funds in an efficient, pragmatic and useful manner for better return and smooth functioning of R&D. All that is now required is to take initiatives for mobilization of the available resources and putting them in a well planned and need based R&D programme. However, there is no need to create a new organization for this purpose. The Policy Support Unit (PSU) under the Ministry of LGRD&C with its current port folios is well suited to undertake this responsibility.

As a part of this assignment Ministry of Science & Technology's (MoST) support for programmes under special allocation for science and technology have been studied and reviewed. Offering fellowship and financial support for the development of science and technology are in no way following the stringent procedure of PPR. Moreover, its scope extends over the horizon of all the subject areas of science and technology disciplines. This is quite open and broad. In sharp contrast, the proposed 'dedicated R&D Fund for WASH' is very precisely for pinpointed area of WASH sector. If it is not done, the WASH sector will suffer and the emerging challenges will remain virtually unaddressed.

While it is essential that transparency is built-in in the management of R&D and its financing, it is also important that enough flexibility is there so as to facilitate undertaking research smoothly. Adherence to elaborate audit requirements may slow down and adversely affect the research undertakings. Members of the Working Committee opined that traditional project audit exercise will adversely affect the smooth undertaking of R&D.

3.2 Mechanism for Continued Financing of R&D

The general perception in the WATSAN sector is that, there will be budget cuts both in GOB and Development Partners' fronts. In this scenario, it may not be a sound proposition to foresee a healthy fund-build-up for R&D activities. Some of the WC members pointed out that there may be issues for investment funding but not for R&D and software related activities. The important aspect is that, appropriate rationale is to be put forward to convince the potential contributors of R&D fund.

Another argument was made, that quite often most organizations do not feel comfortable to put their resources elsewhere under different management control. While all these are quite valid arguments, WC members were also optimistic about a reverse scenario if and when a win-win situation is established. From the perspective of potential funding organizations, recognition of their contributions and also beneficial impact of R&D outcomes to their sponsored programmes, are seen as critical considerations.

When the process of instituting the Dedicated R&D Fund will be communicated to the sector stakeholders and potential partners in a formal way, a lot of their questions will

automatically be answered. A frequent communication and appraisal from PSU to all such potential partners will logically convince them to take active part in this important sector initiative.

To keep R&D moving, the prime issue, i.e., financing is to be ensured in a continuous way. A mechanism is to be set in motion which will demand a Dedicated R&D Fund for WASH.

3.2.1 Dedicated R&D Fund for WASH

It is a challenge to have a dedicated fund absolutely for R&D in WASH sector. The surfing exercise as described in Chapter-2 has identified financing issue as the prime cause for poor R&D activities in the sector although earlier decades showed credit worthy innovations and technological achievements. It means that it is possible to mobilize potential intellectual input and through appropriate institutional arrangement research management can be done efficiently. Now it is financing, the critical element, which deter the R&D moving. However, the surfing exercise in Chapter-2 confidently showed the potential the sector has in mobilizing required financial resources to keep R&D moving to address emerging technological and other pertinent issues.

It is evident that the envisaged dedicated fund can be built up easily with resources already available in the sector. It will not require withdrawing resources from other sectors or direct investment choices. It will require streamlining the uncoordinated R&D activities and associated spending. In fact, a tiny amount of money, to a maximum extent of one-tenth of 1% of public sector outlay, can help constitute the fund, the 'Dedicated R&D Fund'. The next chapter (Chapter 4), takes up the process of building up the fund, managing the fund, utilizing the fund, etc. for a continued, dynamic, and participatory R&D programme for the WASH sector.

3.2.2 Rationale for Dedicated R&D Fund

The SDP has suggested establishment of a Dedicated R&D Fund for WASH sector. Although no argument has been put forward against the concept, yet it is worthwhile to bring up the following points as rationale, to be fair and justified.

Promoting Coordination and Harmonization: From the surfing exercise presented in Chapter-2, 'poor coordination and harmonization' of R&D activities are evident. With the dedicated R&D Fund equipped with appropriate modalities and institutional framework, it is expected that required coordination and harmonization of R&D activities will be promoted to a great extent.

Facilitating Resource Mobilization: When the 'Dedicated R&D Fund' will be established, resource mobilization through pre-set protocol will be facilitated. Partner organizations will join the initiative for a better outcome of their participation in the sector. Therefore, it is expected that misuse of resources for the improper R&D activities will be minimized.

Supporting Optimum Utilization of Resources: Unlike earlier practices, the future R&D initiatives will come under a programmatic approach, meaning that all such activities will now be well coordinated. This will ensure optimum resource utilization through this R&D Fund. Overlapping, duplications can now be avoided.

Better Addressing Sector Issues: Emerging issues and challenges will now be identified through a participatory process. Research Needs Assessment (RNA) and prioritization of the researches will be made for financing through the proposed R&D Fund. As a result, sector issues will now be addressed in a better way.

Supporting Sustainable Development: The scope of mainstreaming R&D outcomes will be enhanced. This will be both for on-going and future interventions in WASH. Expected end result is gradually achieving sustainability in WASH development.

Supporting SDP Implementation: The SDP is the pathway towards sustainable development of WASH sector. All sector activities and investments will be in line with the concept and plan laid down in this document. Back up support from R&D to overcome sector issues and enriching knowledge base through the activities of the SDP's R&D Thematic Front has been precisely mentioned in the document. Establishing Dedicated R&D Fund for WASH is in a way supporting the implementation of the SDP.

Chapter 4
Dedicated R&D Fund and Modus Operandi

4.1 Institutional Framework

The paramount task pertaining to Dedicated R&D Fund is to have an appropriate institutional framework. This will depict a clear picture of all the institutions and entities involved in relation to this fund, and their respective roles and responsibilities. While the overall framework is a prerequisite, the individual structural aspects of all institutions or entities are required to be mentioned. Scope, jurisdiction and terms of reference (ToR) for each of these entities need to be explained in great details not only to avoid ambiguities but also to express their potentials. Operational, administrative and management linkages among these entities should also be portrayed for their effective functioning as a composite unit within a framework. Figure-4.1 shows the institutional setting and functional arrangement of the proposed Dedicated R&D Fund. The following sub-sections explain the composition, scope and the ToR of each of the concerned institutions and entities.

4.1.1 R&D Board

In terms of status this unit in the framework holds the highest authority. It does not have a physical presence like a traditional organization, yet provide requisite services bestowed upon it. It comes into existence through an administrative order from the line ministry and in this case the Local Government Division (LGD) of the Ministry of Local Government, Rural Development and Cooperatives (MoLGRD&C). It receives its secretarial services from PSU. Accordingly, a natural close link exists between these two.

Composition of the 'R&D Board': The Board comprises of members headed by the Secretary, LGD of the Ministry. A representative not below the rank of a Deputy Secretary is the member secretary of the Board. Among other members a few, because of their roles in the WASH, will become ex-officio members. Such ex-officio members will be drawn from DPHE, WHO and ITN-BUET. The logic here is that, DPHE is the sector-lead-agency, ITN-BUET is the 'R&D Focal Institution', and WHO is the member-secretary of the Technical Support Committee. The rest will be from sector agencies and partner organizations as the authority (LGD of MoLGRD&C) deem necessary. The authority in response to sector needs may recast the composition and include expert individuals and relevant organizations/institutions in the Board.

