Government of the Republic of the Union of Myanmar

National Investment Plan

for

Rural Water Supply, Sanitation and Hygiene (WASH),

WASH in Schools and

WASH in Health Facilities

2016-2030

27 June 2016

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Acronyms and abbreviations

CLTS	Community Led Total Sanitation
DHREP	Department of Human Resources and Education Planning, MoE
DBE	Department of Basic Education, MoE
DPH	Department of Public Health, MoHS
DRD	Department of Rural Development, MoALI
DEWATS	Decentralized Treatment Wastewater Facilities
ESD	Environmental Sanitation Division, Ministry of Health and Sports
GoM	Government of the Republic of the Union of Myanmar
MALI	Ministry of Agriculture, Livestock and Irrigation
MoE	Ministry of Education
MoH	Ministry of Health
O&M	Operation and maintenance
ODF	Open defecation free
TDC	Township Development Committee
WASH	Water, Sanitation and Hygiene
WWT	Wastewater treatment
UNICEF	United Nations Children's Fund
WHO	World Health Organization
WSP	Water and Sanitation Program, World Bank

Summary

This Investment Plan defines the costs of achieving and sustaining the goal and objectives set out in the National Strategy for Rural Water Supply, Sanitation and Hygiene (WASH), WASH in Schools and WASH in Health Facilities (2016). It covers WASH in rural areas, schools (primary to high school in rural and urban areas), health facilities (township hospitals down to sub-health centres), and emergency preparedness. It estimates investment requirements, including replacement of life expired infrastructure, and funding availability from government, development partners and other sources, and financing gaps. It attempts to generate comprehensive estimates of funding requirements by including both capital and recurrent costs.

The preparation of the investment plan required a considerable amount of data. In many instances, severe data limitations required the use of assumptions or innovative methods in order to generate estimates.

Planning period and phasing

The Investment Plan is designed to guide spending and actions for the WASH sector to the year 2030. The years 2016 to 2018 are a transition period which focuses on the development and strengthening of administrative systems, fund raising, bidding and other initial tasks to create the capacity for full development of WASH services.

Current coverage, access and needs

The Investment Plan is based on existing coverage and populations in 2014 Census Report, being the most recent and comprehensive data set available. Additional baseline information on WASH in schools and WASH in health facilities was provided by DBE and DPH. The targets set in the National WASH Strategy are to achieve 100% access to services by 2030. A number of assumptions were made in using the source data or lack of it – these are detailed in the Main Report.

Existing access to improved water supply for rural populations is 61%; access to improved sanitation is 67%. There is wide variation in the different State and Regions from these national percentages.

The number of people requiring access to improved water supply and sanitation are shown in Table S1. In addition:

- CLTS and/or ODF verification and certification will be needed in 63,899 villages
- Sanitation marketing to develop the private sector provision of sanitation will be required in all 14 States and Regions
- 664,000 households per year (12,323,000 in total) will require solid waste management services.

Requirements for WASH in schools are shown in Table S2 and for health facilities in Table S3. Requirements for Sector Management and Administration are shown in Table S4.

Table S1. Number of persons requiring access to improved water supply facilities

000 persons

State/region	Water supply				Sanitation			
	Annual		New and replacement		Annual		New and replace	
	New	Replace	Annual	2017-2030	New	Replace	Annual	2017/30
Ayeyawaddy	196	348	544	7,615	99	274	373	5,219
Bago	75	240	315	4,417	76	201	277	3,881
Chin	8	33	41	576	8	19	27	378
Kachin	21	70	92	1,286	11	43	54	751
Kayah	7	17	25	346	2	8	10	141
Kayin	38	73	111	1,554	32	71	103	1,438
Magway	55	166	221	3,095	76	178	254	3,550
Mandalay	51	178	229	3,205	71	216	287	4,022
Mon	38	38	137	1,914	26	75	100	1,404
Nay Pyi Taw	12	12	49	689	8	35	43	598
Rakhine	131	157	288	4,036	150	150	300	4,200
Sagaing	58	195	253	3,541	93	234	326	4,569
Shan	172	324	496	6,949	131	250	381	5,328
Tanintharyi	35	76	111	1,550	29	60	89	1,244
Yangon	90	159	249	3,489	27	103	130	1,818
Total	988	2,173	3,161	44,260	836	1,917	2,753	38,540

Source: Investment Plan calculations based on 2014 Census

Table S2. Physical requirements for school WASH, 2017-2030

Level	Water supply (no. of schools)		Toilets (000 students & teachers)		Hygiene training (no. of teachers)	Extra-curricular hygiene programs (ave. no. of schools/per year)
	New	Replacement	New	Replace		
Primary	13,622	41,028	2,484	5,744	103,552	40,555
Middle	1,927	3,589	2,887	5,589	47,349	3,559
High school	2,706	3,831	1,603	2,434	24,706	3,807
Total	18,255	48,448	9,201	60,085	175,607	47,921

TableS3. Physical requirements for health facilities WASH, 2017-2030

Facility	New	Replacement	Total
Water supply (no. of hospitals)			
Sub-health centre	20,291	18,249	38,541
Rural health centre	2,964	4,051	7,015
Station hospital	55	870	925
Township hospital	100	392	492
Total	23,410	23,562	46,972
Toilets (no. of toilets)			
Sub-health center	85,585	119,142	204,727
Rural health center	26,936	48,203	75,139
Station hospital	-	21,574	21,574
Township hospital	3,071	19,807	22,878
Total	115,592	208,726	324,318

Wastewater treatment facilities (no. of hospitals)			
Station hospital	610	159	769
Township hospital	325	85	410
Total	935	243	1,178
Clinical waste disposal (no. hospitals)			
Sub-health center	-	-	-
Rural health center	-	-	-
Station hospital	-	-	-
Township hospital	300	237	537
Total	300	237	537

Table S4. Number of teams or offices required for sector management

State/region	No. of teams or offices		
	Township level	Regional level	National level
Ayeyawaddy	26	1	0
Bago	27	1	0
Chin	8	1	0
Kachin	17	1	0
Kayah	6	1	0
Kayin	6	1	0
Magway	24	1	0
Mandalay	30	1	0
Mon	9	1	0
Nay Pyi Taw	13	1	0
Rakhine	16	1	0
Sagaing	36	1	0
Shan	54	1	0
Tanintharyi	9	1	0
Yangon	44	1	0
Union	0	0	1
Total	325	12	1

Capital Investment and recurrent expenditure requirements

Based on the needs data analysed above and cost data derived from information provided by the various Government Departments, the overall capital investment requirements and the recurrent costs are summarised in Table S5.

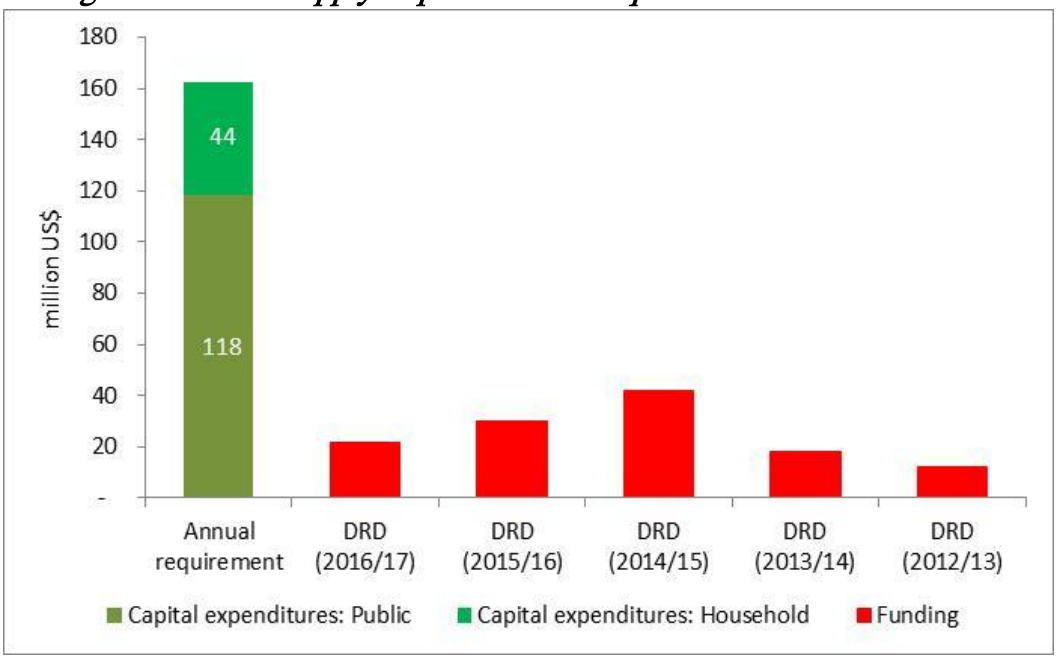
These overall totals can be offset by contributions from various sources, but primarily from households and communities. This is shown for rural water supply in Figure S1, and for rural sanitation hardware in Figure S2. Funding for sanitation software (CLTS, sanitation marketing etc.) would be from public (Government) funds. The recent and present funding for DRD include development partner funding.

Most of the recurrent costs are expected to be paid by users of the services. For this it will be necessary at local government level to set tariffs that will cover the operating and maintenance costs of the services.

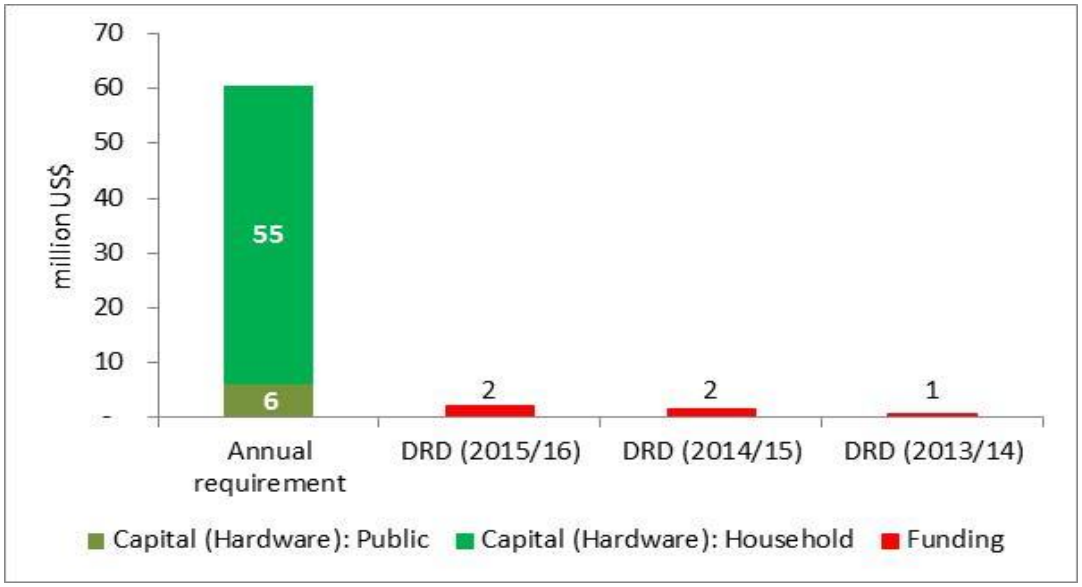
Table S5. Summary of expenditure requirements for the WASH sector, 000 US$

Component	Annual costs			Costs (2017-2030)
	Capital	Recurrent	Total	
Sector management				
Capacity building	1,607		1,607	22,491
Operations		16,339	16,339	228,743
Sub-total	1,607	16,339	17,945	251,235
Rural WASH				
Water supply	162,648	242,010	404,658	5,665,214
Toilets	60,603	44,903	105,506	1,477,078
Solid waste	12,968	66,177	79,145	1,108,030
CLTS	5,258	-	5,258	73,613
Sanitation marketing	26,490	-	26,490	370,863
Sanitation research	107	-	107	1,500
Hygiene promotion	11	30,238	30,249	423,485
Sub-total	268,085	383,328	651,413	9,119,783
WASH in schools				
Water supply	24,891	10,022	34,913	488,776
Toilets	10,105	61,925	72,030	1,008,419
Hygiene	118	8,821	8,939	125,145
Sub-total	35,114	80,768	115,881	1,622,339
WASH in health facilities				
Water supply	2,870	902	3,772	52,808
Toilets and wastewater treatment	12,542	14,576	27,118	379,657
Clinical waste treatment	384	225	609	8,522
Sub-total	15,796	15,703	31,499	440,987
Emergency WASH				
Planning	71	86	157	2,200
Contingency stocks	129	59	187	2,622
Sub-total	200	144	344	4,822
Total	320,801	496,282	817,083	11,439,166

Figure S1: Water supply Capital: Annual requirements and contributions



FigureS2. Funding requirements and current finance for the rural toilets - hardware



Time frame

The implementation of the Investment Plan is proposed in three phases:

- Phase 1 (2017-2018): a transition period in which funds of about of about US$207 million dollars for capital costs need to be raised. About US$390 million/year is required for recurrent costs, of which US$284 million for rural WASH would be paid by service users.
- Phase 2 (2019-2023): scaling-up of implementation of the Investment Plan. Capital needs average about US$383 million/year. Recurrent costs would increase in line with the increase of service provision, again, mainly paid by services users.
- Phase 3 (2024-2030): steady completion of the program. An average of US$309 million/year is expected to be spent on capital costs for the sector. Recurrent costs average about US$498 million, of which US$383 million are for rural WASH, most of which would be raised from user services charges.

1. Introduction

This Investment Plan defines the costs of achieving and sustaining the goal and objectives set out in the National Strategy for Rural Water Supply, Sanitation and Hygiene (WASH), WASH in Schools and WASH in Health Facilities (2016). It was prepared using the same consultative process, guided by a Task Force chaired by the Director General of the Department of Rural Development, with representatives from Ministry of Livestock, Fisheries and Rural Development, the Ministry of Education, the Ministry of Health and other relevant departments and agencies of the Government of Myanmar (GoM), development partners, and other stakeholders with the support of the United Nations Children's Fund (UNICEF).

The Investment Plan covers WASH in rural areas, schools (primary tohigh school in rural and urban areas), health facilities (township hospitals down to sub-health centres), and emergency preparedness. It estimates investment requirements, and funding availability from government, development partners and other sources, and financing gaps. It attempts to generate comprehensive estimates of funding requirements by including both capital and recurrent costs. Capital expenditures are further divided into hardware (equipment and facilities) and software (training, technical assistance, preparation, etc.). In addition, a distinction is made between new investments (expenditures that are provided for people or institutions that previously did not have access to facilities)and replacement investments(expenditures for replacement of existing worn-out facilities).The Plan proposes a phasing of expenditures over the planning period.

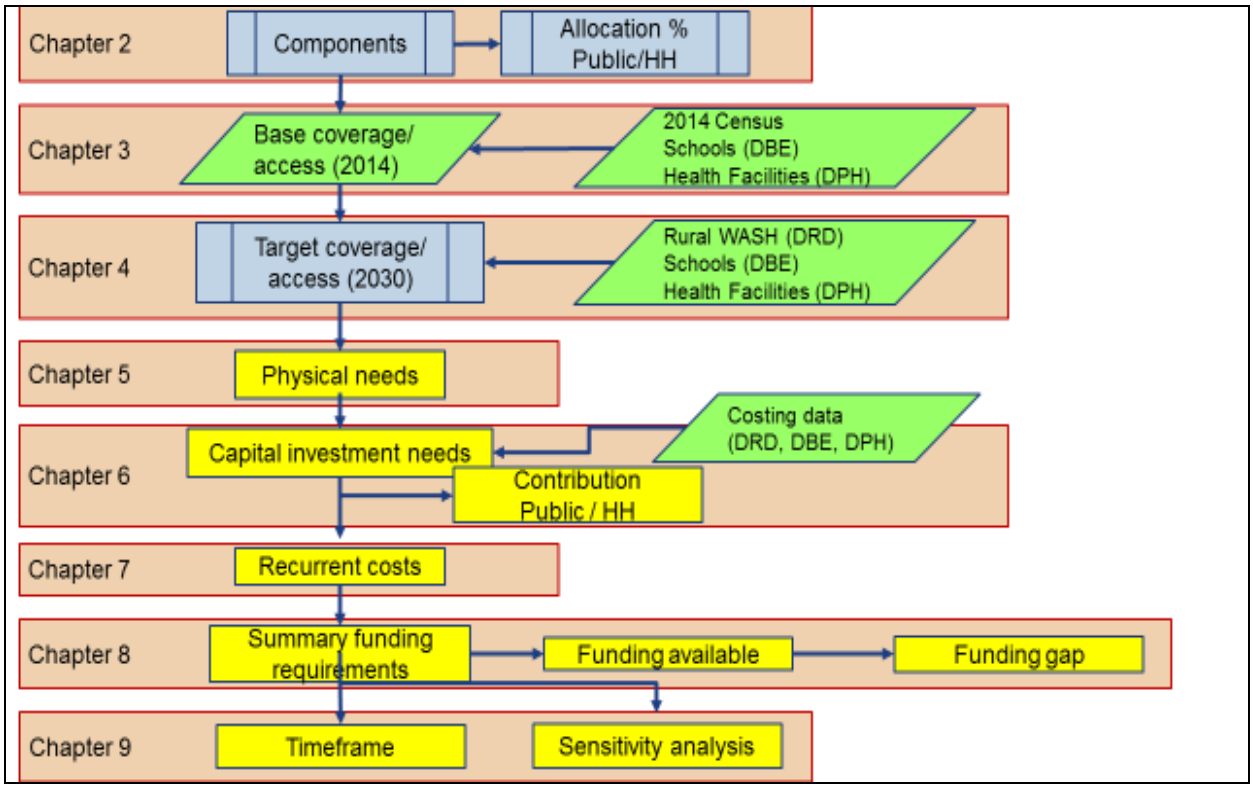
Structure of the Investment Plan Report

This Investment Plan is organized as follows:

- Section 1 provides an introduction to and overview of WASH financing and relevant concepts and approaches, and describes the methodology used for the Planning.
- Section 2 describes the different components of the investment plan.
- Sections 3 and 4 provide current and target (2030) coverage and access rates.
- Section 5 presents the estimates of the physical needs based on current and target access rates.
- Sections 6 and 7 translate physical requirements into required capital and recurrent expenditures.
- Section 8 summarizes the funding requirements and compares this information with available financing.
- Section 9 outlines a strategy for the sector and with important actions for the near future.
- Appendix 1 gives the definitions of terminology used in the Report
- Appendix 2 explains the methods used for computing the investment needs and the data used.
- Appendix 3 gives background information on approaches to investment planning, challenges for investment planning, financing policy issues, and subsidies.

The Flowchart in Figure 1 shows where the different elements of the Investment Plan are located in this Report.

Figure 1. Flow of the investment plan



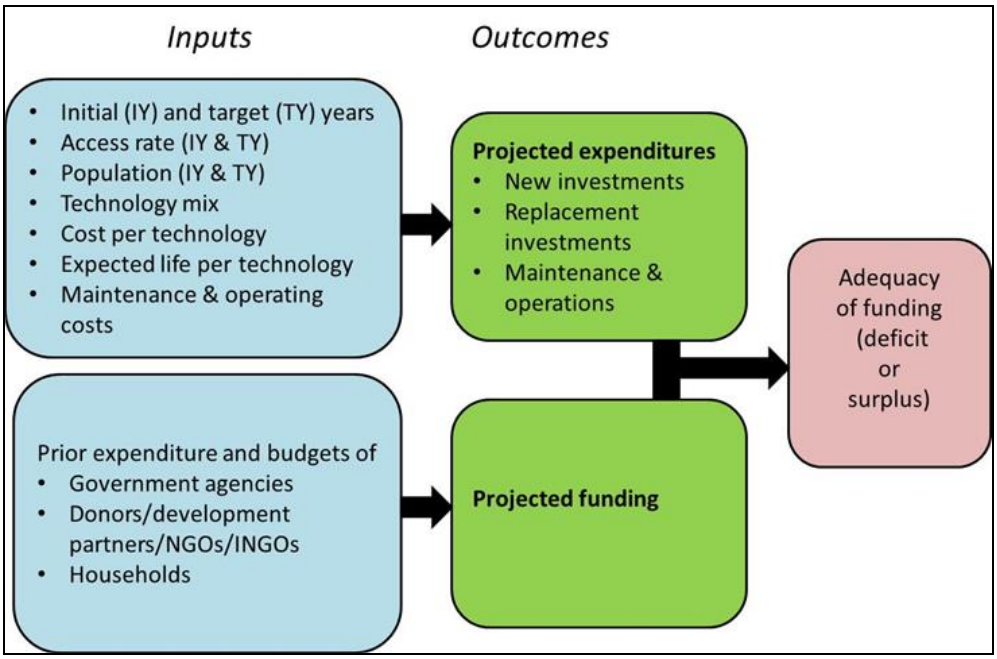
Approach

As far as possible, given serous limitations in the data available, the Investment Plan is based on the Life Cycle Cost approach[1]. It estimates investment requirements, and funding availability from government, development partners and other sources, and financing gaps, as shown in Figure 2. It attempts to generate comprehensive estimates of funding requirements by including both capital and recurrent costs. Capital expenditures are further divided into hardware (equipment and facilities) and software (training, technical assistance, preparation, etc.). In addition, a distinction is made between new investments (expenditures that are provided for people or institutions that previously did not have access to facilities) and replacement investments (expenditures for replacement of existing worn-out facilities). The Plan proposes a phasing of expenditures over the planning period.

Various techniques were used to estimate expenditure requirements. In some instances, calculations were straightforward and only needed simple formulae. In other cases however, in particular with facilities and equipment that have finite lives, the estimation process was rather complex and required the use of a costing tool that was developed by the World Bank (2015).

[1]Catarina Fonseca, Franceys et al., 2011, Briefing Note 1a: Life-cycle costs approach: Costing sustainable services, IRC International Water and Sanitation Centre, NL – see Appendix 3.

Figure 2. Flow of inputs and outputs with the World Bank costing tool



The World Bank costing tool was used extensively in this investment plan for hardware facilities that have finite lives. It is a spreadsheet file that has been used extensively in the estimation of spending requirements and financing gaps for the WASH sector of the East Asian region, including Myanmar (World Bank, 2015; World Bank and UNICEF, 2015). The tool requires information on population and its expected growth, technology mix in the initial and target years, unit costs of technologies, and expected life of technologies. Information on the population, and composition and expected life of technologies are needed to determine the physical requirements. This result refers to people who require access because they (a) did not have access to facilities in the initial year, (b) need an upgrade of their existing facilities and/or (c) require replacement of their existing facilities. Estimates are then converted to monetary units by applying the unit costs of facilities.

The preparation of the investment plan required a considerable amount of data. In many instances, severe data limitations required the use of assumptions or innovative methods in order to generate estimates. In attempting to reduce the inherent weaknesses of such adjustments, data inputs were validated though meetings and workshops with experts and stakeholders in the sector.

2. Scope, contributions and timing

The Investment Plan covers WASH in rural areas, schools, hospitals and health centres, and emergency preparedness. Rural areas include urban wards in sub-townships where there is no Township Development Committee (TDC)[2].

Table 1 shows the specific components for which costs were explicitly estimated in the plan.It also lists some WASH components for which estimates were not generated in this document.

Table 1. Components of investment plan

Component (regional coverage)	Estimated	
	Capital	Recurrent
Sector management and administration [a]		
Institutional capacity development	x	
Management information systems (monitoring)	x	x
Rural Water supply (14 states/regions + NPT)		
Hardware		
Water supply: abstraction, treatment, storage and distribution [b]	x	x
Metered household connections, faucets and fixtures in homes		x
Software	x	
Rural Sanitation (14 states/regions + NPT)		
Toilets/latrines [b]	x	
Wastewater treatment		
Sanitation marketing		
Formative research	x	
Implementation	x	
Community Led Total Sanitation (CLTS)	x	
Hygiene promotion		
Solid waste management [c]	x	x
School sanitation (National)		
Level		
Pre-primary school		
Primary school	x	
Middle school	x	
High school	x	
Tertiary education institutions		
Costcomponent[d]		
Water supply [c]	x	
Toilets/latrines [b]	x	
Hygiene promotion training of teachers [c]	x	
Provision of classroom/curriculum hygiene education		
Health facilities (National)		
Level[f]		
Sub-health center	x	
Rural health center	x	
Station hospital	X	
Township hospital	X	
Others		

[2]One sub-township with no TDC, plus two TDCs where there is no information on the status of the TDC.

Component (regional coverage)	Estimated	
	Capital	Recurrent
Cost component[d]		
Water supply [c]	X	
Toilets/latrines [b]	X	
Wastewater treatment [b]	X	
Clinical waste management facilities (incinerators) [b]	x	
Emergency WASH (National)		
National planning		
Initial preparedness plans [e]	X	
Annual revisions/adjustments		
Prepositioned emergency kits/stocks		
Warehousing		
Replenishing supplies		

Notes

[a] This refers to costs of coordinating and managing the program such as human resources, office operations, transport costs

[b] Represents capital and recurrent costs.

[c] Represents capital and recurrent costs, and hardware and software costs.

[d] Costs will be estimated for each level.

[e] This refers to preparedness plans for the provision of WASH services to people affected by natural disasters and emergencies.

[f] Urban health centres are included in either rural health centres or station hospitals.

Capital and recurrent costs will be shared by households and the public sector, which for the purpose of this Investment Plan combines government, non-government organizations, development partners, philanthropic support from the private sector and other institutions. Allocation of the proportion of costs to be provided by each group is a decision that needs to take account off actors such as affordability and acceptability to each group, including the relative poverty levels of groups within the communities in different states and regions.

Table 2 shows the planned division of costs among the groups, as decided by the Task Force[3]. There are three important points about the entries in the table that need to be explained:

- User fees charged on households could incorporate payments for the installation of facilities. This raises the possibility that households might be the group that ultimately pays for the facilities. Because the precise value of the user fees have not yet been determined, Table 2 only recognizes the group that initially paid for the construction of the facility and not who eventually pays for it.
- The Investment Plan proposes that the public sector pays 10% of the hardware costs of latrines. This is effectively a social subsidy to assist the poorest rural households in the country.
- The Investment Plan proposes that 30% of hardware costs of rural water supply facilities will be paid for by households. This is an average figure for estimation purposes. The actual rate of contribution should be set by States and Regions taking into account the local socio-economic conditions and relative poverty.
- The Investment Plan proposes that households pay 20% of the costs of constructing toilets and water supply facilities in schools and health centres. Moreover, households will pay 10% of the recurrent costs of such facilities.

[3] Task Force Meetings on 4 May and 26 May, 2016

Table 2. Allocation of capital and recurrent costs

Component	Capital		Recurrent	
	Household	Public	Household	Public
Rural WASH sector				
Sector management and administration	0%	100%	0%	100%
Rural Water supply				
Hardware	30%	70%	95%	5%
Software	0%	100%	n/a	n/a
Rural Sanitation				
Toilets/latrines	90%	10%	100%	0%
Sanitation marketing	0%	100%	n/a	n/a
CLTS	0%	100%	n/a	n/a
Hygiene promotion	0%	100%	0%	100%
Solid waste management	0%	100%	100%	0%
Schools				
Toilets	20%	80%	10%	90%
Water supply	20%	80%	10%	90%
Hygiene promotion	0%	100%	0%	100%
Health facilities				
Water supply	20%	80%	10%	90%
Toilets	20%	80%	10%	90%
Wastewater	0%	100%	0%	100%
Clinical waste disposal	0%	100%	0%	100%
Emergency WASH	0%	100%	0%	100%

Planning period and phasing

The Investment Plan is designed to guide spending and actions for the WASH sector to the year 2030. The years 2016 to 2018 are a transition period which focuses on the development and strengthening of administrative systems, fund raising, bidding and other initial tasks to create the capacity for full development of WASH services. Table 3 summarizes the different tasks over the period. The description of the different task codes in the table is provided below.

T1: Transition period: Capacity strengthening and development of administrative systems, fund raising, bidding, etc.

Development and implementation of software for sanitation

Capital expenditures take place so that access rates will not change; i.e. access to facilities will just grow at the same rate as the population. Recurrent expenditures for existing facilities will continue in this period.

T2: Main provision of new and replacement infrastructure and expansion of service.

Table 3. Timing of tasks in the investment plan

Description	Year								
	2016	2017	2018	2019	2020	2021	2022	2023	2024 - 2030
Summary	Transition								
			Implementation period						
Components									
Rural water supply									
Hardware	T1	T1	T1	T2	T2	T2	T2	T2	T2
Software	T1	T1	T1	T2	T2	T2	T2	T2	T2
Rural sanitation									
Hardware: Toilets	T1	T1	T1	T2	T2	T2	T2	T2	T2
Software: CLTS	T1	T1	T1	T2	T2	T2	T2	T2	T2
Software: Formative research for sanitation marketing	T1	T1	T1						
Software: Sanitation marketing	T1	T1	T2	T2	T2	T2	T2	T2	
Software: Hygiene promotion	T1	T1	T1	T2	T2	T2	T2	T2	T2
Solid waste management	T1	T1	T1	T2	T2	T2	T2	T2	T2
Schools									
Water supply	T1	T1	T1	T2	T2	T2	T2	T2	T2
Sanitation: Latrines& WWT	T1	T1	T1	T2	T2	T2	T2	T2	T2
Hygiene promotion training of teachers	T1	T1	T1	T2	T2	T2	T2	T2	T2
Health facilities									
Water supply	T1	T1	T1	T2	T2	T2	T2	T2	T2
Sanitation: Latrines& WWT	T1	T1	T1	T2	T2	T2	T2	T2	T2
Clinical waste management facilities	T1	T1	T1	T2	T2	T2	T2	T2	T2
Emergencies									
Preparation of WASH plans	T1	T1	T2	T2					
WASH kits for each region/state	T1	T1	T2						
WASH contingency stocks in 3 regions	T1	T1	T2						

3. Current coverage and access

Rural water supply, sanitation and hygiene

The most recent and comprehensive data set available for the Investment Plan is the 2014 Census Report and data sheets. The alternative would be the Joint Monitoring Program (JMP)[4]data, but that is based on sample surveys conducted in 2010 with projections to 2015.Table 4presents access rates for rural WASH based on the 2014Census.

Issues with the data

Some concerns with the available data are as follows:

- **Functionality**: There is limited information on the functionality and age of existing facilities. Both the JMP and 2014 Census are based on self-reported surveys: respondents were asked their source of drinking water and type of toilet. For water supply, respondents were likely to have reported what they were using at the time of the question, so an improved facility that was not functioning at the time may not have been accounted for. This implies that the existence of improved facilities may be higher than reported, albeit in need of some repair to make them functional again. In the case of sanitation, access might have been over-reported. A UNICEF (2011) survey of 24 townships found that about 7% of latrines in rural areas were not functional.
- **Solid waste management (SWM) practices**: State/region level data on access rates to improved SWM are not available. Informal information indicates that such services are not operated in rural areas.
- **Hygiene practices**: There is no national or state/region level data on improved hygiene practices. There is some information on hygiene practices in a UNICEF (2011) survey 24 townships in Myanmar. Some key results from the survey are: (a) 11.7% of toilets were "not clean", (b) 10.9% of individuals in rural areas did not wash their hands after defecating, (c) 33% of rural households disposed of their kitchen waste in a river, stream, pond or field and about 36.8 burned their kitchen waste, and (d) 77.5% of the respondents in rural areas were not aware of the "Four Cleans Program".
- **Areas where not all people were enumerated**: For various reasons some populations in Rakhine, Kachin and Kayin were not counted in the Census. The Main Census Report estimated that a total of 1,206,353 people were not enumerated (2.34 percent of the population). However, the analysis and presentation of the detailed information in the Census data is based on data provided by the enumerated population only.[5] This means that the data tables do not include the access to service of these people. To include these unenumerated populations the average percentage coverage for the state has been applied to the numbers estimated in the Census Report[6].

[4]Joint Monitoring Program of WHO and UNICEF: http://www.wssinfo.org/documents/?tx_displaycontroller[type]=country_files

[5] The 2014 Myanmar Population and Housing Census: The Union Report, Census Report Volume 2

[6]Rakhine: 1,090,000; Kachin: 46,600; Kayin: 69,753.

Table 4. Access to water supply and sanitation facilities, % of population

State/ region	Water supply				Sanitation			
	Improved facilities			Unim-proved facility[b]	Improved facilities		Unim-proved facility[c]	No facility
	Tap/ piped water	Tubewell or borehole	Other improved [a]		Flush toilet	Water-sealed toilet		
Ayeyawaddy	0%	33%	13%	53%	0%	72%	13%	14%
Bago	1%	49%	21%	29%	1%	70%	17%	13%
Chin	65%	0%	1%	34%	0%	69%	11%	19%
Kachin	6%	30%	30%	34%	1%	81%	15%	3%
Kayah	24%	3%	21%	52%	1%	86%	5%	9%
Kayin	4%	3%	48%	45%	1%	60%	8%	30%
Magway	4%	50%	20%	25%	1%	65%	14%	20%
Mandalay	4%	52%	24%	19%	2%	72%	5%	21%
Mon	6%	3%	51%	39%	1%	72%	6%	21%
Nay Pyi Taw	2%	55%	20%	23%	2%	82%	6%	10%
Rakhine	2%	2%	28%	67%	1%	23%	5%	71%
Sagaing	6%	49%	24%	21%	1%	67%	13%	19%
Shan	22%	5%	15%	59%	1%	54%	31%	14%
Tanintharyi	9%	5%	38%	48%	1%	59%	21%	20%
Yangon	4%	30%	9%	57%	1%	81%	10%	8%
Union	6%	33%	22%	39%	1%	66%	14%	19%

Source of basic data: 2014 Census

Notes:

[a] Other improved water supply facilities include protected wells and springs, and ponds that have a treatment system.

[b] Unimproved water supply facilities include water sourced from unprotected wells/springs, pools/ponds/lakes, rivers/streams/canals, waterfalls and rainwater, bottled/purified water, tanker/ truck, and other sources.

[c] Unimproved sanitation facilities include traditional pit latrine, bucket latrines and other facilities.

School WASH

There is limited reliable information on access rates on WASH in schools. While there are likely to be water supply and sanitation facilities in many of the schools, national data on the sufficiency and functionality of these facilities in primary, middle and high schools is lacking.

The limited information available for school WASH is:

- The Myanmar Water, Sanitation and Hygiene Sector Situation Analysis Report[7] quotes a report of the Ministry of Health (2011) which showed that 81% of schools had safe water supply. However, it notes that water supply facilities are not necessarily within school grounds, sufficient in terms of quantity, or of good quality.
- A survey of selected primary schools in Myanmar by UNICEF (2010) found the following.
  - 59% of schools had "sufficient water supply". Definition of sufficient is not clear.
  - 69 students per toilet and only 65% of the toilets were functional.
  -

[7] World Bank and UNICEF, 2015

Health facilities WASH

The recent Nation-wide Service Availability and Readiness Assessment (SARA) of Myanmar in 2015 (Ministry of Health, 2016) provides some information on availability of basic amenities, including improved water supply and improved sanitation (Table 5). The data does not, however, define adequacy in terms of the definitions of service set in the new WASH Strategy, or functionality of facilities. Other issues with the data are:

- Data for rural health centres is combined with urban health centres.
- Data on hazardous waste management facilities and solid waste management is not covered in the basic amenities.

Table 5. Availability of basic amenities in health facilities (% of facilities)

Facility type	Improved water source	Sanitation facilities
Township/sub-township hospital	91%	100%
RHC/UHC	93%	98%
Sub-RHC	57%	79%

Source: Ministry of Health (2016)

4. Goal, objectives and targets for services and access

The strategic goals and objectives set in the National Strategy for Rural WASH, WASH in Schools and WASH in Health Facilities are shown in Table 6. These targets are shown in quantitative terms in Tables 7 and 8.[8]

Table 6. Strategic Goal, Strategic Objectives and Components

Strategic Goal	**To contribute to improved socio-economic life of all the rural populace by 2030 through provision of equitable, effective, efficient and affordable services for water supply and sanitation and safe hygienic behaviour**
Strategic objectives and components	
	Climate Change Adaptation and Disaster Risk Reduction 0.1: Disaster risk reduction and climate change adaptation
1. Water supply	All the rural populace will have access to effective, efficient and affordable services for improved water supply by 2030 1.1: Water resource management 1.2: Water supply design, planning and infrastructure 1.3: Water quality standards and water safety plans 1.4: Operation and maintenance
2. Sanitation	All the rural populace will live in open defection free communities; have physical and affordable access to sanitation that is safe, hygienic, secure, socially and culturally acceptable and that provides privacy and ensures dignity ; will use and maintain the sanitation facilities; and will dispose of the domestic solid waste through effective, efficient and affordable services and other arrangements for solid waste recycling and disposal by 2030 2.1: Increasing access to household sanitation and eliminating open defecation 2.2: Increased range of technical options 2.3: Operation and maintenance of sanitation facilities 2.4: Solid waste management
3. Hygiene behaviour change	All the rural populace will practice basic safe hygiene behaviour including use of improved toilets, washing hands with soap at critical times, safe disposal of infants' faeces and safe water storage and handling 3.1: Adoption of safe hygiene behaviour 3.2: Safe disposal of infants' faeces 3.3: Environmental sanitation
4. WASH in schools	All schools provide a healthy physical learning environment through the provision, operation and maintenance of safe water supplies, adequate toilet facilities and handwashing facilities, and solid waste disposal facilities for all students and staff, together with promotion of safe hygiene practices 4.1: School WASH facilities 4.2: School hygiene behaviour change 4.3: Environmental sanitation in Schools

[8] These targets were simplified for the investment plans. The interested reader may refer to the National Strategy for Rural WASH, WASH in Schools and WASH in Health Facilities for more details.