Terms of Reference of 'R&D Board': This ToR will be established and communicated to all concerned at the time of constituting the Board. However, the clauses and sections of this document may be reviewed from time to time and adjusted accordingly by the authority. The following are the essential points in the ToR of R&D Board:

- Provide policy and strategic decisions in respect to the Dedicated R&D Fund;
- Facilitate Fund Mobilization for Dedicated R&D Fund;
- Give clearance to PSU for signing MoU between PSU & Participating Organization(s);

- Meet every six-month interval, or earlier if necessary; and
- Review and Approve Work Plan and Budget submitted by PSU (detailed half-yearly; and indicative for next half of the FY).

4.1.2 Policy Support Unit - PSU

The Policy Support Unit (PSU) for Water Supply, Sanitation and Hygiene (WASH) Sector provides technical assistance to LGD, of MoLGRD&C, to develop and review sector policies, strategies, guidelines and plans; coordinate and monitor performances; and facilitate the development of institutional capacity. All these are in quest of sustainable development of WASH.

Terms of Reference of PSU in relation to 'Dedicated R&D Fund': The PSU, in addition to its responsibilities included in its portfolios, will render services for the R&D Fund. The following are the essential points in the ToR of PSU:

- Provide secretarial services to the 'R&D Board';
- Prepare Work Plan and corresponding budget for R&D programme for approval of the R&D Board;
- Maintain liaison with the 'R&D Focal Institution' and R&D Thematic Group;
- Facilitate mobilizing Participating Organization(s) for contributing to Dedicated R&D Fund;
- Facilitate preparing, and upon clearance from R&D Board, signing of Memorandum of Understanding (MoU) between Participating Organizations & PSU;
- Manage the Dedicated R&D Fund;
- Transfer R&D Fund to the respective research project upon approval of the Work Plan & Budget;
- Organize workshops, conferences and dissemination events with assistance from R&D Focal Institution and R&D Thematic Group; and
- Prepare Annual Report relating to the Dedicated R&D Fund for dissemination to Participating Organizations and others concerned.

4.1.3 R&D Focal Institution, ITN-BUET

In order to streamline sector activities various Thematic Fronts or Groups have been suggested by SDP. The R&D Thematic front is one such front with ITN-BUET as its Focal Institution. This institution stays at a strategic place in the overall institutional framework of the Dedicated R&D Fund and its R&D activities, as depicted in Figure-4.1. Being attached with BUET, it enjoys additional advantages of being involved with the development of the WASH and related environmental issues. At the same time as a Centre of skill, knowledge and capacity development it is deeply involved with the WASH sector and maintains close working relation with sector organizations.

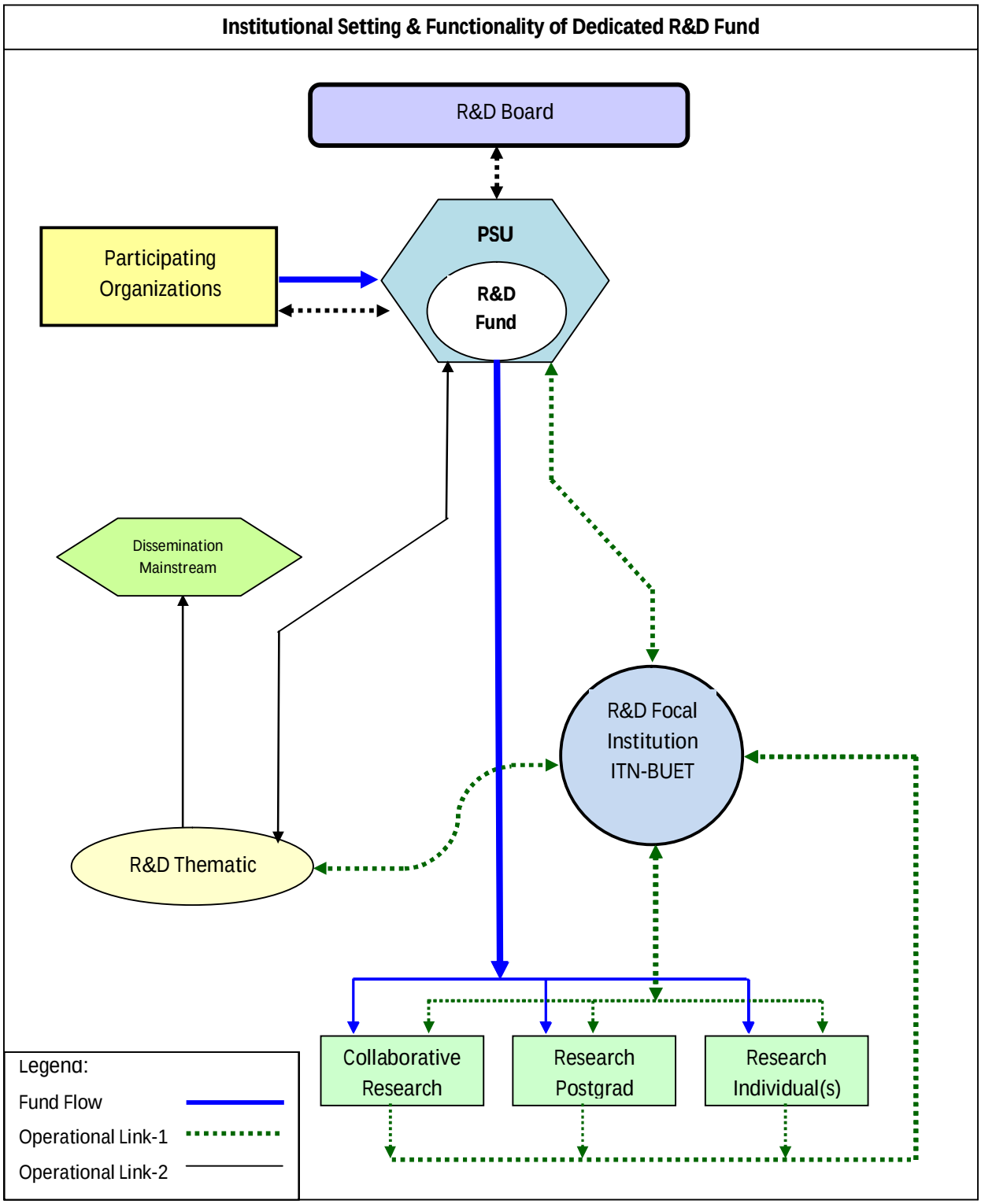

Figure 4.1: Institutional setting & the functionality of Dedicated R&D Fund

Terms of Reference of the R&D Focal Institution ITN-BUET: Parallel to other responsibilities and services which ITN-BUET usually renders, it will now in addition, provide services related to the Dedicated R&D Fund and pertinent R&D activities in accordance with the following terms of references (ToR):

- Establish and maintain close contact with R&D Thematic Front;
- Facilitate organizing Research Need Assessment (RNA) along with R&D Thematic Front;
- Prioritize sector R&D in consultation with the Thematic Front;
- Assist PSU with respect to 'Call for Research Proposals';
- Engage its Research Committee for Assessment of the Research Proposals received through PSU & subsequently make recommendation to PSU regarding suitability of proposals for funding;
- Assist PSU in signing research agreement with: (i) Research Institutions; (ii) Individual Researchers, against approved research proposals;
- Guide the research undertakings till completion;
- Assist the Researcher and PSU to share research outputs;
- Assist PSU and R&D Thematic Front in dissemination of R&D products towards mainstreaming into WASH programme and project initiatives; and
- Assist in quality publication of the accomplished research.