5. WASH in health facilities	All health facilities have adequate water supplies, toilets and handwashing facilities for patients, carers and staff, and clinical and hazardous waste disposal facilities, waste water drainage and treatment appropriate for the type of health facility, and maintain a clean environment. 5.1: Water supply in Health Facilities 5.2: Sanitation in Health Facilities 5.3: Clinical and hazardous waste disposal 5.4: Waste water drainage, treatment and disposal
6. WASH in emergencies and humanitarian action	Effective preparedness and response for the provision of water supply, sanitation and handwashing facilities, and hygiene promotion for people affected by natural disasters, conflict and other emergencies 6.1: Emergency preparedness for WASH 6.2: Humanitarian response 6.3: Early recovery
7. Institutional arrangements	By the end of 2018, the institutional arrangements for Government, private sector and NGOs at State, Region, District and Township levels and communities at Village Tract level, and the legal instruments and human resources will be in place and able to increase and to sustain services for water supply, sanitation and hygiene practices 7.1: Sector management and coordination 7.2: Human resources and capacity development 7.3: Monitoring and management information systems 7.4 Research, development and innovation
8. Financing	Funding for capital and recurrent expenditure will be available in order for WASH services to be provided and operated sustainably 8.1: Financing of capital costs 8.2: Financing of recurrent costs 8.3: Advocacy for funding

Table 7.Sanitation Baseline and Targets (%)

Component	2015	2020	2025	2030
Rural Villages				
Open defecation free(declared ODF)	0.3	92	97	100
Solid waste management in villages [a]				100
Rural Household toilets [b]				
Safe sanitation	67.3			100
Schools				
Latrines adequate for boys and girls separately		40	65	100
Hand washing facilities		40	65	100
Hospitals and health facilities [c]				
Water supply				100
Toilets				100
Wastewater treatment facilities [d]				100
Clinical/hazardous waste disposal				100

Notes:
[a] Includes collection of solid waste, composting of biodegradable waste, recycling and safe disposal of residues.
[b] This assumes one improved toilet per household.
[c] The standards are stated in Table 5.4 of the WASH Strategy.
[d] Applies to station and township hospitals only.

Table 8. Water Supply Targets (%)

Component	2015	2020	2025	2030
Rural community supply [a]				
Access to potable water supplies and improved water for other domestic uses	61	70	85	100
School supply				
Improved water supply		40	65	100
Rural health centre				
Improved water supply		50	75	100
[a] Assumes one water supply source per village				

The other targets and activities in this investment plan are as follows.

- Rural WASH
  - Hygiene promotion activities in all rural areas
  - CLTS in all rural areas
  - Investments in sanitation marketing and research in all regions and states
- School WASH:
  - Training of all academic personnel who teach hygiene-related courses
  - Extra-curricular hygiene program for all schools
- Emergency WASH
  - Preparedness plans for the entire country
  - WASH contingency stocks in all regions and WASH emergency supplies in Nay Pyi Taw, Yangon and Mandalay

5. Physical requirements

This section presents the estimated physical requirements for meeting the targets specified in Section 4. The units for these requirements are expressed in various ways, depending on the type of physical requirement or service. The specific units are as follows:

- facilities (toilets or water supply systems or incinerators or wastewater treatment facilities)
- persons
- households
- geographical units (villages, townships, states/regions)

Physical requirements were calculated using the following information:

- current access rates
- target or desired access rates in 2030
- existing and projected population estimates
- expected life of facilities(where necessary)

The limited life of many facilities (e.g. toilets) means that physical requirements will include the replacement of fully depreciated hardware.

Given the difficulties in assembling a complete set of inputs for the calculations, key assumptions for each component are explained below. Specific values of the inputs that were used in the calculations are shown in Annex 2.

Rural Water supply

Intermediate outputs

Table 9 shows the estimated number of people who will require access to improved water supply in order to meet the targets for 2030. Some of the results are:

- A total of 44million people (3 million/year) will require access from 2017to 2030.
- About 69%of these (2,173/3,161) will require water supply facilities to replace existing systems that will reach the end of their practical life during the period. The need for replacement investments explains why the number of people requiring access is not very different from the population of Myanmar despite high initial access rates.
- The states/regions with the highest requirements (Ayeyawaddy, Bago, Sagiang and Shan) are also the most populous states/regions of the country. Rakhine, which has a relatively small population, also has relatively high requirements because of its very low initial access to improved water supply systems.

Table 9. Number of persons requiring access to improved water supply facilities, 000 persons

State/region	Annual		New and replacement	
	New	Replacement	Annual	2017-2030
Ayeyawaddy	196	348	544	7,615
Bago	75	240	315	4,417
Chin	8	33	41	576
Kachin	21	70	92	1,286
Kayah	7	17	25	346
Kayin	38	73	111	1,554
Magway	55	166	221	3,095
Mandalay	51	178	229	3,205
Mon	38	99	137	1,914
Nay Pyi Taw	12	38	49	689
Rakhine	131	157	288	4,036
Sagaing	58	195	253	3,541
Shan	172	324	496	6,949
Tanintharyi	35	76	111	1,550
Yangon	90	159	249	3,489
Total	**988**	**2,173**	**3,161**	**44,260**

Source: Investment Plan calculations based on 2014 Census

Assumptions

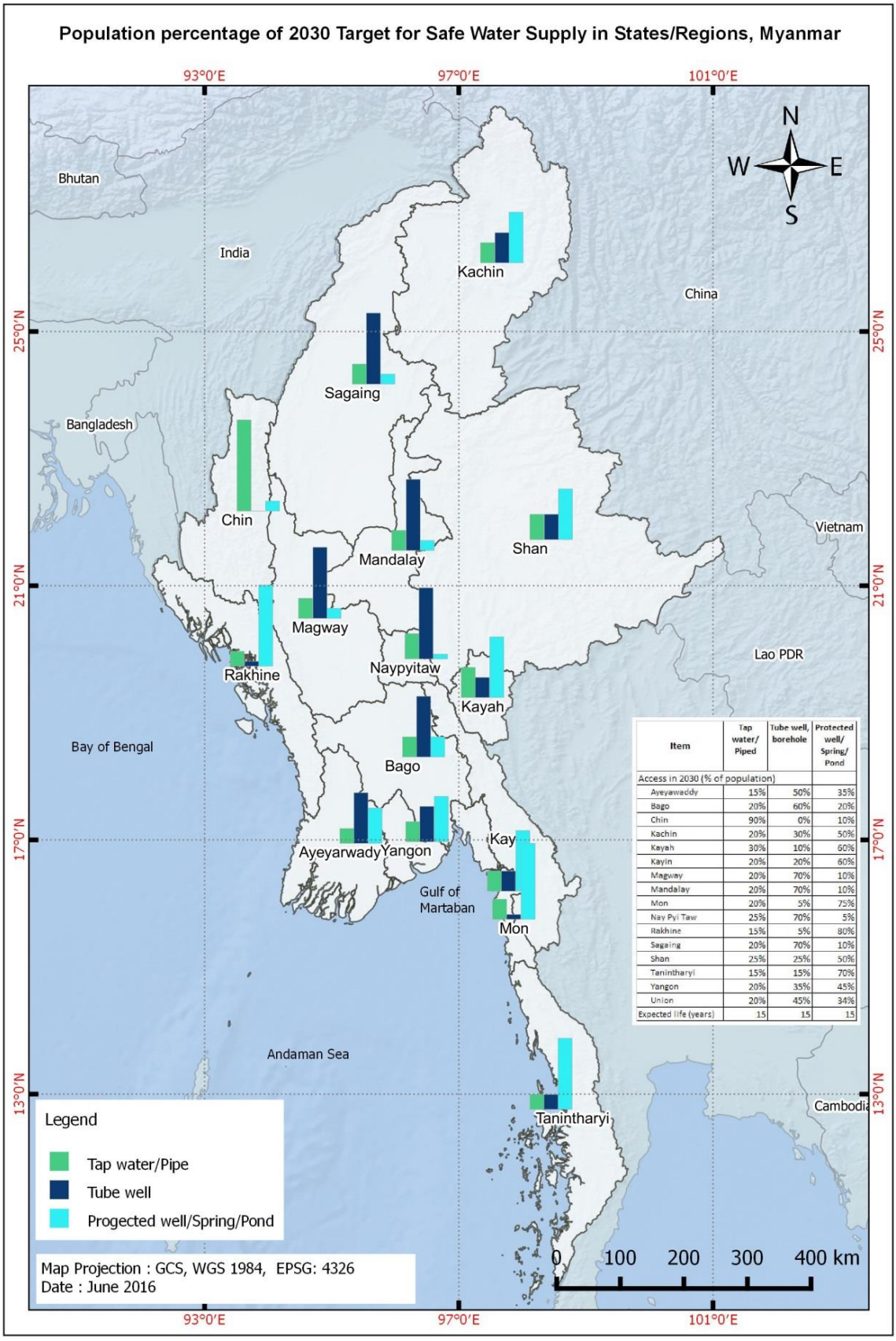
The key assumptions used in the calculation of the requirements are as follows:

- Populations for 2016, 2018 and 2030 were projected from the population in the 2014 Census, (GoM, 2015) using growth rates for rural Myanmar from the World Statistics Pocket Book (United Nations, 2014)[9]. The information on population growth is not disaggregated across regions, so the analysis assumes that the rural population of each region is growing at the same pace. The population data used in the analysis is presented in Annex Table 2.1.
- Access to improved water supply facilities during a transition period from 2016 to 2018 is the same as in 2014.[10] The change in the number of people that have access to facilities will only be consistent with changes in the population and with the replacement of facilities that are expected to wear out during the period. Access rates and the major investment necessary are planned to increase from 2019 until the entire rural population has access to improved facilities in 2030.
- The proposed types of improved water supply facilities in 2030 are shown in Figure 3 and Annex Table 2.2. Compared to 2014, a larger proportion (20%) of the rural population will have access to piped water by 2030.
- The expected lives of water supply facilities are presented in Annex Table 2.2. The values were provided by the Department of Rural Development (DRD).

[9] There are disaggregated growth rates for rural populations in the Census. A combined national growth rate is estimated, but this does not account for differences, including rural-urban migration.

[10] See Table 4 for the details.

Figure 3. Target water supply facilities by region/state in 2030



Item	Tap water/ Piped	Tube well, borehole	Protected well/ Spring/ Pond
Access in 2030 (% of population)			
Ayeyawaddy	15%	50%	35%
Bago	20%	60%	20%
Chin	90%	0%	10%
Kachin	20%	30%	50%
Kayah	30%	10%	60%
Kayin	20%	20%	60%
Magway	20%	70%	10%
Mandalay	20%	70%	10%
Mon	20%	5%	75%
Nay Pyi Taw	25%	70%	5%
Rakhine	15%	5%	80%
Sagaing	20%	70%	10%
Shan	25%	25%	50%
Tanintharyi	15%	15%	70%
Yangon	20%	35%	45%
Union	20%	45%	34%
Expected life (years)	15	15	15

Rural Sanitation and Hygiene

Rural sanitation has hardware and software components. Hardware components refer to latrines and facilities for solid waste management while software components include sanitation marketing (with formative research for development), CLTS, and hygiene promotion programs.

Intermediate outputs: Hardware

The physical requirements for hardware (presented in Table 10) indicate:

- Nearly 39 million people (or 3 million persons per year) will need to construct improved toilets. The majority of the requirements are for replacing latrines that are expected to reach the end of their practical life during the period.
- Over12 million households will require solid waste management facilities and services. Most of the costs are for new facilities, as there are no reported services (see Section 3 and the assumption below).
- For toilets and SWM, the most populous regions/states generally have the largest requirements.

Table 10. Physical requirements for hardware in rural sanitation

State/region	Annual		New and replacement	
	New	Replacement	Annual	2017-2030
	Rural sanitation (thousands of persons)			
Ayeyawaddy	99	274	373	5,219
Bago	76	201	277	3,881
Chin	8	19	27	378
Kachin	11	43	54	751
Kayah	2	8	10	141
Kayin	32	71	103	1,438
Magway	76	178	254	3,550
Mandalay	71	216	287	4,022
Mon	26	75	100	1,404
Nay Pyi Taw	8	35	43	598
Rakhine	150	150	300	4,200
Sagaing	93	234	326	4,569
Shan	131	250	381	5,328
Tanintharyi	29	60	89	1,244
Yangon	27	103	130	1,818
Total	836	1,917	2,753	38,540
	Solid waste management (thousands of households)[a]			
Ayeyawaddy	106	34	140	1,959
Bago	74	24	98	1,375
Chin	6	2	8	109
Kachin	15	5	20	278
Kayah	3	1	5	65
Kayin	21	7	28	389
Magway	65	21	86	1,200
Mandalay	74	24	99	1,381
Mon	25	8	34	469
Nay Pyi Taw	15	5	20	279
Rakhine	52	17	69	966

State/region	Annual		New and replacement	
	New	Replacement	Annual	2017-2030
Sagaing	75	24	99	1,389
Shan	73	24	97	1,353
Tanintharyi	18	6	24	329
Yangon	42	14	56	782
Total	664	216	880	12,323
Note: The Investment Plan assumes that investments in solid waste management facilities will commence in 2019 after a period of research into needs and options				

Assumptions: Hardware

The key assumptions used in the calculation of the requirements are:

- The percentage access to improved toilets from 2016 to 2018 will be the same as in 2014.[11] This means that any changes in the number of people that have access to facilities will only be consistent with changes in the population and with the replacement of facilities that expected to wear out during the period. Access rates and investment are planned to increase from 2019 until the entire rural population has access to improved facilities in 2030.
- The types of improved toilets in 2030 are shown in Annex Table 2.2. Compared to 2014, a larger proportion of the population (10%) will have access to flush toilets in 2030. The use of flush toilets with septic tanks means that additional services for wastewater and septage management may be needed, but these have not been estimated in this Investment Plan.
- The number of toilets is based on one per household. It is recognised that this may not fit with cultural practices and limitations of space in some areas, but it is necessary for estimating purposes. There is insufficient information on shared toilets to make a more detailed estimate.
- The expected life of toilets is based on the Myanmar Water, Sanitation and Hygiene Sector Situation Analysis Report (World Bank and UNICEF, 2015):flush toilets and water-sealed toilets are expected to last for 20 years and 10 years, respectively.
- For solid waste management, there is no service or facilities in rural areas at present. The number of households in 2014(Annex Table 2.1) isderived from the 2014 Census by dividing population by the average household sizes. This is extended to 2016, 2018 and 2030 using the population growth rate from the UN World Statistics Pocket Book (2014)[12]. The estimate for the expected life of hardware facilities of 20 years is derived from a solid waste management program in Vietnam, which wasthe subject in a World Bank study (Nguyen et. al., 2012).[13]

Key outputs: Software

The planned physical requirements for sanitation software and hygiene promotion are shown in Table 11. It indicates:

- All rural villages of Myanmar will be exposed to CLTS.

[11] See Table 4 for the details.

[12] United Nations, 2014. World Statistics Pocketbook 2014 Edition. Series V, No. 38. Statistics Division, Department of Economic and Social Affairs, United Nations, New York

[13] The program involves the collection and disposal of waste in a sanitary landfill.

- Formative research for sanitation marketing will be implemented in all regions over a period of two years.
- Sanitation marketing will be implemented in each region for the first five years of the planning period.
- Capital expenditure in the initial year of the hygiene behaviour program will involve the preparation of materials, protocols for trainings and pilot testing. After the first year, hygiene promotion programs will be implemented 22 times in each township – three times per year for the first five years and once a year until 2030.

Table 11. Physical requirements – software in rural sanitation and hygiene (2017-2030)

State/region	CLTS [a]	Sanitation research [b]	Sanitation marketing (years)	Hygiene behavior program	
				Township cycles of promotion/training [c]	Development of materials [d]
Ayeyawaddy	11,908	1	5	572	
Bago	6,495	1	5	572	
Chin	1,346	1	5	572	
Kachin	2,582	1	5	572	
Kayah	511	1	5	572	
Kayin	2,063	1	5	572	
Magway	4,795	1	5	572	
Mandalay	4,781	1	5	572	
Mon	1,150	1	5	572	
Nay Pyi Taw	796	1	5	572	
Rakhine	3,760	1	5	572	
Sagaing	6,005	1	5	572	
Shan	14,348	1	5	572	
Tanintharyi	1,230	1	5	572	
Yangon	2,129	1	5	572	
Total	63,899	**15**	75	8,580	1

Notes:
[a] Number of villages covered, including verification and certification of open defecation free status
[b] Number of studies
[c] Recurrent costs represent the number of trainings/promotions from 2017-2030
[d] Capital costs

Assumptions: Software

The key assumptions used in the calculation of the software requirements are as follows:

- For estimating purposes, CLTS process will be applied in all villages. This may not be necessary in villages where existing access to latrines is high. However, the cost of verification and certification of open defecation free (ODF) status will be required in all villages.
- With sanitation marketing, information from programmes in other countries on the duration required for the development of small businesses to become self-sustainable is not clear. For this Investment Plan, it is assumed that small businesses will be self-sufficient in 5 years, after which they will continue to market latrines without external support.
- All communities will require repeated hygiene promotion over the duration of the Strategy to achieve safe hygiene practices.

WASH in Schools

Intermediate outputs

Table 12shows the physical requirements for WASH in schools. The main points are:

- For water supply and toilet facilities, replacement investments are expected to be larger than new investments.
- A total of 175,607 teachers are expected to undergo training on teaching safe hygiene behaviour as part of the curriculum in schools.
- For each year of the implementation period (2019-2030), all schools will be implementing extra-curricular hygiene programs.

Table 12. Physical requirements for school WASH, 2017-2030

Level	Water supply (no. of schools)		Toilets (000 students & teachers)		Hygiene training (no. of teachers)	Extra-curricular hygiene programs (ave. no. of schools/per year)
	New	Replacement	New	Replacement		
Primary	13,622	41,028	2,484	5,744	103,552	40,555
Middle	1,927	3,589	2,887	5,589	47,349	3,559
High school	2,706	3,831	1,603	2,434	24,706	3,807
Total	18,255	48,448	9,201	60,085	175,607	47,921

Data requirements

Data needed to calculate school requirements are as follows:

- number of schools in 2016, 2018 and 2030
- the number of students in 2016 and 2030
- student-toilet ratios for 2016 and 2030
- teacher-toilet ratios for 2016 and 2030
- access to adequate water supply in 2016 and 2030
- the expected life of latrines and water supply facilities

Data on the number of schools, students and teachers in 2014 were provided by the Department of Human Resources and Education Planning (DHREP) of the Ministry of Education (MoE). It covers public, private and monastic schools. Monastic and other private schools are included in this Investment Plan[14].The values used in the analysis are presented in Annex Table 2.3

Assumptions

School populations

- All school age children will been rolled in school by 2030. Current levels of enrolment are less that the total number of school age children.

[14]Data on the proportion of children in monastic and private schools is not available, so it is difficult to estimate only for public schools.

- The population of school age children in 2030is projected by applying the population growth rate of Myanmar (UN, 2014) to the population of the different age groups in 2014. Projections for the years 2016 and 2018 were derived by gradually increasing to 100 the percentage of students enrolled between 2014 and 2030, as well as applying population growth rates.
- Projections for the number of schools in 2016, 2018 and 2030 are not available, so it is assumed that the number will increase at the same rate as the number of students. This effectively sets the number of students per school in 2030 to be the same as in 2014.
- To estimate the number of teachers in 2016, 2018 and 2030, the student-teacher ratio in 2030 is taken to be the same as 2014.