4.1.4 Participating Organizations

The WASH sector is endowed with a good number of organizations from public sector, private sector, development partners, NGOs and LGIs. These organizations take a very important position within institutional framework of the Dedicated R&D Fund as clearly indicated in Figure-4.1.

Many of these organizations are expected to participate in this initiative. Especially those organizations whose current and future programmes are likely to be benefited from research outcomes will be interested to participate in this initiative. Some of these organizations may value it as an opportunity to be a bonafide partner. They will be happy to be acknowledged by the sector stakeholders for their participation in this novel initiative. Also their quick appraisal will make them convinced that their effort will eventually contribute towards sustainable development. There is a potential opportunity for them to be inducted as a member of the R&D Board, depending on their involvement in this initiative as judged by the authority.

Interactions and policy dialogues between PSU and potential partner organizations may help conceptualizing the possibilities. At a certain stage a common understanding can be demonstrated by both of them (PSU and the partner) through signing a Memorandum of Understanding (MoU).

4.1.5 R&D Thematic Front

Sections 2.2.2 and 2.2.3 of Chapter-2 discussed about the R&D Thematic Front. Representatives from the active sector organizations constitute the Group which is led by the R&D Focal Institution (ITN-BUET) as Chairperson. PSU in consultation with the Chairperson of the R&D Focal Institution usually decides the membership of this Thematic Group.

Terms of Reference of R&D Thematic Front: Like a traditional organization It does not have a physical presence, yet provide requisite services bestowed upon it. The following are the important points included as the terms of reference of this Thematic Group:

- Maintain liaison with PSU and the relevant sector organizations;
- Attend meetings, discussion sessions, workshops, seminars etc. convened by the R&D Focal Institution;
- Contribute in identifying emerging issues and challenges in WASH;
- Contribute in research needs assessment (RNA) and prioritizing them;
- Participate in dissemination workshops, organized by PSU & R&D Focal Institution, on research products; and
- Play a pro-active role towards mainstreaming research outcomes.

4.1.6 Research Projects

For a certain period of time research projects may also be seen as organs in the overall Institutional Framework. Research projects could be categorized into three basic types based on their nature, structure, scope and extent viz., (i) Collaborative research; (ii) Individual research; and (iii) Research linked to Postgraduate programme. Figure-4.1 shows the relative positions of these three types of research projects. It explains that all researches would be managed, from quality assurance perspective, by the R&D Focal Institution, ITN-BUET. On the other side, financial resources will be disbursed by PSU directly to the research projects led by a Principle Researcher/Institution. These are further discussed in the following sections for a better understanding relating to their potentials and limitations as well. As regard TOR, the research proposal itself along with the contract agreement will provide necessary terms and conditions.

Collaborative Research: Where the scope of a research is of multi-disciplinary nature it is unlikely for a lone researcher to possess all requisite skills and knowledge to undertake it. A simple example could be a research entailing both software and hardware elements extensively. Other examples could be, water resources management and pollution control through grassroots participation; epidemiology and impact of WASH interventions. There are other important researches that would require a longer time span and multi-disciplinary skills, viz., recharge mechanism of groundwater in deep aquifer system. Such researches would require a collaborative approach among researchers/institutions with requisite skills. Collaborative research could also be linked to post graduation programme.

Individual Research: This type of research carried out by individual researcher is relatively easy to manage. Generally, intellectual input, resource requirement and time span are not of big scale. Traditionally these are popular and straight forward.

Research linked to Postgraduate Programme: Both public and private universities have post graduation programmes that are related to WASH and environmental science. Experience shows that academic researchers face difficulty in undertaking research that requires field investigations or linkage with implementing organizations. This is primarily because of resource constraints and lack of collaboration with field/implementing organizations. If concerned universities in consultation with sector institutions could facilitate such an arrangement, postgraduate programmes could then undertake useful field based researches pertaining to WASH issue.

4.2 Process of Building up the Fund

The Policy Support Unit – PSU will be the prime organization to set the process in motion. It will use this document for facilitating the process. Pertaining to building up the fund, PSU may apply a few but important techniques. These are indirect but effective. It is expected that potential partners will not only be convinced about the necessity of such a fund but will also be motivated to become a partner. The term, 'partner' is applicable for any potential stakeholder willing to participate.

At the outset PSU may organize a consultation session to appraise the sector stakeholders about the objectives of instituting the Dedicated R&D Fund. Such sessions and dialogues need to continue with a proactive role from PSU. The following sections provide the points to be addressed in such discussions.

4.2.1 Participation based on Interest & Comparative Advantage

Sector organizations have their own institutional policies and preferences. All government agencies, semi-autonomous organizations, LGIs, Development Partners, NGOs, academic and research institutions and private sector have their comparative advantages. They may contribute to the fund on condition that they would like to see their contributions used for researches on the areas of their choice.

There are organizations working solely on software issues, while some are working absolutely on hardware issues. There is a possibility for them to join hands and contribute to the R&D fund for collaborative research. Some organization may prefer to contribute for academic research. Likewise, some of the potential partners could ask for their involvement in the publications of the research outcomes. They could put it as precondition, so that their contribution is acknowledged and reflected in the publications. Some may want to put their resources for organizing dissemination workshop on research products. All these choices could easily be accommodated in a document say, memorandum of understanding (MoU), which will be discussed separately in a subsequent section.

Institutional competences and choices vis-à-vis their participation in the 'Dedicated R&D Fund' is pictorially presented in Figure 4.2. This further explains participation of many partners for different purposes, and on different issues. But one thing is common, it is all about the R&D affair.

This concept of participation based on interest and comparative advantages will help potential partners in their own decision making.

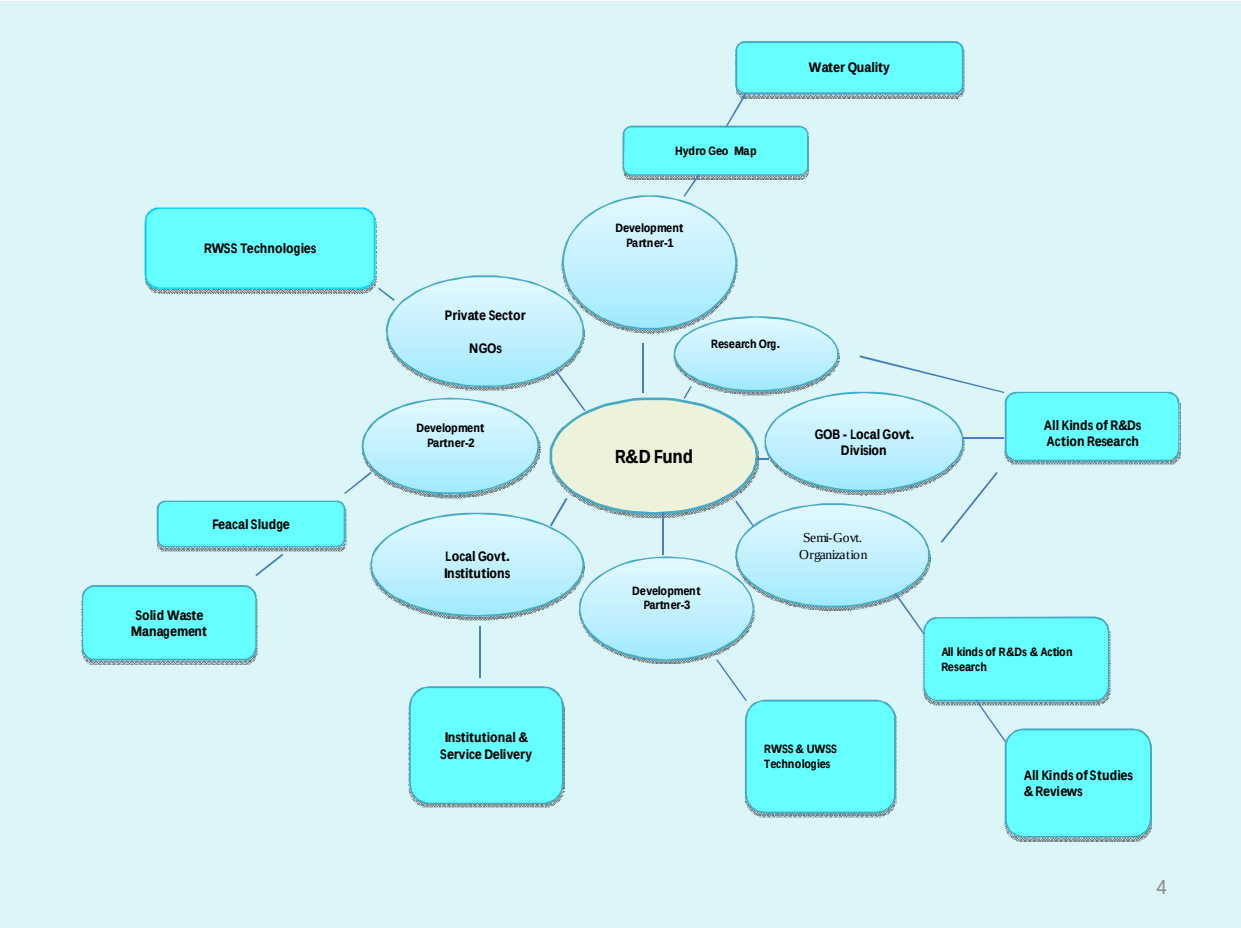

Figure 4.2 : Participation for building up Dedicated R&D Fund based on comparative advantage

4.2.2 Rationale for Participation

An immediate question may be raised as regard participation in this initiative of PSU. What could be the justification for a partner to contribute in creating the proposed Fund? Is it going to be beneficial for the participating institution? There are many responses to this basic question. There are many positive counts which are quite evident from the discussions already presented in Chapter-2 and 3 of this document. A few of them are mentioned below:

- It is in line with the with the SDP, a document for all to follow;
- It is a government initiative through its Policy Support Unit, PSU;
- It promotes coordination and harmonization in R&D activities;
- It supports optimum utilization of resources to be spent for R&D;
- It addresses emerging sector issues;

- It offers an opportunity to join hands in a common platform to work together for R&D front;
- It avoids overlapping and duplications of R&D through its institutional mechanism; and
- It supports sustainable development of WASH sector.

4.2.3 Memorandum of Understanding (MoU) as a Tool

A memorandum of understanding (MoU) could be instrumental in bringing two or more institutions together based on a common understanding. Based on such MoU specific agreement can be reached with potential partners for their participation in the Dedicated R&D Fund. PSU needs to strive from now on to get the potential partners convinced about its initiative and come to a common understanding for the cause of effective R&Ds and eventually achieve sustainable development of WASH sector. An example of MoU in generic format is attached as Annex-II of this document. This short piece of document can be tuned, refined, or adjusted easily as needed.

4.2.4 In-built Mechanism within Development Programmes

While there remains scope for the sector stakeholders to come forward and give endowment straightaway, there are other ways too. Quite logically, TPPs and DPPs can make provisions for R&D as a requirement and support to other activities. This approach is equally applicable for the implementing agencies as well as the development partners. If they agree to this concept, projects and programmes can be formulated accordingly. Enough provisions could also be made both for pre and post investment studies and impact assessments. Research activities can also be accommodated within the purview of capacity building. Where applicable, a candid mention of the role and purpose of the Dedicated R&D Fund can be made in the Prodoc, TPPs and DPPs. The institutional framework and the functional aspect of the R&D Fund can be mentioned as well. Personnel associated with project and programme formulation need to be appraised on this concept.

Another way of getting R&D Fund can be explained as follows:

The PSU is already in existence under revenue budget and within the administrative management of LGD of the MoLGRD&C. It will be rather easy to create a budget head as 'R&D in PSU' with concurrence from the Ministry of Finance. Interested partners can provide fund year to year in line with MoU signed with PSU.

Three kinds of funding channels for the R&D Fund can be visualized as follows:

<u>R&D Funding Channel-A</u>: (i) GoB Sources - as endowment; (ii) In-built mechanism through TPPs and DPPs; and (iii) budget head as 'R&D in PSU'.

<u>R&D Funding Channel-B</u>: (i) Multi-lateral and bi-lateral Development Partners – as endowment; (ii) In-built mechanism through Prodoc, TPPs and DPPs; and (iii) budget head as 'R&D in PSU'.

R&D Funding Channel-C: (i) National and International NGOs – as endowment, programme and project financing; (ii) Academic & Research Institutions, and Private Sector – as programme and project financing; and (iii) budget head as 'R&D in PSU'.

Figure-4.3 provides the above information pictorially. Potential Partners may be willing to participate and contribute following any of the three Funding Channels. But a mechanism needs to be in place to scrutinize and assess the legal aspects prior giving clearance to allow any contribution to the Dedicated R&D Fund. The proposed tool, i.e., MoU as discussed in section 4.2.3 can play such a role. Figure-4.3 also shows a kind of filtering services prior to allowing any resources to enter into the proposed fund.

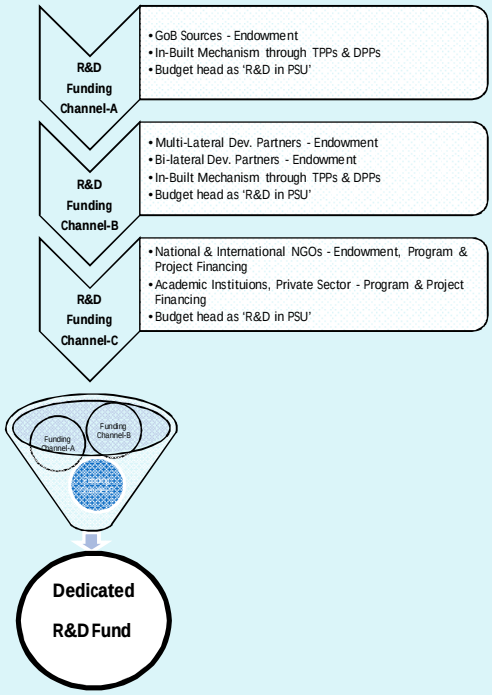

Figure 4.3 : Pictorial view of various funding channels for the Dedicated R&D Fund

4.3 Access to R&D Fund

The previous section (4.2) discussed about building up the fund while this section discusses about the protocol of accessing the fund. The only way to make use of the 'Dedicated R&D Fund' is through approved work plan and associated budget. PSU will require this approval from the 'R&D Board'. An example of a work plan and budget format is attached as Annex-VII of this document. The major activity in the work plan is undertaking research. The

following sections discuss about research proposal, their evaluation, acceptance and financing.