Toilets

- Current student-toilet and teacher-toilet ratios. The only available information on existing toilet access is from a UNICEF (2010) sample survey of primary schools. This means that assumptions have to be made for (a) student-toilet ratios at the other levels of education, and (b) teacher-toilet ratios for all levels of education in 2016:
  - student-toilet ratios middle and high schools are the same as in primary schools
  - there is one toilet for teachers in each school
  - student- and teacher-toilet ratios in 2030 were set at levels consistent with the targets presented in Section 4
- Expected life of toilets. On the premise that toilets in schools will not last as long as private toilets due to higher usage, the expected life is 10 years.

Water supply

- A UNICEF (2010) sample survey of primary schools found that 59% of the sample had access to water supply facilities. In the absence of more recent data and information for middle and high schools, this percentage was used as the starting point for the analysis. The target access rate for 2030 is 100% for all school levels.
- The expected life of water supply facilities in schools is 15 years. This is consistent with the assumed expected life for boreholes with community water supply in rural areas.

Hygiene training

- The number of teachers who will undergo hygiene promotion training is equal to 50% of all the teachers at each level.
- The cost of delivery of hygiene promotion in the classroom comes under the education budget so is not included in this WASH Investment Plan.

Extra-curricular hygiene programs

- Each school will have an annual budget for extra-curricular hygiene programs.
- The number of schools shown in Table 13 only indicates the average for 2017 to 2030.

WASH in Health Facilities

Intermediate outputs

Table 13shows the number of hospitals that will require water supply systems, toilets, wastewater treatment facilities and incinerators.

Table 13. Physical requirements for health facilities WASH, 2017-2030

Facility	New	Replacement	Total
Water supply (no. of hospitals)			
Sub-health center	20,291	18,249	38,541
Rural health center	2,964	4,051	7,015
Station hospital	55	870	925
Township hospital	100	392	492
Total	23,410	23,562	46,972
Toilets (no. of toilets)			
Sub-health center	85,585	119,142	204,727
Rural health center	26,936	48,203	75,139
Station hospital	-	21,574	21,574
Township hospital	3,071	19,807	22,878
Total	115,592	208,726	324,318
Wastewater treatment facilities (no. of hospitals)			
Station hospital	610	159	769
Township hospital	325	85	410
Total	935	243	1,178
Clinical waste disposal (no. hospitals)			
Township hospital	300	237	537
Total	300	237	537

Physical requirements

Data for estimating the physical requirements are:

- The number of hospitals and health centres for 2016 were provided by Department of Public Health (DPH).
- Access to water supply facilities in 2016, 2018 and 2030.
- Access to toilets/latrines in 2016, 2018 and 2030.
- Expected life of water supply facilities and of toilets/latrines.

Assumptions

Health facilities

- The number of hospitals and health centres in 2018 were assumed to be the same as in 2016.
- For 2030, the number of hospitals and health centres were estimated using information provided by officials of the Environmental Sanitation Division (ESD) of the Ministry of Health (MoH). The ESD has set the following geographical requirements for hospitals and health facilities.
  - Sub-health centre – one per village tract
  - Rural health centre – one per 5 to 6 village tracts
  - Station and Township hospitals – one per township

Water supply

- In estimating investment requirements, the Investment Plan used the access rates for health facilities presented in Table 6 for 2016. By 2030, access rates will be 100%.
- Water supply facilities in hospitals and health centres have an expected life of 15 years (consistent with the assumed expected life for boreholes in community water supply).

Toilets

- The number of toilets needed for each type of health centre and hospital are estimated on the basis of the service standards provision for patients and staff in the WASH Strategy. For 2016, the access rates presented in Table 6 were used in the analysis. By 2030, this access rate should be 100%.
- Toilet facilities in hospitals and health centres have an expected life of 15 years. This is consistent with the assumed expected life of toilets in rural settings.

Wastewater treatment facilities

- All station and township hospitals will have decentralized wastewater treatment systems (DEWATS) by 2030.None of the hospitals have these facilities in 2016.
- DEWATS have an expected life of about 25 years.

Clinical and hazardous waste.

- All township hospitals will have facilities for disposing of clinical and hazardous wastes by 2030. None of the hospitals and health centres have these facilities in 2016.
- Facilities have an expected life of 10years.

Emergency WASH

There are two sub-components for emergency WASH–preparation of a national WASH preparedness plan for emergencies and establishing WASH supplies for contingencies.

Estimation of the pre-positioned WASH supplies is based on:

- One 40 foot container of WASH kits for each region/state.
- WASH contingency stocks (e.g. pipes and high value equipment for repairing damaged water supply facilities) in three strategic regions – Nay Pyi Taw, Yangon and Mandalay.

Assumptions

- The preparation of a plan for WASH in emergencies will take the first year of the planning period. The process will require funds for consultants and staff, rental office space and office supplies, costs of meetings and consultations, and dissemination.
- Thereafter, annual allocations for assessment, monitoring and revisions to the plan will be required.
- The emergency stocks are treated as capital investments. When used for an emergency, they will be replenished using funding from that emergency. Annual recurrent funds will be required for storing contingency stocks.
- The capital and operational requirements for running an emergency response are not covered in this Investment Plan.

Sector Management

Sector management covers the costs associated with:

- Developing the capacity of staff and provision of equipment, as a capital cost

- Managing the development and operation of WASH services and coordinating the WASH Sector, as a recurrent cost.

Assumptions

- Table 14 shows the number of teams or offices that need to be created in order to manage the sector. It indicates that teams need to be organized for each township, which will in turn be supervised by a region level team. All teams will then be under the coordination of a national team.

Table 14. Number of teams or offices required for sector management

State/region	No. of teams or offices(by level)		
	Township	Regional	National
Ayeyawaddy	26	1	0
Bago	27	1	0
Chin	8	1	0
Kachin	17	1	0
Kayah	6	1	0
Kayin	6	1	0
Magway	24	1	0
Mandalay	30	1	0
Mon	9	1	0
Nay Pyi Taw	13	1	0
Rakhine	16	1	0
Sagaing	36	1	0
Shan	54	1	0
Tanintharyi	9	1	0
Yangon	44	1	0
Union	0	0	1
Total	325	12	1

- Each team, be it township, region or national level will be composed of 10 staff. The teams will be organized in 2017 and will continue until 2030. Team members are responsible for the following:
  - Rural water supply (4 members based at the DRD)
  - Rural sanitation and hygiene (4 members based at the DRD)
  - Schools (1 member based at the DBE)
  - Health (1 members based at the DPH)
- Staff will be trained in various workshops in 2017 and 2018 as part of capacity development. Each team will also be provided with equipment computer equipment (4 sets) and vehicles (2 units). Apart from the salaries of the staff, offices will also have an annual budget for its operations.
- Physical units for recurrent costs are measured in terms of person-years. Confining the measurement units to person-years is used an aid in determining costs. Unit costs not only include the salaries of these staff but also an approximation of related expenses for the operations of the offices. Operations costs may also consider the implementation of a water safety plan and water quality monitoring activities.

6. Capital Investment needs

This section presents the capital expenditure requirements for the different WASH components of the Investment Plan. These were calculated using the information on physical requirements presented in Section 5 and unit costs shown in Annex Tables2.5 (rural water supply and rural toilets) and 2.6 (all other components).All results are expressed in US$ and valued at 2015 prices.

Rural WASH

Water supply

Table 15shows that the annual capital expenditure required to meet the 2030 target for water supply is US$163 million(a total of US$2.3billion over the next 14 years). Approximately 91% (US$148million/year) of these costs are for hardware, which is the sum of new and replacement investments.

Costs for Rakhine, Ayeyawaddy and Bago may be underestimated due to the challenges in water resources. In Rakhine a large proportion of population without water are in areas where it will be very expensive to provide – low lying saline areas with no aquifer. In areas Ayeyawaddy and Bago where arsenic is present in the groundwater, more expensive solutions may be required.

Table 15. Required capital expenditures for improved water supply

State/region	Annual average (000s US$)			Total (2017-2030)
	Hardware	Software	Total	
Ayeyawaddy	16,853	1,685	18,539	259,542
Bago	13,273	1,327	14,601	204,411
Chin	1,210	121	1,331	18,633
Kachin	2,468	247	2,715	38,011
Kayah	559	56	615	8,608
Kayin	3,124	312	3,437	48,113
Magway	20,427	2,043	22,470	314,581
Mandalay	25,308	2,531	27,839	389,750
Mon	3,495	349	3,844	53,816
Nay Pyi Taw	6,515	652	7,167	100,332
Rakhine	6,777	678	7,454	104,362
Sagaing	26,615	2,662	29,277	409,877
Shan	11,607	1,161	12,768	178,752
Tanintharyi	2,556	256	2,811	39,357
Yangon	7,073	707	7,781	108,928
Total	147,862	14,786	162,648	2,277,074

Sanitation

Table 16 shows that the capital expenditures needed in order achieve sanitation targets for rural households are aboutUS$105million/year (a total of US$1.5 billion from 2017-2030). Capital expenditures for toilets (hardware) and solid waste management are expected to be about US$61 million/year and US$13 million/year respectively.

Capital expenditure needed for software is about US$32million/year(a total of US$446million for 2017-2030). These expenditures are critical for:

- encouraging the rural population to change behaviour and invest in toilets through CLTS and sanitation marketing;
- understanding sanitation markets in the states and regions (research);
- ensuring that small-scale businesses are developed and strengthened to promote the purchase of toilets, provide facilities and support services (sanitation marketing);
- developing relevant materials and protocols for promoting hygiene.

Table 16. Required capital expenditures – improved sanitation and hygiene (000 US$)

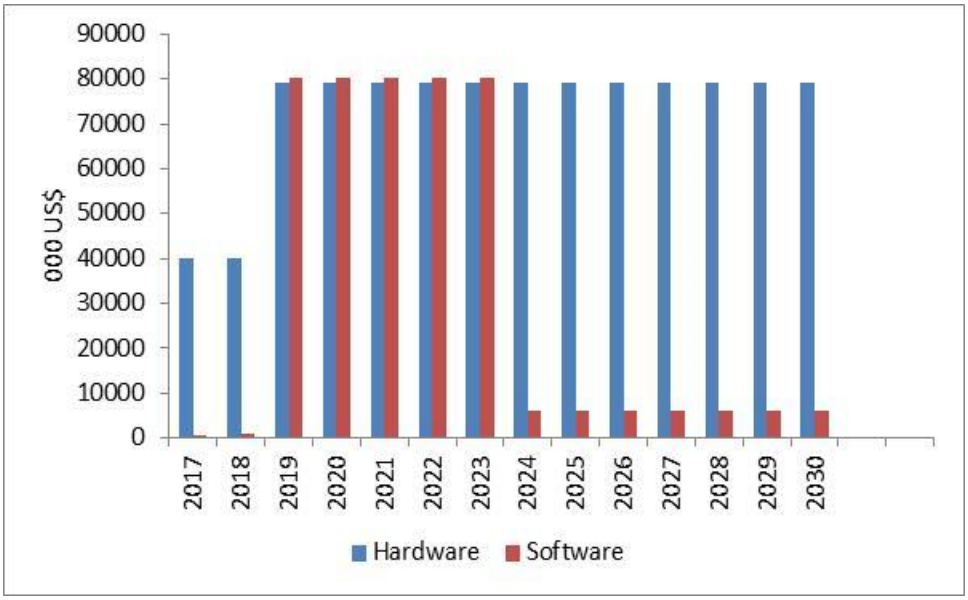
State/region	Hardware (Annual average)		Software (Annual average)				Total	
	Toilets	Solid waste	CLTS	Sanitation Marketing		H Prom	Annual ave.	2017-2030
				FR	Devt			
Ayeyawaddy	9,039	2,062	980	3,942	7	-	16,030	224,418
Bago	6,487	1,447	534	2,831	7	-	11,307	158,294
Chin	621	114	111	271	7	-	1,125	15,748
Kachin	1,604	292	212	694	7	-	2,811	39,352
Kayah	354	68	42	153	7	-	624	8,739
Kayin	2,032	409	170	889	7	-	3,507	49,104
Magway	5,503	1,262	395	2,408	7	-	9,575	134,053
Mandalay	6,816	1,453	393	2,957	7	-	11,626	162,770
Mon	2,426	494	95	1,055	7	-	4,076	57,063
Nay Pyi Taw	1,293	294	66	557	7	-	2,217	31,039
Rakhine	4,591	1,016	309	2,064	7	-	7,988	111,832
Sagaing	7,148	1,462	494	3,120	7	-	12,231	171,234
Shan	7,036	1,424	1,181	3,093	7	-	12,740	178,367
Tanintharyi	1,756	346	101	771	7	-	2,982	41,747
Yangon	3,895	823	175	1,686	7	-	6,586	92,207
Unclassified	-	-	-	-	-	11	11	150
Total	60,603	12,968	5,258	26,490	107	11	105,437	1,476,116

Note:
FR = Formative research
Devt = Development
H Promo = hygiene promotion

The timing of the expenditures for rural sanitation hardware and software are different. Hardware expenditures are expected to be steady from 2019-2030, whereas software expenditures are going to be quite high from 2019 to 2023 before dropping substantially in succeeding years (see Figure 4). This is due to the relatively intensive efforts at sanitation marketing in the first five years of the planning period.[15]

[15] See Tables 3 and 12 for more details.

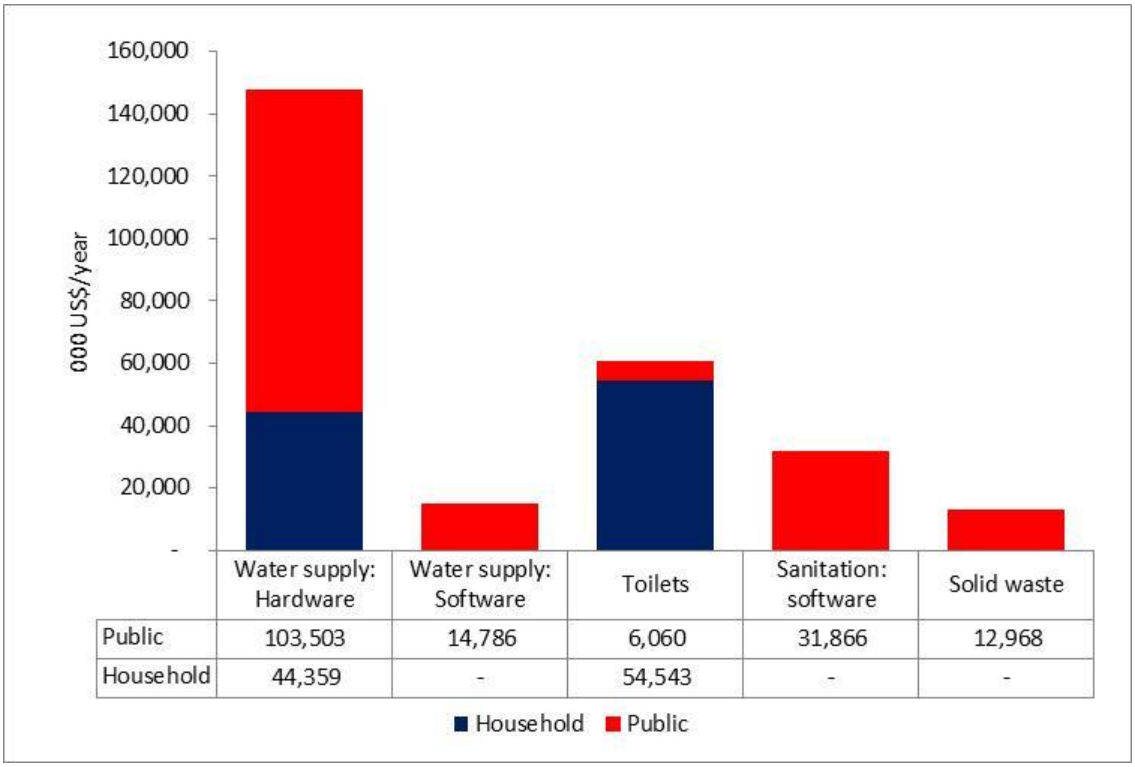
Figure 4. Breakdown of rural sanitation capital expenditures over time



Government, community and household contributions

Figure 5 shows the contributions of households and the public sector in capital expenditures for rural WASH. Based on assumptions outlined in Table 2 and the estimates presented in Tables 15 and 16, about 63% or US$169 million/year of capital requirements are expected to be paid for by the public sector. Households are expected to raise about US$99 million/year to contribute to finance community water supply facilities and to pay for their own toilets.

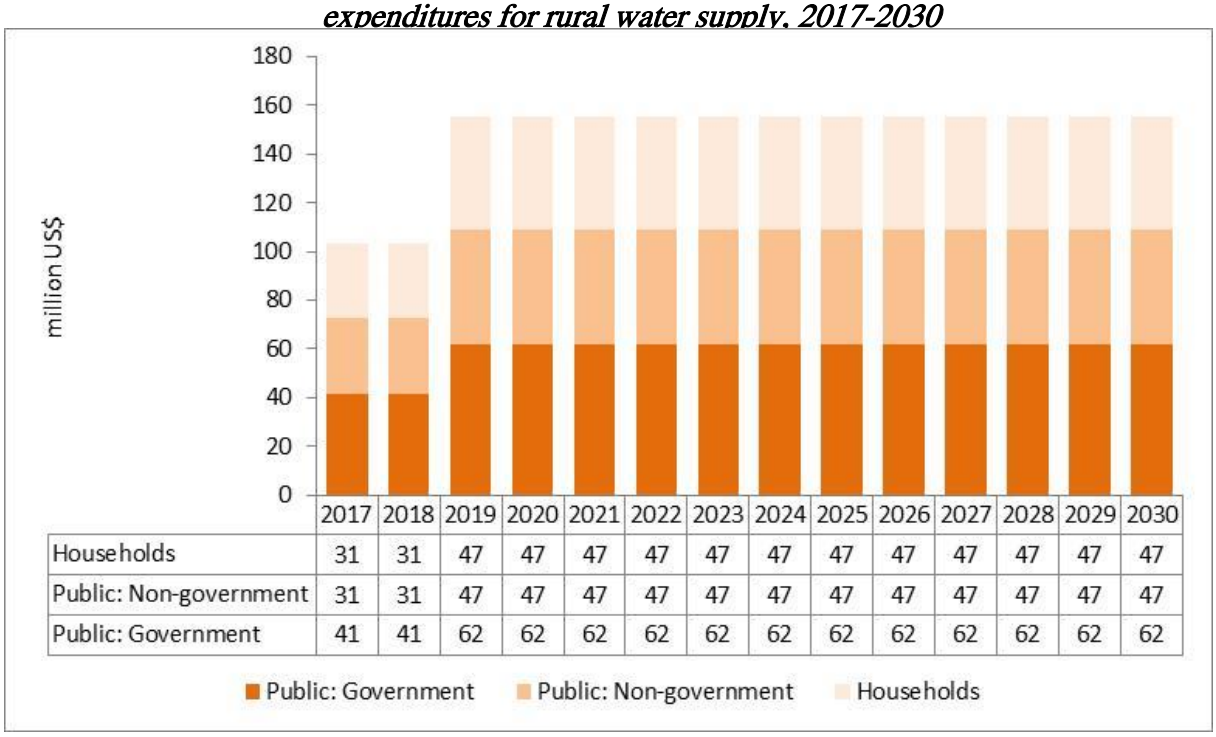
Figure 5. Contributions of stakeholders in capital expenditures for rural WASH, annual average



	Water supply: Hardware	Water supply: Software	Toilets	Sanitation: software	Solid waste
Public	103,503	14,786	6,060	31,866	12,968
Household	44,359	-	54,543	-	-

The public sector is made up of government, development partners, donor agencies, private philanthropic firms and other non-household entities. Where information is available, the contributions of these different entities may be identified as well. Figure 6 depicts a situation where government pays for 40% of the hardware capital costs for water supply.[16] This is of course just illustrative and can be applied to all other components of the investment plan. Depending on the availability funds, the shares of the different stakeholders may also change over time.