4.3.1 Call for Research Proposals

Well ahead of a general call for Research Proposals, PSU will upload the prioritized and all other research areas pertaining to WASH in its Website. This is required to keep the potential researchers/institutions abreast of the current research priorities in response to present challenges in the sector. Annex-I provides a list of Areas of Research in the Context of Prevailing Challenges. PSU will receive updated list of research-areas from R&D Thematic Front from time to time.

Call for Research Proposals: In addition to its Website, PSU will use various modes of communication to widely disseminate the message requesting Research Proposals. Such call for research proposals from PSU will be made on a routine basis preferably quarterly. Apart from a general call such message will include the following:

- List of Prioritized Research Areas – (as in Annex-I)
- Guidelines for the Research Proposal - (as in Annex-III)
- Format of Research Proposal – (as in Annex-IV)

As noted earlier (Section 4.1.6), the research proposals could be of three categories, viz., (i) Collaborative research; (ii) Individual research; and (iii) Research linked to Postgraduate Programme. Figure 4.4 pictorially shows the possible collaborations, depending on research area/discipline-wise skills and potentials.

PSU will receive the proposals and will send those to R&D Focal Institution, ITN-BUET for necessary evaluation. For technical assessment of proposals and to ensure that this exercise is carried out with high quality of technical expertise, PSU will depend on ITN-BUET. While sending the proposals PSU will also indicate a time frame for ITN-BUET to accomplish this task and its feed-back with necessary recommendations.

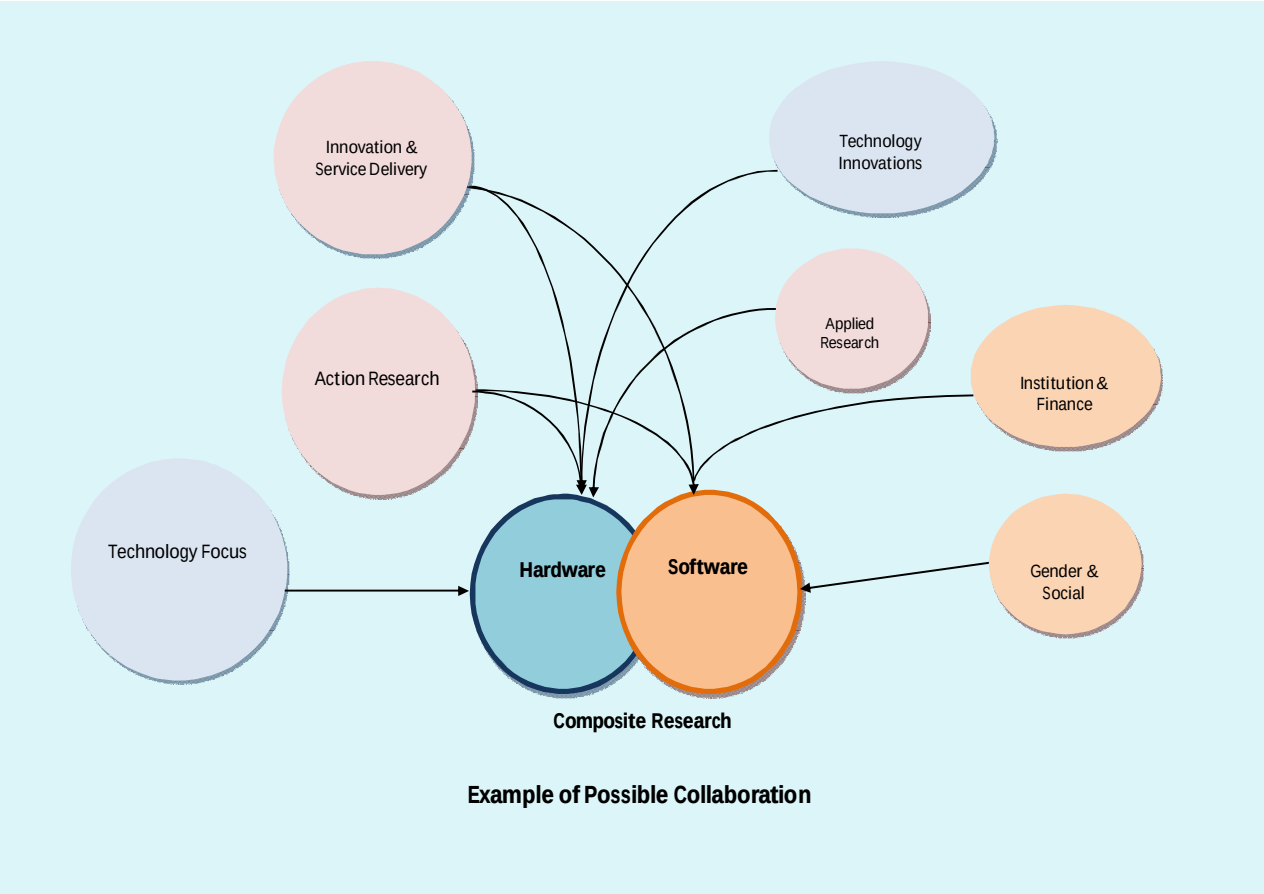

Figure 4.4 : Example of possible collaboration for accessing the R&D Fund

4.3.2 Evaluation of Research Proposals & Approval Process

The R&D Focal Institution, ITN-BUET has a Research Committee in place comprising of members, who are recognized academicians and professionals of the sector. This Research Committee will immediately be engaged for carrying out the evaluation exercises using its norms and practices. The Research Committee may engage reputed academicians and professionals in the review process. During the course of evaluation if any clarification is required the Research Committee may request the proposed Principle Researcher (Applicant of the Research Proposal) for explaining his/her views. If there is scope to improve the proposal and the applicant is willing to incorporate the observations, the Research Committee will allow such improvements. This is primarily because of the fact that a considerable amount of intellectual inputs have already been made, not only by the applicant but also by the members of the Research Committee.

Upon completion of the evaluations, the R&D Focal Institution will provide its feed-back, observations and recommendations to PSU about the research proposals for further course of action from PSU's end.

4.3.3 Financing Research Projects

After receiving the feed-back on the evaluation of the research proposals and if it is recommended for acceptance, PSU will include it in its forthcoming Work Plan with associated budget. PSU will request for approval of the Work Plan & the Budget from the 'R&D Board'.

In accordance with the decision of the R&D Board pertaining to the approval of the work plan, PSU will take immediate steps to communicate the message to the applicant of the Research Proposal (Principle Researcher/Institution) and the R&D Focal Institution. An agreement will be executed with the Principle Researcher/Institution as the case may be.

PSU will disburse the fund as per agreement directly to the Principle Researcher/Institution. This will preferably be in installments as indicated in the agreement. The agreement will include the final version of the Research Proposal.

4.3.4 Feed-back on Physical and Financial position of Ongoing Research

Upon signing the agreement the Principle Researcher/Institutions will submit the Inception Report which will include a detailed work plan to be followed by him/her in carrying out the research. As an example, Annex-V presents a format of the proposed Inception Report which needs to be submitted to PSU. The work plan included will be the basis of monitoring the physical as well financial status of the on-going research. The Focal Institution will guide the research and monitor its physical progress status based on reports (e.g., quarterly) submitted by the Researcher/Institution. Financial progress report will be submitted by the Principle Researcher/Institution along with the physical progress report. PSU will review the financial progress report.