Figure 6. Contributions of government, households and other institutions to hardware capital expenditures for rural water supply, 2017-2030



	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Households	31	31	47	47	47	47	47	47	47	47	47	47	47	47
Public: Non-government	31	31	47	47	47	47	47	47	47	47	47	47	47	47
Public: Government	41	41	62	62	62	62	62	62	62	62	62	62	62	62

WASH in Schools

Table 17 shows that the capital expenditure requirements for school WASH are about US$35million/year (US$492millionfor 2017-2030). About 71% (US$25million/year) of the costs are for the provision of water supply facilities.

The values presented in Table 17 underestimate the required capital expenditures because lack of information on the number of pre-primary schools meant that these had to be omitted from the estimating.

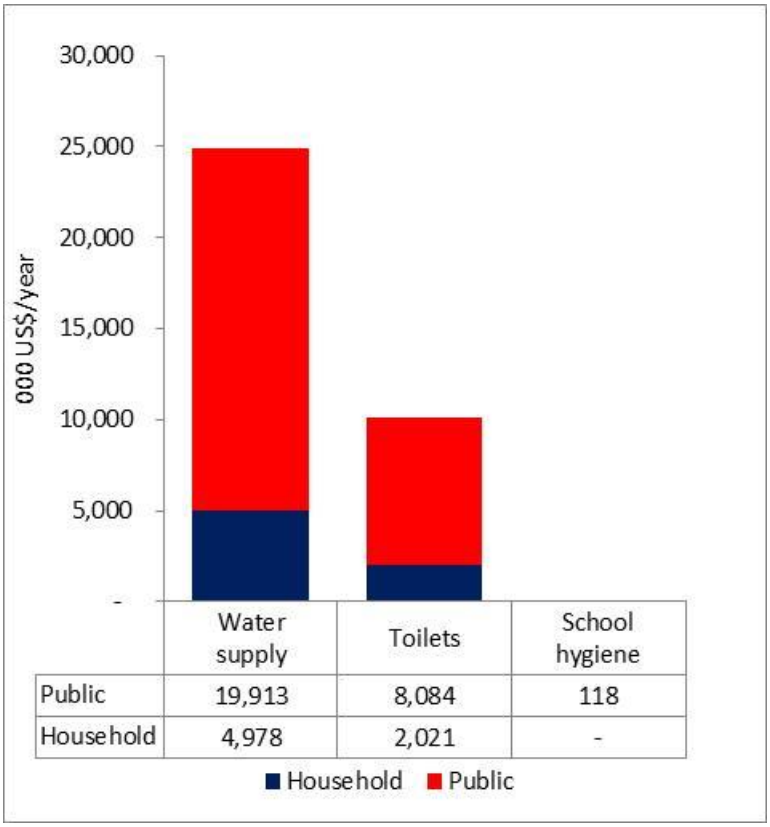
Table 17. Capital expenditures for school WASH, 000 US$

Level	Annual average				Total (2017-2030)
	Water supply	Sanitation	School Hygiene	Total	
Primary	20,393	4,268	70	24,731	346,236
Middle	2,058	3,954	32	6,044	84,613
High	2,439	1,883	17	4,339	60,745
Total	24,891	10,105	118	35,114	491,594

[16] The remainder is split equally between households and other stakeholders.

Based on the allocation of contributions proposed in Table 2 and the values reported in Table 17, Figure 7 shows that a significant proportion of the funds for school WASH will have to be raised by the public sector.

Figure 7. Contribution of stakeholders to capital costs for school WASH, annual average



	Water supply	Toilets	School hygiene
Public	19,913	8,084	118
Household	4,978	2,021	-

WASH in Health facilities

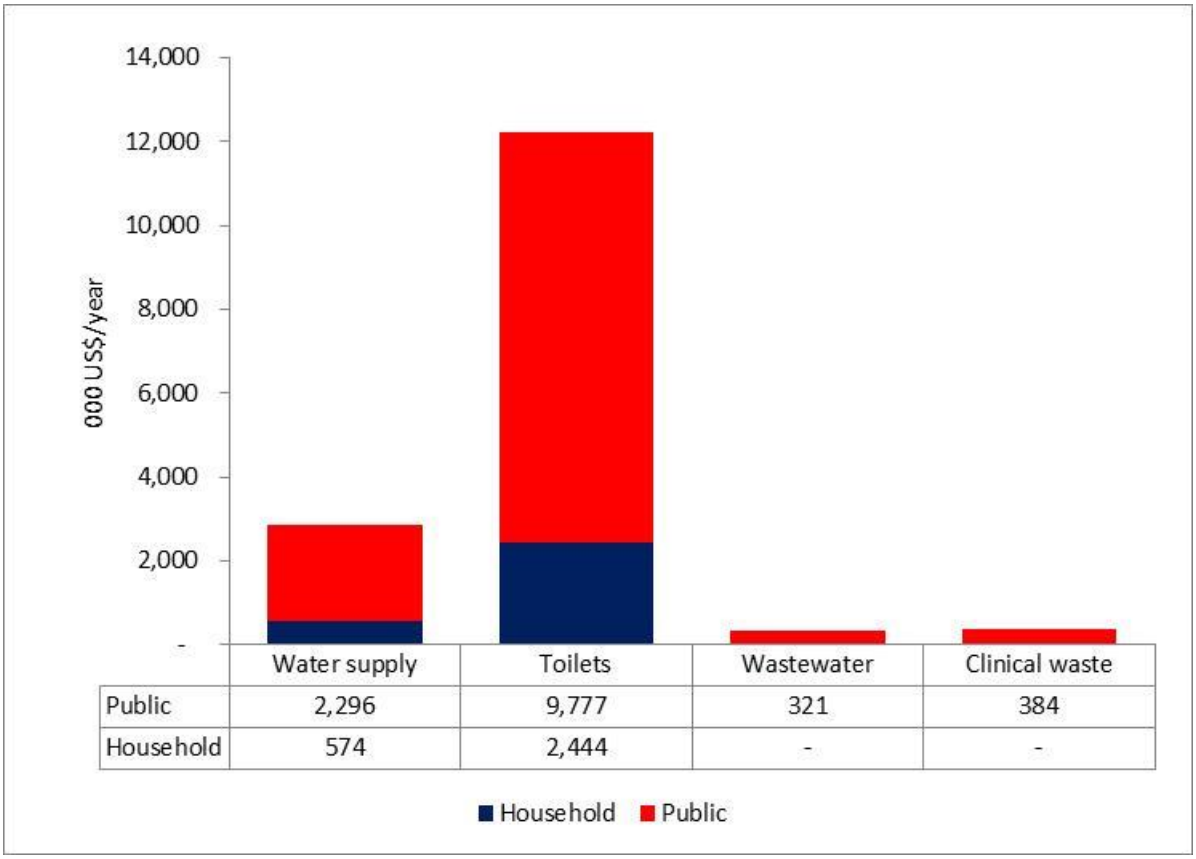
Table 18 shows that the capital expenditure for WASH in health facilities is estimated to be about US$16 million/year(a total of US$221million from 2017 to 2030).

Table 18. Capital expenditures for health facilities WASH, 000 US$

Level	Annual average					Total (2017-2030)
	Water supply	Toilets	Wastewater treatment	Clinical waste	Total	
Sub-Health Centers	1,717	7,312	-	-	9,028	126,396
Rural Health Centers	625	2,739	-	-	3,363	47,089
Station Hospitals	345	821	170	-	1,336	18,705
Township Hospitals	184	1,350	151	384	2,068	28,952
Total	2,870	12,221	321	384	15,796	221,142

Based on the allocation of contributions proposed in Table 2 and the values reported in Table 18, Figure 8 shows that a significant proportion of the funds for health facilities WASH will have to be raised by the public sector.

Figure 8. Contribution of stakeholders to capital costs for health facilities WASH, annual average



	Water supply	Toilets	Wastewater	Clinical waste
Public	2,296	9,777	321	384
Household	574	2,444	-	-

Emergency WASH

Table 19shows that required capital expenditures for emergency WASH are aboutUS$200thousand/year (a total of about US$3 million). Nearly two-thirds of this amount is for establishing supplies of emergency kits in every state/region and contingency stocks in Nay Pyi Taw, Yangon and Mandalay. The investment in contingency stocks and emergency kits is for one period only – users of the stocks are expected to replace these stocks in the future as part of an emergency response.

Table 19. Capital expenditures for emergency WASH, 000 US$

Item	Annual	Total (2017-2030)
Planning for emergencies	71	1,000
Contingency stocks/emergency kits	129	1,800
Total	200	2,800

Sector Capacity development

Table 20 shows the capital expenditures for developing the capacity for effective sector management. Representing costs for training and the acquisition of equipment and vehicles by the different teams, the costs are only incurred in 2017 and 2018. Average costs (over two years) are about US$11 million/year. All of the funds for sector management are expected to be raised by the public sector.

Table 20. Capital expenditures for capacity development, 000 US$/year

Region/State	Rural WASH	School	Health	Total
Ayeyawaddy	826	32	32	890
Bago	856	34	34	923
Chin	275	11	11	297
Kachin	550	22	22	594
Kayah	214	8	8	231
Kayin	214	8	8	231
Magway	765	30	30	824
Mandalay	948	37	37	1,022
Mon	306	12	12	330
Nay Pyi Taw	428	17	17	462
Rakhine	520	20	20	561
Sagaing	1,132	44	44	1,220
Shan	1,682	66	66	1,814
Tanintharyi	306	12	12	330
Yangon	1,376	54	54	1,484
National level	31	1	1	33
Total	10,429	408	408	11,246

Summary

Table 21shows that a total of US$321 million/year (US$4.5 billion from 2017-2030) of capital expenditures are needed to meet the WASH targets for 2030. About 84% of these expenditures (US$268 million) are for rural WASH. About the same proportion of the total are needed for the provision of hardware. Despite high investments for hardware, the importance of software expenditures in stimulating household demand for and contribution to such hardware and the development of markets in rural areas should not be ignored.

Table 21. Overall Capital expenditures requirements for WASH, 000 US$

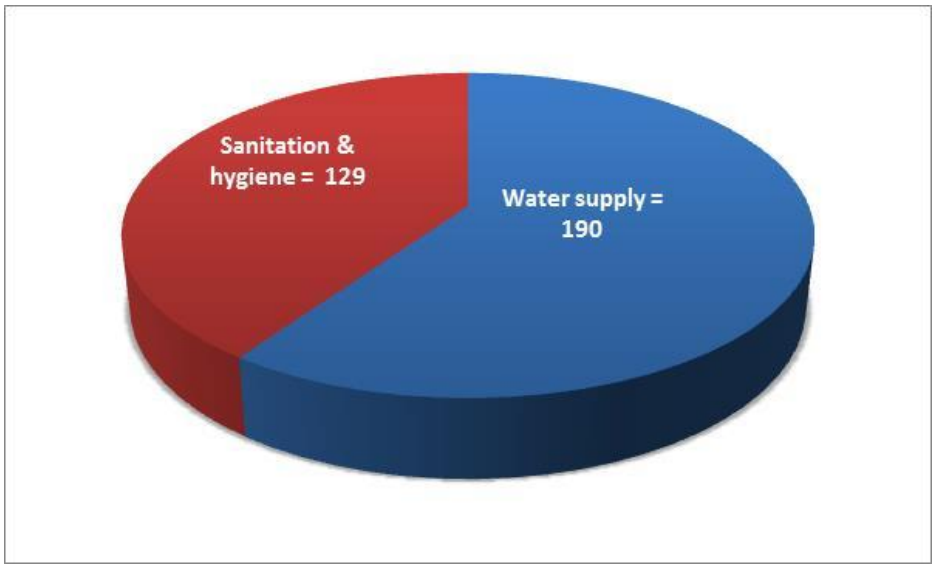
Component	Cost (annualized)			Total (2017-2030)
	Hardware	Software	Total	
Sector capacity [a]	1,267	340	1,607	22,491
Rural	220,166	47,919	268,085	3,753,190
Schools	34,995	118	35,114	491,594
Hospitals	15,796	-	15,796	221,142
Emergency	129	71	200	2,800
Total	272,353	48,449	320,801	4,491,217

[a]For purposes of presentation, capital expenditures for sector management, which are only incurred in 2017 and 2018, were annualized over 14 years

Other aspects of the results to note are:

- Excluding the estimates on WASH for emergency preparedness, most of the capital expenditures are needed for water supply (Figure 9).[17]
- Most of the capital expenditures for rural WASH are for water supply (Figure 10).
- The expected contribution of the public sector to capital costs is larger than households (Figure 11).

Figure 9. Capital expenditures for water supply and sanitation and hygiene, million US$/year



[17] It is not possible to make a distinction between allocations for water supply and sanitation with the current estimates for emergency preparedness.

Figure 10. Capital expenditures for rural WASH and sector management, m US$

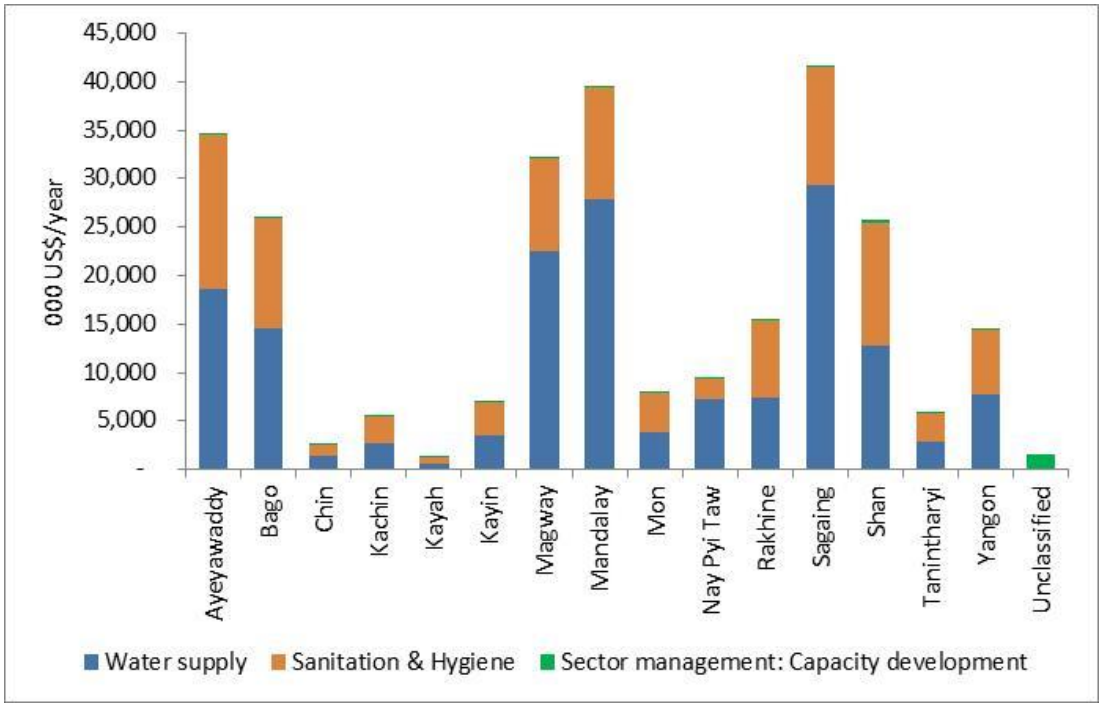
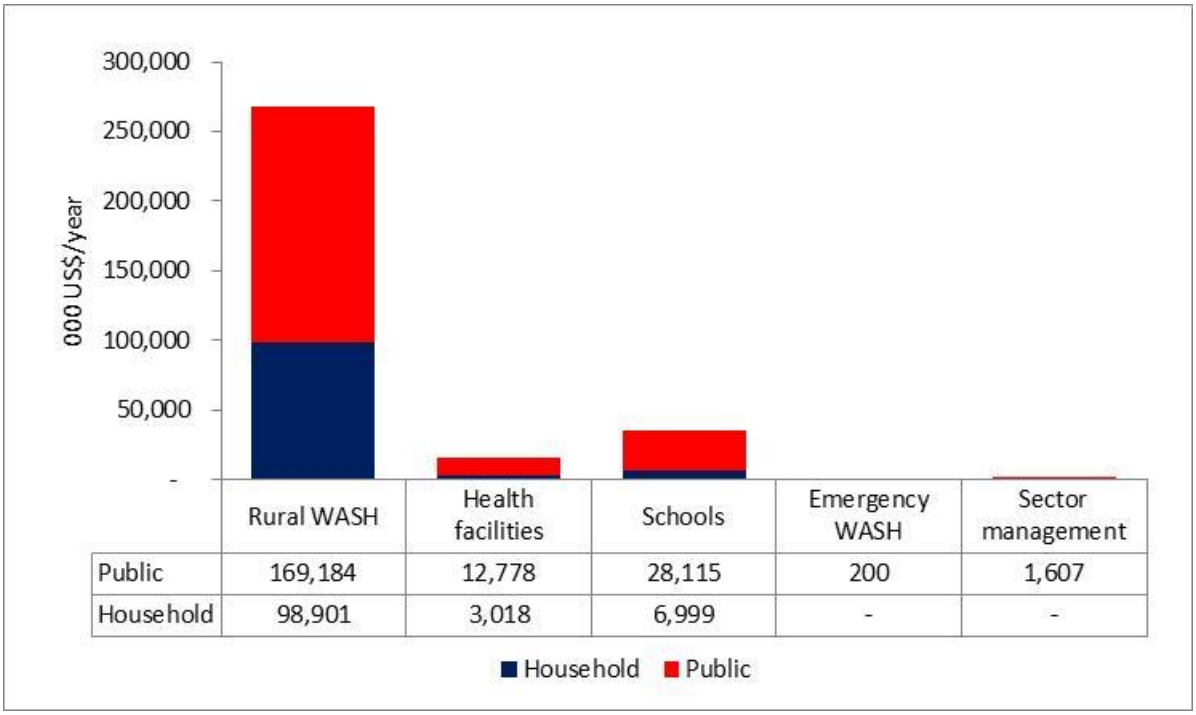


Figure 11. Contributions of the different stakeholders to capital costs, annual average



	Rural WASH	Health facilities	Schools	Emergency WASH	Sector management
Public	169,184	12,778	28,115	200	1,607
Household	98,901	3,018	6,999	-	-

7. Recurrent expenditures

Although not strictly an "investment", adequate funding for the recurrent costs of operating and maintaining services is critical for sustainability. Without provision of recurrent costs, the value of the investment in infrastructure and services will be wasted.

Recurrent expenditures include the following:

- Water supply
  - Energy and fuel for pumped supplies
  - Routine cleaning and maintenance
  - Repairs after breakdown
  - Meter reading and revenue collection
  - Customer service (for bigger piped systems)
  - Operational management of services
  - Support services to village water committees
  - Performance management and regulation
- Household sanitation
  - Cleaning and repair of latrines
  - Desludging and pit emptying
  - Replacement of latrines
- Solid waste management
  - Segregation of wastes
  - Collection
  - Sorting and recycling
  - Composting bio-degradable waste
  - Disposal of residual waste to landfill
- Hygiene promotion
  - Refresher training in communities
- School WASH
  - Operation and maintenance of water supply
  - Tariff payment to water service provider
  - Cleaning and repair of WASH facilities
  - Solid waste services
- Health facility WASH
  - Operation and maintenance of water supply
  - Tariff payment to water service provider
  - Cleaning and repair of WASH facilities
  - Cleaning of health facility
  - Operation and maintenance of waste water treatment system
  - Operation and maintenance of clinical and hazardous waste disposal
  - Solid waste services
- Emergency WASH
  - Maintenance of contingency stocks in stores

- Sector management: Institutional operation, management, oversight and regulation
  - Staffing
  - Offices and equipment
  - Maintenance of monitoring system

As with capital expenditures, the estimation of the recurrent costs requires the information on physical requirements (Section 5) and unit costs (Annex Tables 2.5 and 2.6).

Rural WASH

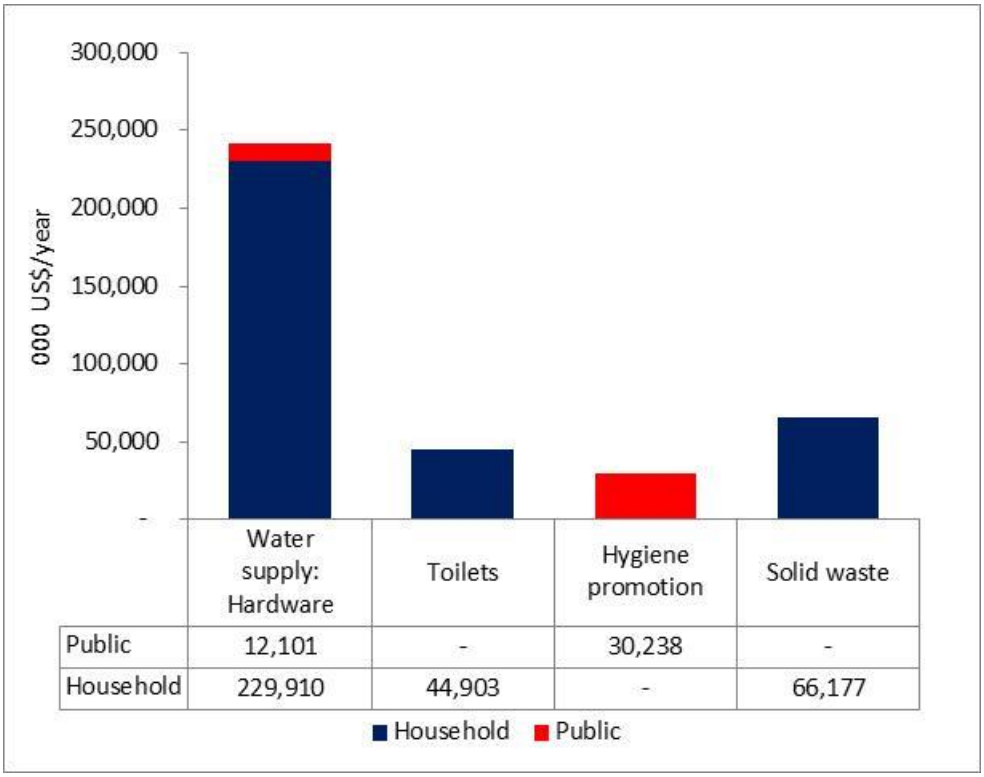
Table 22 shows that the recurrent costs needed to sustain the services to2030 are about US$383million/year (approximately US$5.4billion over the entire period of the plan). Approximately 63% of cost (US$242 million/year) is required for the operation and maintenance of water supply systems. This is followed by solid waste management which requires about US$66 million/year. Hygiene promotion activities, which involve repeated trainings in the regions, amount to about US$30 million a year.

Figure 12showsthe contributions of the different stakeholders to recurrent costs. It indicates that the public sector is expected to finance hygiene promotion activities and a small fraction (5%) of recurrent cost for water supply. The remainder of the recurrent costs will be paid by households through user fees charged by the service providers.

Table 22. Recurrent expenditures for rural WASH, 000 US$

State/ region	Average annual costs					Total (2017-2030)
	Water supply	Toilets	Solid waste	Hygiene promotion	Total	
Ayeyawaddy	24,200	4,685	10,523	2,419	41,827	585,572
Bago	23,454	3,816	7,385	2,512	37,167	520,335
Chin	4,612	1,851	583	744	7,790	109,066
Kachin	12,793	2,494	1,492	1,582	18,360	257,043
Kayah	7,418	2,167	348	558	10,491	146,878
Kayin	6,482	2,211	2,089	558	11,340	158,764
Magway	23,093	3,388	6,442	2,233	35,156	492,182
Mandalay	33,223	4,073	7,415	2,791	47,502	665,025
Mon	9,944	2,579	2,520	837	15,881	222,331
Nay Pyi Taw	18,303	2,503	1,499	1,210	23,515	329,206
Rakhine	13,820	2,155	5,187	1,489	22,650	317,102
Sagaing	22,709	4,007	7,460	3,349	37,525	525,351
Shan	22,058	3,711	7,268	5,024	38,062	532,872
Tanintharyi	7,602	2,022	1,767	837	12,228	171,193
Yangon	12,300	3,242	4,198	4,094	23,834	333,673
Total	242,010	44,903	66,177	30,238	383,328	5,366,593

Figure 12. Contributions of stakeholders to the recurrent costs of rural WASH



WASH in Schools

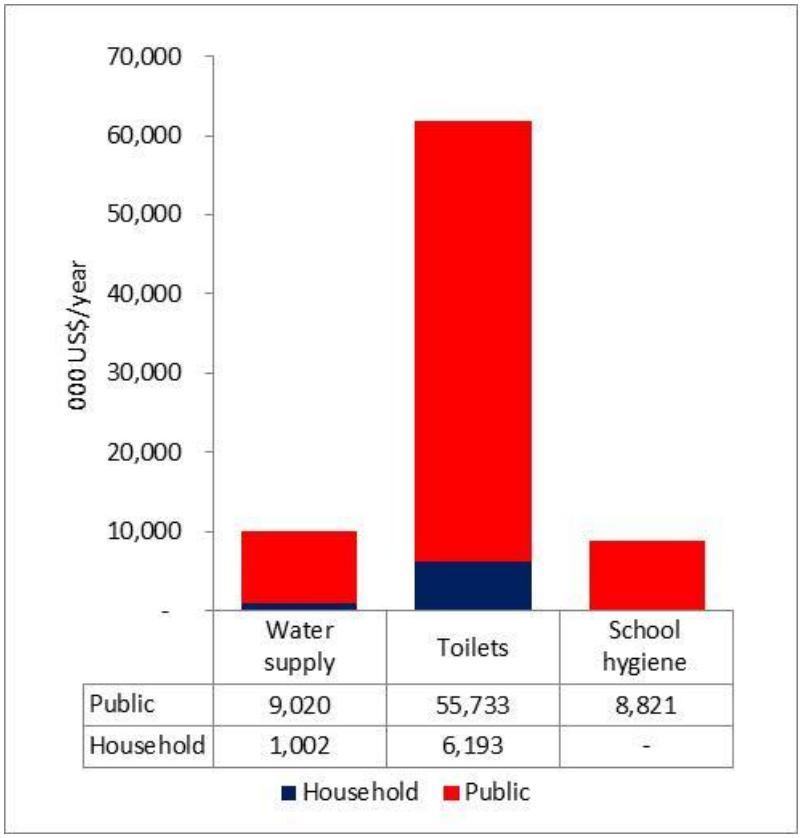
Table 23 shows that recurrent expenditures for WASH in schools are estimated at US$81million/year (about US$1.1 billion from 2017-2030). Costs for school sanitation are also close to six times higher than the costs for water supply because of the labour costs for maintaining school toilets. Extra-curricular hygiene promotion (school hygiene) accounts for slight over 11% to recurrent costs for school WASH. Figure 13shows that more than 90% of the recurrent costs for school WASH will be financed by the public sector.

Table 23. Recurrent expenditures for WASH in schools, 000 US$

Level	Average annual cost				Total costs (2017-2030)
	Water supply	Sanitation	School Hygiene [a]	Total	
Primary	8,445	32,274	6,053	46,772	654,815
Middle	756	20,591	1,062	22,409	313,722
High	821	9,060	1,705	11,586	162,208
Total	10,022	61,925	8,821	80,768	1,130,745

[a] Represents extra-curricular hygiene promotion activities. Classroom teaching of safe hygiene behaviour is considered part of the education budget, so is not estimated in this Investment Plan.

Figure 13. Contributions of stakeholders to the recurrent costs of school WASH



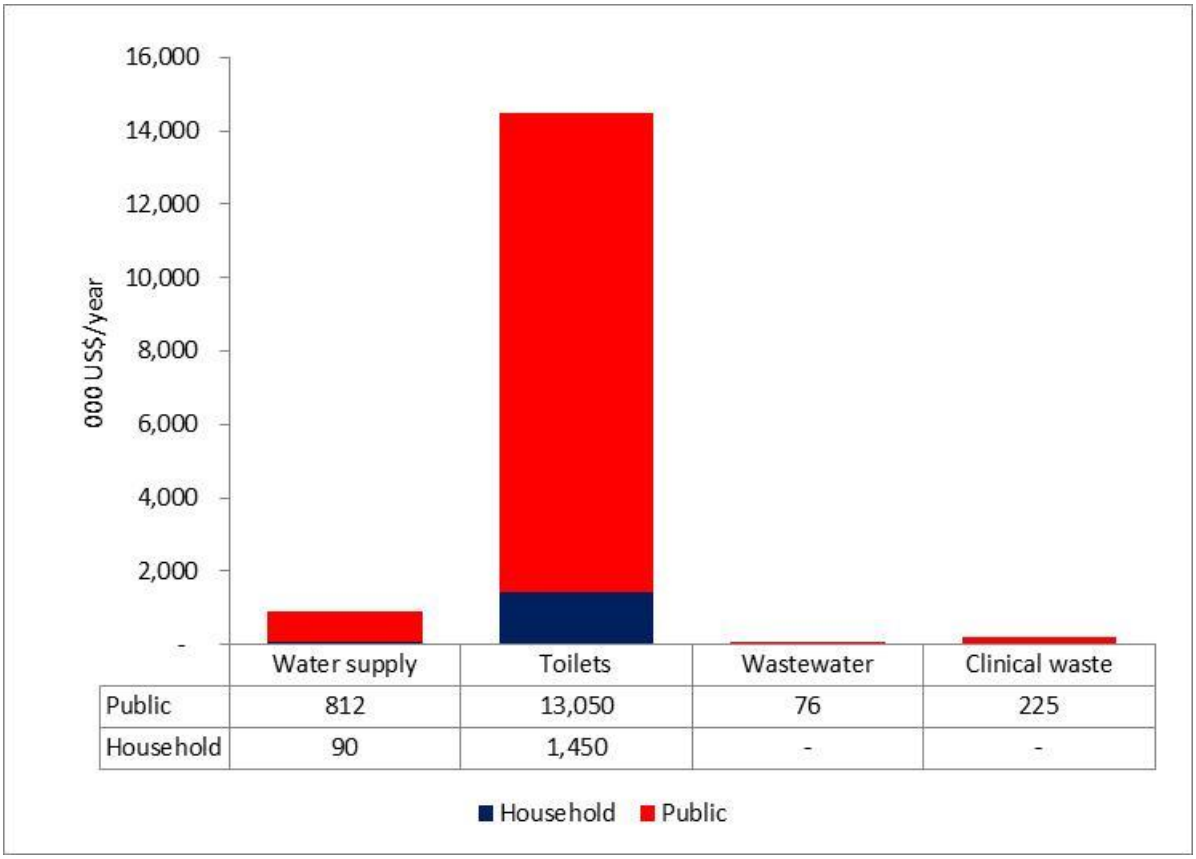
WASH in Health Facilities

Table 24 shows that recurrent expenditures for WASH in health facilities are about US$16 million/year(about US$220 million from 2017-2030). About 92% of these costs are for operating and maintaining toilet facilities. Figure 14 shows that about 90% of the recurrent expenditures for health facilities WASH is expected to be financed by the public sector.

Table 24. Recurrent expenditures for WASH in hospitals and health centres, 000 US$

Level	Average annual cost					Total cost (2017-2030)
	Water supply	Toilets	Wastewater treatment	Clinical waste	Total	
Sub-Health Centers	481	6,719	-	-	7,199	100,791
Rural Health Centers	197	3,264	-	-	3,462	48,463
Station Hospitals	152	2,245	40	-	2,438	34,131
Township Hospitals	72	2,272	36	225	2,604	36,460
Total	902	14,500	76	225	15,703	219,845

Figure 14. Contributions of stakeholders to recurrent costs of health facilities WASH



	Water supply	Toilets	Wastewater	Clinical waste
Public	812	13,050	76	225
Household	90	1,450	-	-

Emergency WASH

Recurrent expenditures for emergency WASH are estimated atUS$144 thousand/year (Table 25). About 60% of these funds are allocated for the annual monitoring, reassessment and, if necessary, revisions to the WASH component of emergency plans. The remaining expenditures are for the costs (rental and staff) of storing contingency stocks in warehouses.

Table 25. Recurrent expenditures for Emergency WASH, 000 US$

Item	Annual	2017-2030
Planning for emergency stock	86	1,200
Contingency stocks/emergency kits	59	822
Total	144	2,022

Sector management

Table 26presents the annual recurrent costs for sector management from 2017-2030. It indicates that a total of US$16 million/year for all regions/states, including the costs of the operations of the Union level government team. About 85% of the costs (US$14 million/year) are attributable to rural WASH.

Table 36. Recurrent costs for sector management, 000 US$, annual average

State/Region	Rural WASH	School	Health	Total
Ayeyawaddy	1,099	97	97	1,293
Bago	1,140	101	101	1,341
Chin	366	32	32	431
Kachin	733	65	65	862
Kayah	285	25	25	335
Kayin	285	25	25	335
Magway	1,018	90	90	1,197
Mandalay	1,262	111	111	1,485
Mon	407	36	36	479
Nay Pyi Taw	570	50	50	671
Rakhine	692	61	61	814
Sagaing	1,507	133	133	1,772
Shan	2,239	197	197	2,634
Tanintharyi	407	36	36	479
Yangon	1,832	162	162	2,155
Union level	46	4	4	54
Total	13,890	1,225	1,225	16,339

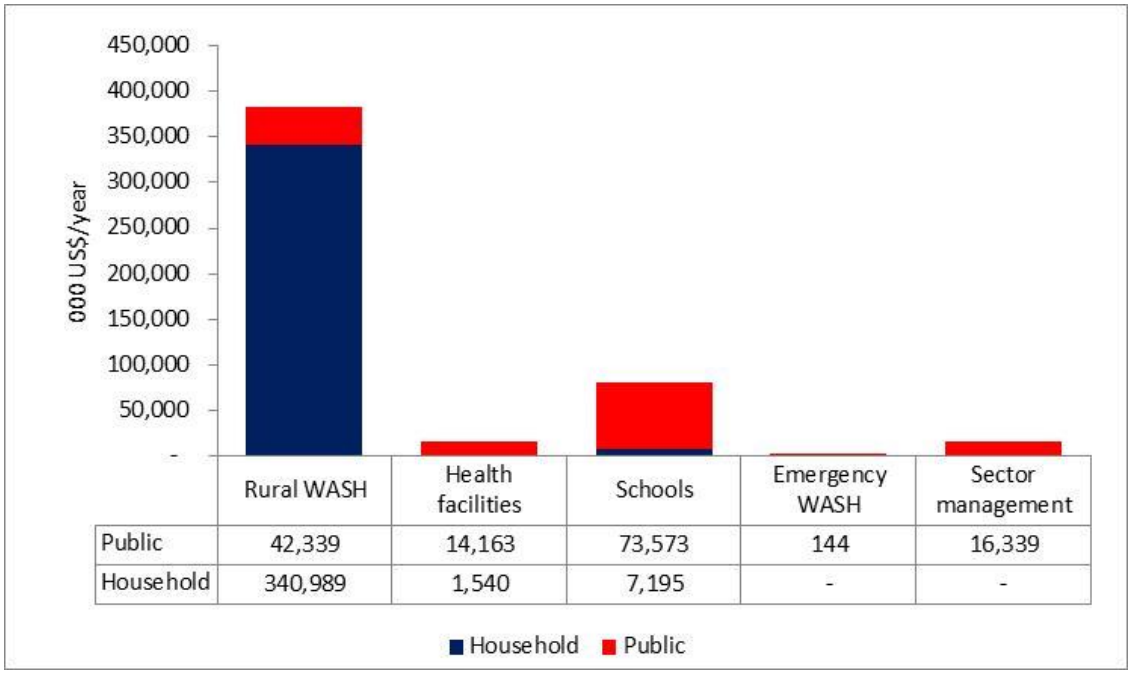
Summary

The estimated annual recurrent cost of sustaining all WASH services is about US$496million/year or a total of US$6.9billion from 2017-2030 (Table 27). Most of these costs are for water supply(61%) and more than 3out of every 4dollars is needed by the rural WASH sub-sector. About 70% of all recurrent costs are expected to be paid for by households (Figure 15). This is due to the very large share of rural WASH in total recurrent costs.

Table 27. Summary of recurrent expenditures, 000 US$

Category	Average annual cost				Total cost (2017-2030)
	Water supply	Sanitation & hygiene	Unclassified	Total	
Sector Management			16,339	16,339	228,743
Rural	242,010	141,318	-	383,328	5,366,593
School	10,022	70,746	-	80,768	1,130,745
Health facilities	902	14,801	-	15,703	219,845
Emergency	-	-	144	144	2,022
Total	252,934	226,865	16,483	496,282	6,947,948

Figure 15. Summary of contributions for recurrent costs



	Rural WASH	Health facilities	Schools	Emergency WASH	Sector management
Public	42,339	14,163	73,573	144	16,339
Household	340,989	1,540	7,195	-	-

8. Overall funding requirements and available funds

This section summarizes the estimated expenditure requirements presented in Sections 6 and 7 and compares these with estimates of the available funding in the WASH sector.The results show that there are substantial financing gaps in the WASH sector.