4.4 Dissemination of Research Outcomes & Documentation

4.4.1 Dissemination and Mainstreaming

Research outcomes need to be disseminated among the sector stakeholders. PSU in consultation with the R&D Focal institution and the Thematic Front will organize dissemination events. Research outcomes will be presented along with provisions for asking clarification if needed. It is expected that such events will play an important role in mainstreaming the potential outcomes in WASH programmes.

4.4.2 Documentation and Publication

Documentation is important to enrich the data base and the knowledge bank for future use and application. Some of the accomplished research and its products could be worthy of publication for which PSU with the recommendation of the Focal Institution will include this task in its forthcoming Work Plan. Research outcomes could also be presented in national/international conferences/seminars and published in national/international journals by the Researcher/Institution, with prior permission from the PSU.

It is necessary that PSU takes appropriate measures to develop an archive of all research publications vis-à-vis all sector policy and strategy documents. This library should also contain various studies and reviews for the researchers, planners, academicians and all other potential users. Standard norms and practices in line with modern library science should govern the operation and management of this unit of PSU appropriately equipped with requisite manpower and logistics.

4.4.3 Managing Website

PSU has its Website. A new dynamic window needs to be created for the Dedicated R&D Fund. List of priority areas, general guidelines for research proposal, standard format of research proposal, accomplished research and pertinent information, etc. need to be put in the Website. It is important that this particular window is kept always updated.

4.5 Functional R&D Fund in Place

The basic elements relating to the 'modus operandi' of the Dedicated R&D Fund have already been discussed in great details. A few more items not very strictly to be included as 'modus operandi', viz., 'governance mechanism', and 'strengthening a few institutions' are discussed in section 4.6 and 4.7, respectively. However, there is no harm in including the governance mechanism into modus operandi.

In quest of having the 'Dedicated R&D Fund' fully operational and delivering, a very important task is to be accomplished as a forerunner. This is called Process Action Plan (PAP). The 'Modus Operandi' is prepared and is available for application. But the process is to be set in motion, pursued and monitored to see a Functional R&D in place. Figure 4.5 presents pictorially the impact of a Functional Dedicated R&D Fund.

4.5.1 Process Action Plan - PAP

Although the 'Modalities for the Dedicated R&D Fund' is now available, yet it is to be made functional in real sense. A Process Action Plan (PAP) is to be prepared in a participatory mode involving key personnel in the sector. The task is simple and small in its scope but immensely important to set the process in motion to eventually achieve a Functional Dedicated R&D Fund. Annex-VI is a designed format for preparing and following the said 'Process Action Plan – PAP'.

4.5.2 Set the Process in Motion

The pre-imminent task is to prepare a PAP and following it. Its preparation process requires participation of key personnel in the sector. It will have in-built review system.

Figure 4.5 : A Functional Dedicated R&D Fund will generate more and more R&D

4.6 Governance Mechanism

For any kind of institutional affair a governance mechanism is a prerequisite. It is to be seen in the context of the objectives of the institution. Institutional integrity and transparency in decision making are most important. Instituting a dedicated R&D Fund has similar requirements. The 'modus operandi' itself, of the Dedicated R&D Fund, specifies candidly the institutional arrangement; management and operational aspects; process of accessing the resources; sharing and dissemination of outcomes; monitoring and reporting; transparency and documentation; quality control system; etc. The mechanism is in-built and takes care of good governance.

4.6.1 In-built System for Check & Balance

The institutional framework and the terms of references (ToRs) as delineated for each institution involved sets the jurisdiction of their authority and responsibility.

MoU as a tool for promoting partners' involvement provides clear understandings without any ambiguity among the concerned institutions.

Work Plan and associated budgets through a well designed format not only provide systematic approval process but also at the same time allow review and monitoring of both the physical and financial status. Progress reports are required to be submitted at regular intervals to the controlling office which will ensure adherence to rules and procedures.

Information dissemination through PSU's Website along with other communication channels establishes transparency adequately.

4.6.2 Reporting

From governance perspective basically there are two kinds of reporting, internal reporting and the external reporting.

Internal reporting is covered in section 4.6.1 through an in-built system. External reporting is in fact an Annual Report from PSU for the Partners and other key stakeholders, which provides all kinds to information relating to building-up the R&D Fund, its management and process to access and utilization.

4.6.3 Independent Audit

There are discussions in Chapter 3 and specifically in section 3.1.3 about the necessity of smooth implementation of R&D under a conducive environment. While it is essential that transparency is to be built-in in the management of R&D and its financing, it is important that enough flexibility is there so as to facilitate undertaking researches smoothly. Adherence to strict audit requirements especially on the part of the researcher may slow down and adversely affect the research undertakings. Members of the Working Committee opined that traditional project audit exercise may affect the smooth undertaking of R&D. Nevertheless, building up the Dedicated R&D Fund and disbursement to research projects and utilization may be audited through an appropriate terms of reference.

4.7 Strengthening a few Institutions

4.7.1 Policy Support Unit – PSU

Although this particular aspect is outside the scope and jurisdiction of this assignment, yet the Consultant considers it as an obligation to bring the issue to the notice of the authority. PSU's inherent portfolio is the policy affair of the WASH sector. The next ones are strategy formulation followed by action plans. At tertiary level, support to SDP implementation is also an important responsibility. The role, it is required to play with respect to 'Dedicated R&D Fund' is of tertiary level. The ToR of PSU in relation to the R&D Fund is extensive.

The nature of activities relating to Dedicated R&D Fund will necessitate PSU to interact with various ministries, agencies, development partners, academic institutions, NGOs, etc. The present level of staffing and status are in no way conducive to these requirements. Therefore, the PSU needs to be strengthened from both these two perspectives.

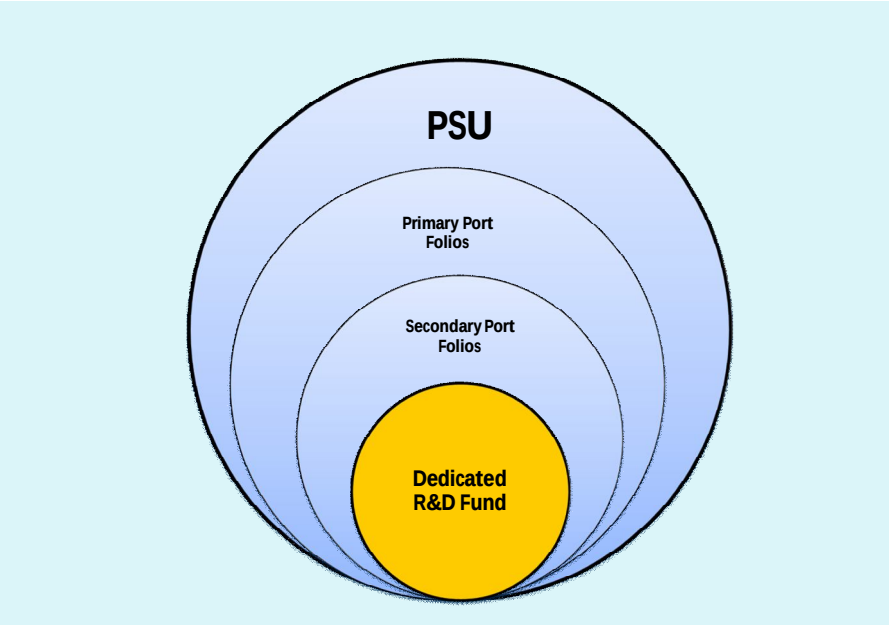

Figure 4.6 : Pictorial presentation of PSU and its portfolios

4.7.2 Dedicated R&D Division within 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.

It is expected that in 'collaborative research areas', as envisaged in 'Dedicated R&D Fund', the participation of DPHE will be very much needed. In many instances this organization may even play the lead role of such collaborative research.