Summary of funding requirements

Expenditure requirements for meeting WASH targets are large. Estimates prepared for this Investment Plan suggest that a total of US$11.4billion (US$817million/year) are needed from 2017 to 2030 (Table 28). About80% (US$651 million/year) of these requirements are for rural WASH, including US$405 million/year for water supply.

The estimates highlight the importance of recurrent expenditures for sustaining and managing WASH services and infrastructure. At more than US$496 million/year,these are larger than capital expenditures.

Table 28. Summary of expenditure requirements for the WASH sector, 000 US$

Component	Annual costs			Costs (2017-2030)
	Capital	Recurrent	Total	
Sector management				
Capacity building	1,607		1,607	22,491
Operations		16,339	16,339	228,743
Sub-total	1,607	16,339	17,945	251,235
Rural WASH				
Water supply	162,648	242,010	404,658	5,665,214
Toilets	60,603	44,903	105,506	1,477,078
Solid waste	12,968	66,177	79,145	1,108,030
CLTS	5,258	-	5,258	73,613
Sanitation marketing	26,490	-	26,490	370,863
Sanitation research	107	-	107	1,500
Hygiene promotion	11	30,238	30,249	423,485
Sub-total	268,085	383,328	651,413	9,119,783
WASH in schools				
Water supply	24,891	10,022	34,913	488,776
Toilets	10,105	61,925	72,030	1,008,419
Hygiene	118	8,821	8,939	125,145
Sub-total	35,114	80,768	115,881	1,622,339
WASH in health facilities				
Water supply	2,870	902	3,772	52,808
Toilets and wastewater treatment	12,542	14,576	27,118	379,657
Clinical waste treatment	384	225	609	8,522
Sub-total	15,796	15,703	31,499	440,987
Emergency WASH				
Planning	71	86	157	2,200
Contingency stocks	129	59	187	2,622
Sub-total	200	144	344	4,822
Total	320,801	496,282	817,083	11,439,166

Table 29. Summary of expenditure requirements for rural WASH sector by State/Region, 000 US$

Region/state	Annual average			Total 2017-2030
	Capital	Recurrent	Total	
Ayeyawaddy	34,696	43,120	77,816	1,089,418
Bago	25,908	38,508	64,415	901,815
Chin	2,456	8,221	10,677	149,482
Kachin	5,526	19,222	24,748	346,476
Kayah	1,239	10,827	12,066	168,919
Kayin	6,944	11,676	18,620	260,675
Magway	32,045	36,353	68,399	957,579
Mandalay	39,466	48,987	88,452	1,238,333
Mon	7,920	16,360	24,280	339,915
Nay Pyi Taw	9,384	24,185	33,569	469,965
Rakhine	15,442	23,464	38,907	544,695
Sagaing	41,508	39,297	80,805	1,131,272
Shan	25,508	40,697	66,205	926,871
Tanintharyi	5,793	12,707	18,500	259,003
Yangon	14,367	25,989	40,356	564,983
Total	268,201	399,613	667,814	9,349,403
Note: Costs include sector management				

Financing gaps

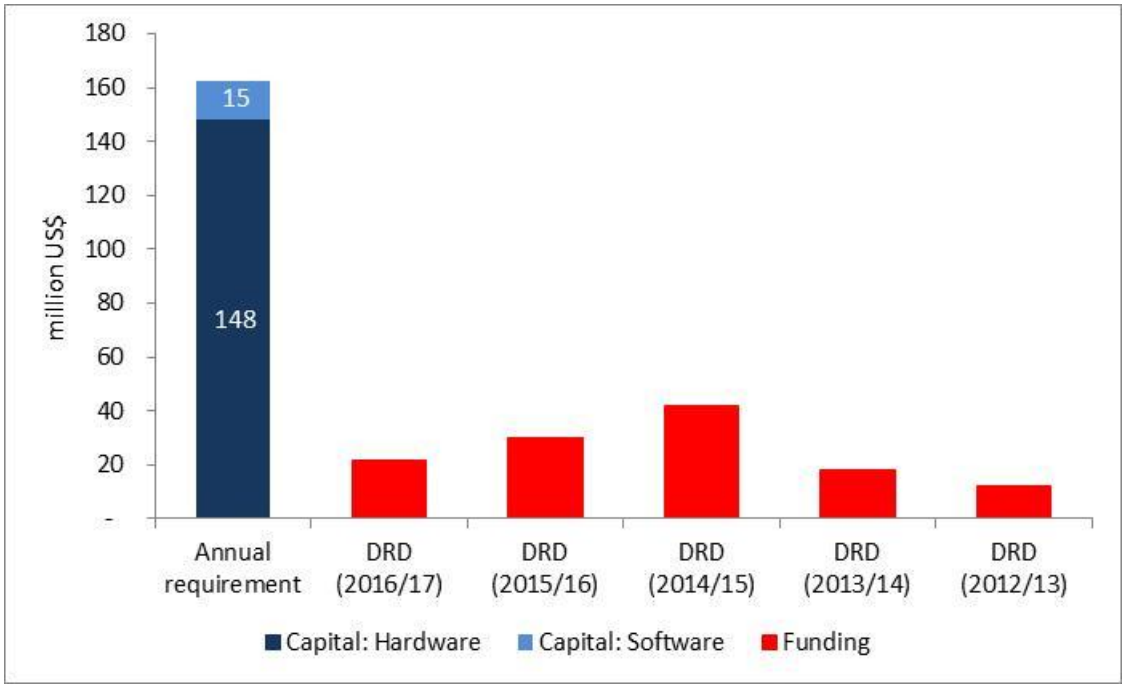
Rural Water Supply

The DRD budget for water supply projects from 2012/13 to 2016/17 averaged about US$25 million/year (Figure 16a). Focused more on hardware, these budgets include contributions from development partners including DFID (through UNICEF), JICA and USAID (though PACT and UN-HABITAT), and World Bank (as part of a multi-sector local development program).

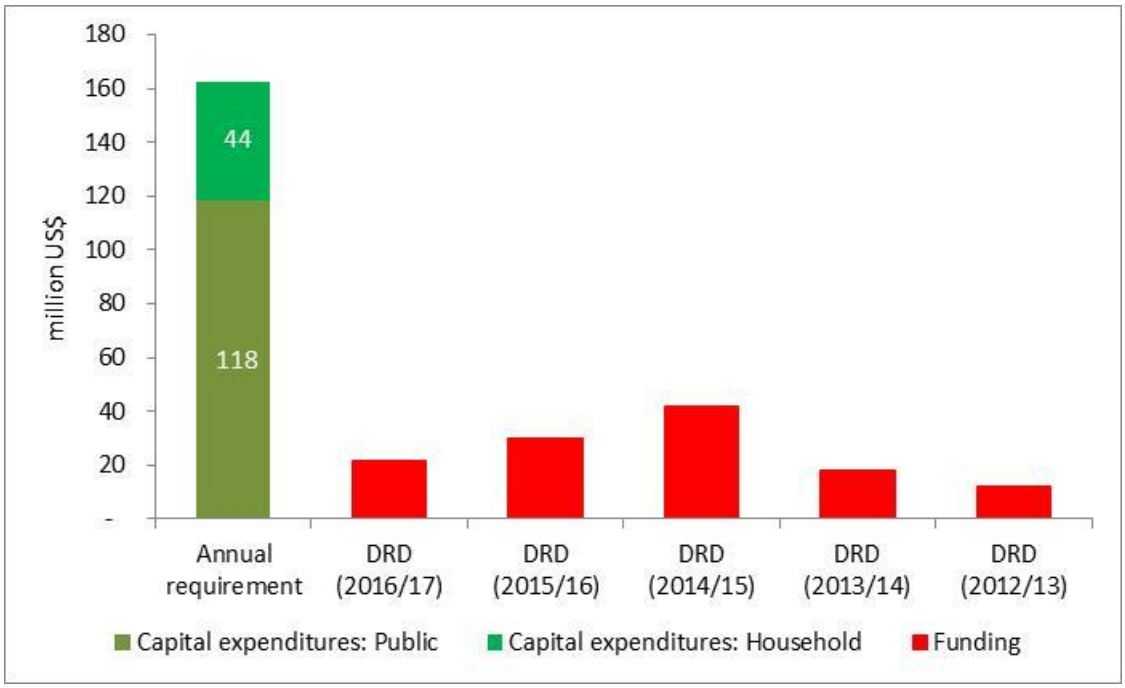
Matched against the required annual expenditures, the available financing is clearly very low. The average annual DRD budget for water supply for the period is only about 17% of the required capital expenditures (US$148 million/year). This gap remains large even if the expected contribution of households is accounted for (Figure 16b).

The funding gaps suggested by Figure 16 might actually be smaller because it excludes the contributions of development partners and other groups that did not put funds through the DRD. These groups include the expected contribution of rural households in financing the construction and recurrent costs of water supply facilities.

Figure 16. Funding requirements and available finance for the rural water supply



(a)



(b)

Note: Expenditure requirements as estimated in this Investment Plan. Information on funding provided by the DRD.

Rural Sanitation and Hygiene

Estimating the financing gap for rural household sanitation is more complex, with components in: hardware (household toilets); sanitation promotion (CLTS and sanitation marketing); hygiene promotion; and solid waste management.

The intent of the Strategy is to use the limited public funds (including development partner contributions) in two ways to maximise the uptake of toilets by households:

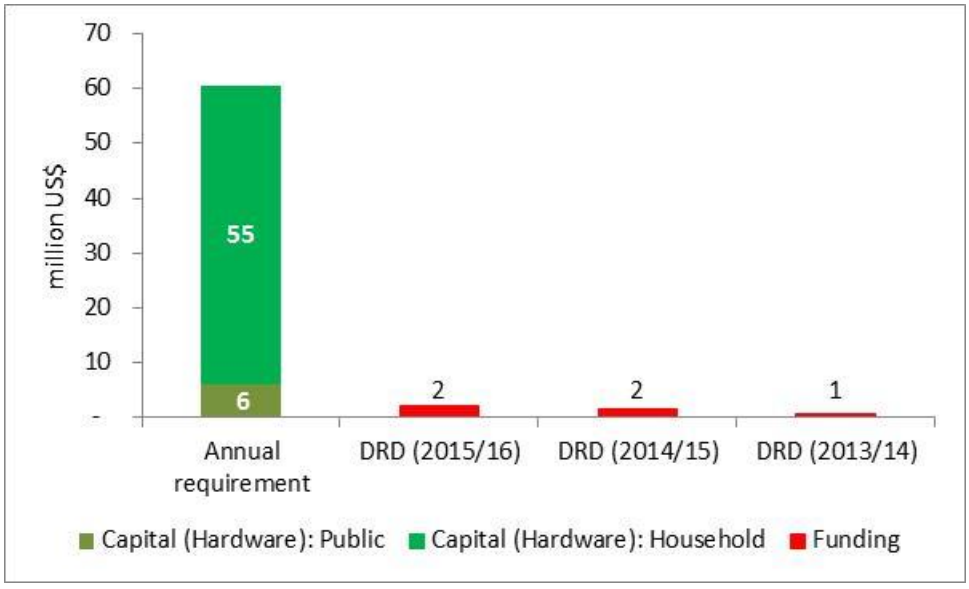
- First, promote the behaviour change necessary to motivate people to want and to use latrines that they will buy for themselves.
- Second, develop the supply side of sanitation –the enabling environment in which the private sector will meet the demand.

Thus, the financing requirement will be split into two parts: one for the construction of toilets where the financing gap will be filled by the households (except for the poorest) and communities; the other for public financing for the promotion and capacity development of the private sector (through CLTS and sanitation marketing) with a very limited element to support the poorest households to obtain toilets.

Household toilets – hardware

With support from donor agencies and other groups, the DRD has been financing the construction of household and public toilets. Between 2013/14 and 2015/16, DRD allocations for rural toilets amounted to slightly over US$1 million/year (Figure 17). These budgets are very low compared to the US$61 million/year in capital expenditures that are needed to achieve the targets by 2030. However, the gap is considerable lower when account is taken of the intended household contribution - $55 million annually. For reasons similar to those given to water supply, the financing gaps reported here are likely to be overestimated.

Figure 17. Funding requirements and current finance for the rural toilets - hardware



Note: Expenditure requirements estimated for the Investment Plan.
Information on funding provided by the DRD.

Household toilets and hygiene promotion – software

The annualised cost for sanitation software varies over time. Sanitation marketing research and development and hygiene promotion development are carried out over the first 5 years – the annualised investment needed for this and CLTS is approximately US$80 million. Thereafter the annual investment required is about US$6 million for CLTS and ODF verification and certification.

While financial information was not obtained for this Investment Plan, CLTS has been taking place in Myanmar. The Myanmar Water. Sanitation and Hygiene Sector Situation Analysis found some of the agencies actively involved in this activity are the Myanmar Health

Assistance Association, International Rescue Committee, Central Health Education Bureau, UNICEF, and Malteser.
Staff of the Department of Public Health of the MoHS undertakes hygiene promotion efforts. Supported by the UNICEF, the budget for such efforts for 2014 and 2015 was about US$80 thousand per year.

In effect, the whole investment required for sanitation software is a gap – US$80 million per year from 2017-2021, and US$5 million per year thereafter.

Solid waste management

There is currently no service or funding for this. In effect, therefore, the annualised investment requirement is a gap of US$11 million.

Total gap for sanitation requirement

Table 30 shows the total capital financing gap for sanitation, and how it varies over time.

Table 30. Summary of sanitation capital financing gap (US$ 000s)

Year	2017	2018	2019-2023 (average)	2024-2030 (average)
Toilets				
Public contribution	4,002	4,002	6,403	6,403
Household contribution	36,016	36,016	57,631	57,631
CLTS	0	0	6,134	6,134
Sanmark research	750	750	0	0
Sanmark development	0	0	74,173	0
Hygiene promotion	0	150	0	0
Solid waste management	0	0	11,418	11,418
Total	40,767	40,917	155,759	81,586
Effective gap[a]	4,752	4,902	98,129	23,956
Note: Effective gap = Total – Household contribution				

School and Health facilities WASH

Little information is available on funding for school WASH. School buildings are typically equipped with water supply and toilet facilities during construction, according to unofficial reports. However, the likely share of WASH facilities in total construction costs, which would have been useful in determining funding, has not yet been made available by the DBE.

According to DBE officials, there are no government funds specifically allocated for the construction of water supply facilities in existing schools. They also stated that local communities, persons of goodwill and other donors are the groups that typically finance water supply projects but there is no information on the amount of these funds.

In the case of latrines, the MoE has a program that provides one million kyats/school for program beneficiaries.[18] Estimates in the Myanmar Water, Sanitation and Hygiene Sector Situation Analysis Report (2015) showed that UNICEF, UN-HABITAT, CARE, Malteser and UNDP contributed a combined US$0.7 million/year for school WASH from 2011 to 2013.The Sector Situation Analysis Report also notes that schools can finance WASH projects and the maintenance of these facilities through government budget codes 0313 or 0315 – approximately US$37.6 million (or US$ 940/school) in financial year 2012/2013;WASH projects in this case compete with other demands on this funding. The scale of this funding combined appears to be much less than the US$35 million required annually.

Information on funds being allocated to WASH for health facilities was not available for this Investment Plan.

[18] DBE officials state that the one million kyats is designed to support that the construction of a latrine that has two cubicles.

9. Sector financing strategy

Addressing the financing gaps will require a considerable advocacy effort. For the capital component, the responsible department will need to persuade the Government to allocate sufficient funds, persuade communities to make their expected contribution, and attract donor funding. Arguments for this can include the:

- cost of doing nothing;
- benefit of investing in WASH;
- saving that can be made in funding for other sectors such as health.
- The contribution that WASH make to achieving many of the other SDGs.

Most of the recurrent costs are expected to be paid by users of the services. For this to happen, it will be necessary at local government level to set tariffs that will cover the operating and maintenance costs of the services.

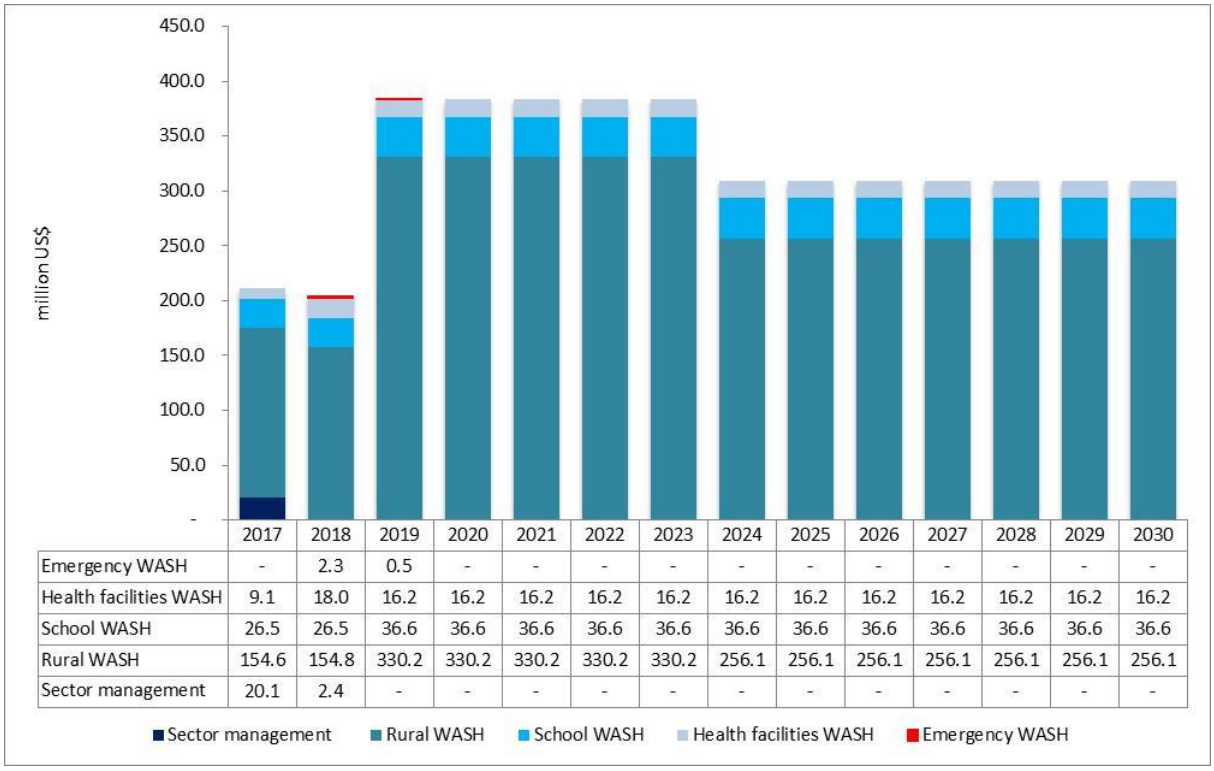
All the financing will need to take account of the affordability of provision of services, taking into account the high levels of poverty in many rural areas. It may be necessary to provide subsidies in some form to ensure this.