In this backdrop, it is strongly suggested that a full-fledged R&D division be established with requisite manpower and other resources within DPHE.

4.7.2 Dedicated R&D Division within WASAs

From a similar view point as in section 4.7.2 and considering the extent of activities in urban sector of WASH, it is also suggested that R&D divisions be established with requisite manpower and logistics within WASAs.

Chapter 5
Conclusions

5. Conclusions

To keep R&D going in support of sustainable development of WASH sector it is imperative that the 'Dedicated R&D Fund for WASH' as suggested in the SDP (2011-2025) be instituted without any further delay.

It is possible to mobilize potential intellectual input, and through appropriate institutional arrangement research management can be done efficiently.

The envisaged dedicated fund can be built up easily with resources already available in the sector. It will not require withdrawing resources from other sectors or direct investment choices. It will require streamlining the uncoordinated R&D activities and associated spending.

The modus operandi as spelt out in this document is not rigid or static. It can be reviewed, revisited and tuned accordingly as prevailing situation may demand.

The Process Action Plan (PAP), needs to be prepared and followed, to set the process of instituting the 'Dedicated R&D Fund' in motion as early as possible.

Annex-I

Areas of Research in the Context of Prevailing Challenges

- Research on institutional arrangement for sustainable WASH development
- Appropriate technologies for hard to reach areas
- Epidemiology in WASH perspective
- Economic impact of WASH interventions
- Risk assessment of arsenic and other carcinogenic elements present in groundwater
- Behavioral change impact on sustainable WASH
- Water conservation mechanism
- Climate change impacts on WASH and possible adaptation
- Artificial recharge of groundwater
- Resource recovery from wastewater and waste
- Research on treatment technologies addressing user concern
- Groundwater contamination from on-site sanitation
- Appropriate wastewater treatment and sludge management
- Water treatment for removal of Manganese and other heavy metals
- Surface water pollution Management
- Faecal Sludge Management
- Software Issues pertaining to sustainable WASH development
- Arsenic removal technology under varied hydro-geochemical perspective
- Alternate water resources in urban and rural areas
- Economic impact of Water Safety Plan (WSP)
- Hazardous waste site remediation
- Environmental aspect of river improvements
- Development of locally manufactured arsenic test kits
- Community-based iron, manganese removal technologies
- Research in stony problem areas
- Environmental management system
- Low cost water treatment
- Low cost and innovative sanitation technologies
- Urban storm drainage
- Solid Waste Management
- GIS Application in Environmental Engineering

- Research on Maintenance of Hardware
- Appropriate water and sanitation technologies for people with disabilities
- Recharge mechanism of deep aquifer system
- Community participation, gender parity and financing mechanism in WASH
- Rural piped water supply schemes and conjunctive use of water
- Appropriate sanitation technologies for Hard to Reach (HtR) areas
- Devolution of planning and management of WASH
- Rainwater harvesting mechanism and use
- Action Research on sustainable WASH services
- Mechanism for enhancing local participation in WASH
- Urban sanitation
- Improved handpumps for very low water levels
- Decentralized wastewater treatment
- Appropriate sewerage systems for cities and towns in Bangladesh
- Water and industrial waste treatment
- Surface water treatment technologies
- Water quality modeling
- Ecology and environment
- Environmental remediation technologies
- Frequent floods – latrines ineffective, damage water supply system, increased disease
- Impacts of climate change on WATSAN sector and their remediation.
- WSS in slum areas
- Development of climate resilient WSS technologies
- Updated technology mapping for Bangladesh
- Updated water quality mapping for Bangladesh

Annex-I I

MEMORANDUM OF UNDERSTANDING

Between

xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx, Bangladesh

And

Policy Support Unit – PSU, Local Govt. Division, Ministry of LGRD&C

1.0 The Parties

This Memorandum of Understanding (hereinafter referred to as "MOU") is entered into on the ……..day of the month of ……, 2014, by and

BETWEEN

……
……
……, Dhaka Bangladesh

AND

Policy Support Unit (PSU), Local Government Division, Ministry of Local Government, Rural Development and Cooperatives (MoLGRD&C), DPHE Bhaban, Captain Monsoor Ali Sarani, Kakral, Dhaka 1000.

The parties hereto are hereinafter referred to individually as the "Party" and collectively as the "Parties".

2.0 The Background of the Parties

XXXXXXXX

……
……
……
……
……
……
……
……

Policy Support Unit-PSU

The Policy Support Unit (PSU) for Water and Sanitation Sector (WSS) provides technical assistance for the Local Government Division (LGD), Ministry of Local Government, Rural Development &

Cooperatives (MoLGRD&C), to develop and review sector policy, strategies and plans; coordinate and monitor performances; and facilitate the development of institutional capacity.

3.0 Rationale for the collaboration

Local Government Division has prepared the Sector Development Plan - SDP (FY2011- FY25) for the Water and Sanitation Sector in Bangladesh. The SDP is a path-breaking initiative to sketch a bottom-up road map to achieve the goal of providing safe drinking water and sanitation for all. It has addressed various issues related to sector financing, planning and coordination mechanism, and monitoring and evaluation. It analyzes the issues of donor harmonization, highlighted the need of enhancing the Research and Development (R&D) activities to support innovating technological solutions, besides many other issues under its short, medium and long term plans.

Furthermore, in the recent National Forum and LCG working group on WSS meetings following the SDP road map PSU has been advised to take initiative for creating a dedicated R&D fund for WSS. This is the context on which this MOU is based on.

4.0 Objectives of the MOU

The collaboration in general will focus on sustainable development of WASH and in particular, on establishing a functional 'Dedicated R&D Fund' to facilitate undertaking research and development activities. In line with its interest, comparative advantage and institutional policy, 'XXXXXXX' intends to increase the knowledge base in ……(viz. Faecal Sludge Management……..) the WASH sector in partnership with PSU.
……
……
……
……
……
……

After discussion on possible collaboration, the following tentative activities have been agreed:

a. Partnership in establishing a 'Dedicated R&D Fund': PSU and XXXXXXX to develop ……
……
…….

b. Partnership in Collaborative Research : PSU and XXXXXXX to undertake joint research programmes relating to the above mentioned field.

c. Partnership in Dissemination of R&D Findings: PSU and XXXXXXX to collaborate in publications, symposia, workshops and conferences to disseminate research findings and strengthen policy and practice.

Funding for these activities would be sought by both PSU and XXXXXXX. The Project Director of PSU and ……of XXXXXXX will be responsible for coordinating the activities.

5.0 This MOU will become effective immediately on being signed and will be reviewed by the two parties every two years.

Date: **Date:**

Policy Support Unit – PSU
Local Government Division, MoLGRD&C

XXXXXXX

Annex-III

Guidelines for the Research Proposal(s)

1. Research proposal(s) must focus on specific issues / problems from the following broad based research topics,

A.
B.
C.
D.

2. Application form must be filled properly and separate sheets may be attached where needed.

3. Research proposal(s) must reach Policy Support Unit - PSU on or before _____ ***2014***.

4. Principal researchers shall be professionals from academic institutes, implementing agencies and relevant private organisations. Research associates may be employed from post graduate students or young professionals, where necessary.

5. Minimum qualification of the principal researcher shall be at least post-graduation with considerable experience in supervising research work in relevant field.

6. R&D Focal Institution's 'Research Committee' shall assess the qualification, experience and capabilities of the researchers on a case by case basis.

7. Principal Researcher, Researchers and Support Staff shall be remunerated with 'honorarium'.

8. Individual TOR will be prepared against each selected research proposal to be undertaken and the principal researcher must sign the TOR after mutual agreement with Policy Support Unit - PSU.

9. Researchers must strictly follow the approved time frame and workplan of the research work.

10. Principal Researcher must submit progress reports to Policy Support Unit – PSU through the R&D Focal Institution regularly as per prescribed format.

11. Principal Researcher shall prepare budget for the research work giving detail breakdown of individual item of work. After approval of the budget by PSU, fund will be disbursed in installments by PSU subject to satisfactory progress of research work.

12. Principal Researcher shall be responsible for proper documentation (in hard and soft form) for their research outputs and present the same through workshops/seminars on clearance from the R&D Focal Institution and in accordance with the agreement with PSU.

13. Principal Researcher shall submit five (5) copies of the research reports (Inception report, Mid-term report & Draft report) to Policy Support Unit – PSU through the R&D Focal Institution.

14. Principal Researcher shall submit five (5) copies of the research Final report along with a soft copy at the end of research work to Policy Support Unit – PSU through R&D Focal Institution.

15. PSU, through the R&D Focal Institution, will advise and provide guidance to the researcher as and when necessary.

16. PSU, through the R&D Focal Institution, shall regularly monitor the progress of research work, ensure timely completion of research work and, review and comment on the documentation of the research outputs by the researcher.

17. PSU, through the R&D Focal Institution, will assist the researcher in presentation of research outputs through workshops / seminars.

18. The Principal Researcher shall submit a ***Research Concluding Report*** to Policy Support Unit – PSU on successful completion of the research project.

19. Policy Support Unit – PSU shall posses the right to accept or reject any proposal without showing any reason.

20. Policy Support Unit – PSU may disseminate the research outputs through publications and uploading in its Website. However, proper acknowledgement of the contribution of the researcher will be made.

21. Policy Support Unit - PSU shall have the copyright of the research outputs.

Annex-IV

Format of Research Proposal

I, the undersigned, would like to undertake a research project specified herein, to be approved and financed by PSU, and supervised and monitored by R&D Focal Institution, Dhaka, Bangladesh.

1. Name of the Principal Researcher:	
2. Tentative title of the research topic:	
3. Present state of the art of the proposed research topic:	• Not more than five hundred (500) words. • Mention only those activities which are currently being carried out in different places. • Support your information by citing relevant references. • Relevant references must be given mentioning the author(s), title of the paper or name of the journal / proceedings etc. along with volume no., year of publication, name of publisher etc.
4. Objective(s) of the research:	• List the objective(s) using short sentences. • If the objective(s) are to be explained in a paragraph, limit within three hundred (300) words. • Specifically mention relevance of the research work with WASH situation in Bangladesh. •
5. Expected result(s) of the research:	• Briefly list the expected results from the research.
6. Application:	• Explain the possible applications of the outcome of the proposed research findings within two hundred (200) words.
7. Methodology / procedure:	• Clearly outline the sequence of activities as to how the research work will be carried out in detail.
8. Research period and workplan:	• Provide detailed workplan mentioning the activities and time schedule in a bar chart.
9. Qualification of Researcher:	• Present job status. • Qualification and experiences in relevant field.
10. Project Cost:	• Remuneration / fees for Principal researcher, researchers, research associates / assistants / enumerators / relevant post graduate students (where applicable). • Cost for support services (field workers, labourers, conveyance etc.). • Cost of consumable materials with break up. • Construction of pilot plant with break up (if necessary). • Cost of experimental work (if necessary). • Cost of report preparation, binding etc. • Others (please specify).

11. Contact address of the Principal Researcher:		**12. Telephone no./ fax/e-mail:**
_____ **Date**	_____ **Signature of the Principal Researcher**	

15. Recommendation from parent department / organisation:	
_____ **Date**	_____ **Signature of the Recommending Authority** **(Name:)**

Notes:

1. ***Please attach separate sheet(s) for providing the information for item no. 3 to 10.***
2. ***Please attach short CVs of the research associates / assistants (if any).***

To be filled by the R&D Focal Institution's 'Research Committee'.

Comments of the Research Committee of R&D Focal Institution:	
_____ **Date**	_____ **Signature of the Chairman, Research Committee, R&D Focal Institution**

To be filled by the Authority, Policy Support Unit - PSU.

Comments of the Policy Support Unit - PSU:	
_____ **Date**	_____ **Signature of the Approving Authority, Policy Support Unit**

Annex-V

General Format of an Inception Report

Top-sheet
Table of Contents
Abbreviations & Acronyms

1. Background of Research Project

2. Detail Methodologies
(as appropriate)

- Sample size
- Data collection procedure
- Detail of laboratory tests (if any)
- Facilities to be used

3. Data Processing Technique(s)

4. Data Analyses

5. Workplan & Time Schedule (barchart)

6. Expected Outcomes

7. Risk Factors (if any)

8. Conclusions

Attachments: Research proposal submitted to PSU.
TOR for the Principal Researcher
Contract document

Annex-VI

Policy Support Unit
Dedicated Research Fund for WASH Sector
Process Action Plan - PAP

Action No.	Particulars of Activity	Responsibility	Deadline	Status	Remarks
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
13.					
14.					
15.					
16.					
17.					
18.					

Annex-VII

Output	Activity Head	R&D Work Plan & Budget for the period of July 2015 to June 2016 Showing particulars of activities				Remarks
		July '15 - December '15		January '16 - June '16		
		Physical	Financial	Physical	Financial	
1.1	**Research & Development (R&D)**					
A(1.1.1)	**Collaborative Research**					
A001						
A002						
A003						
B(1.1.2)	**Individual Research**					
B001						
B002						
B003						
B004						
C(1.1.3)	**Post Graduation Research**					
C001						
C001						
C002						

Annex-VII

Output	Activity Head	R&D Work Plan & Budget for the period of July 2015 to June 2016 Showing particulars of activities				Remarks
		July '15 - December '15		January '16 - June '16		
		Physical	Financial	Physical	Financial	
C003						
D(1.1.4)	**R&D Board Meeting**					
D001						
D002						
E(1.1.5)	**R&D Thematic Group Meeting**					
E001						
E003						
F(1.1.6)	**Workshops and seminars**					
F001						
F002						
G(1.1.7)	**Publication & documentation**					
G001						
G003						
H(1.1.8)	**Dissemination of Information**					
H001						
H002						