Time frame

Figure 18 shows the projected expenditures by year for the duration of the investment plan, with the following phases for the implementation of the Investment Plan:

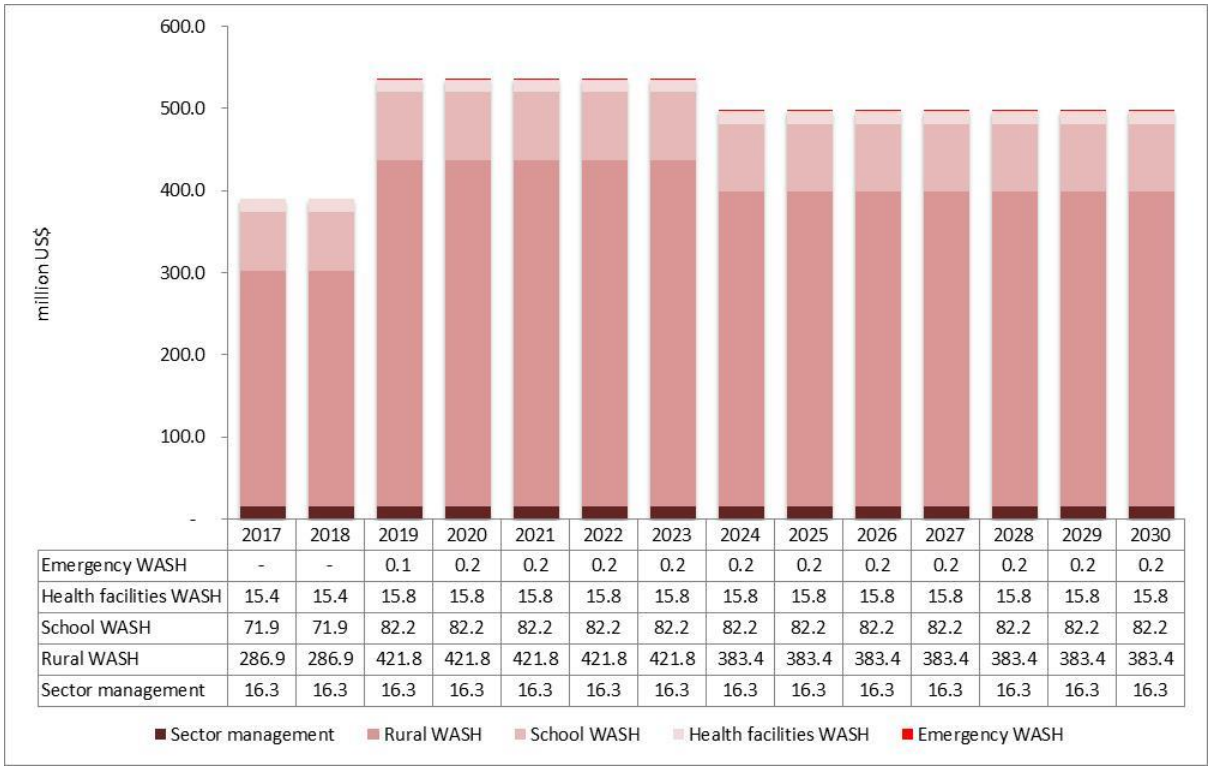
- Phase 1 (2017-2018): This is the transition period in which funds averaging about US$207 million dollars are required for capital expenditures, mostly for the replacement of worn-out facilities and the construction of new facilities designed to prevent access rates from falling below current levels. Recurrent costs would be about US$390million/year), mostly for maintaining and operating existing facilities(of which US$284 million for rural WASH would be paid by service users).
- Phase 2 (2019-2023): This is period represents the scaling-up of implementation of the Strategy and Investment Plan. With capital costs averaging about US$383 million/year, access rates to facilities are planned to start rising during this period and, in the case of rural sanitation, through a scaling-up of implementation of CLTS and sanitation marketing. Recurrent costs average about US$563 million/year, but would actually increase in line with the increase of service provision, again, mainly paid by services users, plus the full-scale implementation of hygiene promotion activities.
- Phase 3 (2024-2030): In this period there should be the steady completion of the Strategy and Investment Plan. An average of US$309million/year is needed for capital costs. The reduction in capital expenditures is due to the completion of sanitation marketing activities. Recurrent expenditure will average about US$498 million/year of which US$383 million are for rural WASH, most of which would be raised from user services charges. The decline in recurrent expenditures is due to the slowdown in hygiene promotion activities.

Figure 18. Expenditures by period



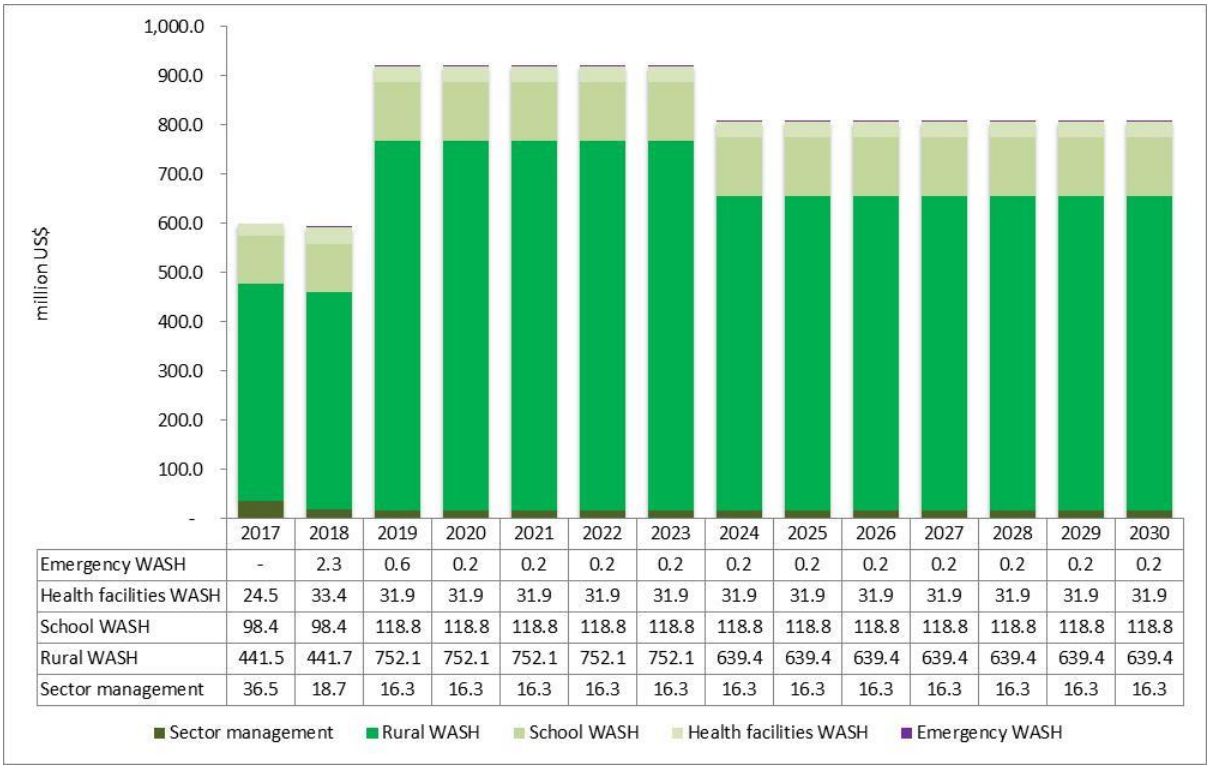
	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Emergency WASH	-	2.3	0.5	-	-	-	-	-	-	-	-	-	-	-
Health facilities WASH	9.1	18.0	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2
School WASH	26.5	26.5	36.6	36.6	36.6	36.6	36.6	36.6	36.6	36.6	36.6	36.6	36.6	36.6
Rural WASH	154.6	154.8	330.2	330.2	330.2	330.2	330.2	256.1	256.1	256.1	256.1	256.1	256.1	256.1
Sector management	20.1	2.4	-	-	-	-	-	-	-	-	-	-	-	-

(a) Capital expenditures



	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Emergency WASH	-	-	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Health facilities WASH	15.4	15.4	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8
School WASH	71.9	71.9	82.2	82.2	82.2	82.2	82.2	82.2	82.2	82.2	82.2	82.2	82.2	82.2
Rural WASH	286.9	286.9	421.8	421.8	421.8	421.8	421.8	383.4	383.4	383.4	383.4	383.4	383.4	383.4
Sector management	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3

(b) Recurrent expenditures



	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Emergency WASH	-	2.3	0.6	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Health facilities WASH	24.5	33.4	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9
School WASH	98.4	98.4	118.8	118.8	118.8	118.8	118.8	118.8	118.8	118.8	118.8	118.8	118.8	118.8
Rural WASH	441.5	441.7	752.1	752.1	752.1	752.1	752.1	639.4	639.4	639.4	639.4	639.4	639.4	639.4
Sector management	36.5	18.7	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3

(c) Capital and recurrent expenditures

Uncertainties and future work

The formulation of investment plans and budgets are always liable to uncertainty due to the lack of information, and on what might happen in the future. This was heightened in the current Investment Plan by the challenges faced in assembling reliable baseline data. This suggests an urgent need to strengthen and then maintain the information base, which when available can be used to update current estimates.

The specific areas where more recent and reliable information is needed are as follows.

- Demography
  - Growth rate of rural population at the regional level
  - Growth rate of the population by age groups.
- Changes in prices
  - All values in the study are expressed in 2015 prices. As prices of goods, services and foreign exchange (exchange rate) are not constant, the nominal (or current price) values of the estimates will change over time. Time and resources permitting, the values here may be updated to reflect existing prices.
  - Where resources and time are limited, a quick way to adjust the estimates to existing prices is to use the formula below.

$$Adjusted\ estimate\ (US\$) = \frac{Original\ cost\ estimate\ (US\$)\ x\ E_{2015}}{E_{current\ year}}\ x\ \frac{CPI_{current\ year}}{CPI_{2015}}$$

where

E_{2015} = Exchange rate for 2015 = MMK 1,149/US$

$E_{current\ year}$ = Exchange rate for the current year

CPI_{2015} = Consumer price index for 2015

$CPI_{current\ year}$ = Consumer price index for the current year

  - Note that this formula is just a rough method for updating the estimates to existing prices. It assumes that the various prices of the goods and services included in the estimates move in the same direction and magnitude as the average of the prices of all goods and services included in the CPI.

- Access rates
  - Access of households to improved solid waste facilities
  - WASH in schools, by level and conformity to standards specified in the WASH Strategy
  - WASH in hospitals (including clinical waste disposal), by level and conformity to standards specified in the WASH Strategy
  - In all instances above, determine the functionality of the facilities
- Schools data:
  - Information for the pre-primary level
- Technical information on facilities:
  - Unit costs for capital and recurrent expenditures
  - Expected life of facilities
- Financial information
  - National database for WASH expenditures (for household WASH, school WASH, hospital WASH, solid waste). Make a distinction between (a) donor/NGO and government funds, (b) funds allocated for hardware and software.
- CLTS: The forthcoming UNICEF CLTS Review Report states a success rate of 60% for CLTS programs in 350 villages in Myanmar in 2014. This suggests that follow-up programs or visits might be needed to accomplish the objective of zero open defecation by 2030. The study did not find information on (a) the type of program that needs to be implemented for follow-up visits, and (b) its costs.
- Sanitation marketing and research. This investment plan used information from other countries. There is a need to get a better sense of the costs and effectiveness of these efforts in Myanmar.
- School hygiene program. Weak assumptions on number of teachers to undergo training and training costs.
- Emergencies. It is important to note that the quantity and management contingency stocks of WASH equipment and kits might change after preparedness plans are put in place.
- Damage from natural calamities and events. While an allocation is made in this investment plan for emergencies, there is no allocation of the replacement of damaged facilities such as toilets and water supply facilities in homes, schools and hospital facilities. Future updates may be considered for this once estimates of potential damage over time are available.

Sensitivity analysis

One way to address uncertainties in the model is to conduct a sensitivity analysis. By examining how estimation results change as assumptions are revised, this process provides a sense of the robustness of the results. It also contributes to the identification of assumptions that have the strongest influence on the outcomes.

Given the many dimensions evaluated in the current Investment Plan, the decision is to be selective and limit the sensitivity analysis to a few variables only. To be more specific, the focus of the evaluation will be on capital expenditures for rural water supply, which accounts for 20% of overall costs.

The following scenarios were considered in the analysis:

- Scenario 1 (Length of life): Piped water supplies will last for 20 years. The original estimates were based on a length of life of 15 years.
- Scenario 2 (Lower initial access rates): Access to water supply at the start of the analysis is 51% at the national level, based on the JMP estimate for 1990 of access to improved water supply.[19] The original estimates were based on an access rate of 61%, which were drawn from the 2014 Census.
- Scenario 3 (Higher initial access rates): Access rate for water supply at the start of the analysis was assumed to be 74% at the national level, based on JMP projections for 2015.

Selected results from the analysis are presented in Table 31. Results for scenario 1 show that the 33% (15 to 20 years) increase in the expected life of water supply facilities reduce the capital and total costs of rural WASH by 5% and 2%, respectively. The reason for the decline in costs is that longer lives of facilities will require fewer replacements of facilities for the duration of the analysis. This leads to a decline in overall costs of only 2%. Scenarios 2 and 3 generated impacts on costs that were much smaller than Scenario 1.

Table 31. Results of the sensitivity analysis

Variables affected	Original estimate (m US$, annual)	Results (% deviation from original estimate)		
		Scenario 1 Life	Scenario 2 Lower access	Scenario 3 Higher access
Overall costs	11,439,166	-2%	0%	0%
Capital only	4,491,217	-4%	0%	0%
Rural WASH	9,371,018	-2%	0%	0%
Capital only	3,775,681	-5%	0%	0%
Rural Water supply	5,665,214	-3%	0%	0%
Capital only	2,277,074	-8%	1%	-1%

Note: Overall costs refer to the sum of capital and recurrent expenditures for rural, school, health centre and emergency WASH.

[19] The interested reader may refer back to Table 3 for the estimates used in Scenarios 2 and 3.

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Appendix 1. Definitions

Term	Definition/Description
Access to water supply services	The availability of an improved water source within 250 meters of the user's dwelling. An "improved" water source is one that is more likely to provide "safe" water, such as a household connection, a borehole, etc.
Access to adequate sanitation	one of the improved sanitation options is available at the user's dwelling
Community:	The specific group for whom the WASH sectoral activity is undertaken
Development partners	donors, development banks and multilateral development organisations
Drinking Water	water that meets water quality standards and is safe to drink with or without treatment
Hardware	physical infrastructure such as a piped water supply system, borehole, well, handpump or latrine
Hygiene	A set of behaviours associated with domestic water storage and use, and sanitation practices. Good hygiene is the practice of keeping oneself and one's living and working areas clean in order to help prevent illness and disease.
Hygienic latrine	A latrine or toilet the use of which effectively breaks the cycle of disease transmission through: confinement of faeces away from the environment; blocking the pathways for flies and other insect vectors; venting the gases generated in the pit through a properly position fly-proof vent pipe.
Hygiene promotion	A planned approach to preventing sanitation-related diseases through the adoption of safe hygiene practices
Improved sanitation	Flush or pour flush toilet connected to sewerage, a septic tank or a covered pit, a pit latrine with a slab or a Ventilated Improved Pit (VIP) latrine.
Improved water supply	water from a source that is more likely to provide "safe" water, such as a household connection, a borehole, etc.[20]
Maintenance Maintenance can be divided into: Preventive maintenance Corrective maintenance Crisis maintenance	the activities required to sustain a water supply in a proper working condition. regular inspection and servicing to preserve assets and minimise breakdowns. minor repair and replacement of broken and worn out parts to sustain reliable facilities. unplanned responses to emergency breakdowns and user complaints to restore a failed supply.
Monitoring	The checking, collection and analysis of information about current project development and service delivery to improve implementation, performance and results.
NGOs	non-governmental organisations, specifically non-profit making organisations; including international NGOs (INGO) and national and local NGOs: Private organizations that do not gain profit and focus on humanitarian and development activities for the benefit of society.

[20] Current information is insufficient to establish a relationship between access to safe water and access to an improved source. The two terms should not be confused or used interchangeably

Term	Definition/Description
Objective	The specific purpose or purposes of a plan of action. Objectives must be actions of change that are achievable and measurable.
Operation:	the everyday running and handling of a water supply, involving several activities: Major operations required to convey safe drinking water to the users, e.g. starting and stopping a motorised pump, the supply of fuel and the control of valves; - The correct handling of facilities by users to ensure long component life, e.g. the handling of a rope and bucket at a well, handpump use, and the use of taps at a standpost.
Pit latrine	latrine with a pit for collection and decomposition of excreta and from which liquid infiltrates into the surrounding soil
Pour-flush latrine	Latrine that depends for its operation on small quantities of water, poured from a container by hand, to flush away faeces from the point of defecation (usually to a pit (as above))
Recurrent cost	A cost that needs to be paid periodically to ensure that a system or installation will continue to function satisfactorily.
Rural area	Areas classified by the Department of General Administration (GAD) as village tracts. Generally these are areas with low population density and a land use which is predominantly agricultural.[21]
Rural communities	Settlements located outside of gazetted municipal areas.
Safe drinking water source	A source that consistently provides water of a quality that meets Proposed Myanmar National Drinking Water Quality Standards or other appropriate interim values.
Sanitation	Management and disposal of human urine, excreta and domestic waste water.
- "adequate sanitation" (SDG goal)	Definition: Population using a basic sanitation facility (current JMP categories for improved sanitation) which is not shared with other households and where excreta is safely disposed in situ or treated off-site.[22]
improved sanitation facility (for MDG monitoring)	one that hygienically separates human excreta from human contact.
Basic sanitation	facilities that effectively separate excreta from human contact, and ensure that excreta do not re-enter the immediate household environment. Each of the following sanitation facility types is considered as basic sanitation for monitoring progress toward the household sanitation

[21]The 2014 Myanmar Population and Housing Census: The Union Report: Census Report Volume 2

[22] Consolidated technical input from UN agencies on water and sanitation related indicators: List of proposed indicators and metadata for proposed indicators, Inter-agency and Expert Group on Sustainable Development Goal Indicators (IAEG-SDGs), July 2015, https://sustainabledevelopment.un.org/index.php?page=view&type=400&nr=2076&menu=35

Term	Definition/Description
	targets, if the facility is shared among no more than 5 families or 30 persons, whichever is fewer, and if the users know each other:[23] – A pit latrine with a superstructure, and a platform or squatting slab constructed of durable material. A variety of latrine types can fall under this category, including composting latrines, pour-flush latrines, and ventilation improved pit latrines (VIPs). A flush toilet connected to a septic tank or a sewer (small bore or conventional).
Sanitation marketing	The use of marketing techniques to promote the construction and use of sanitation facilities. Sanitation marketing considers the target population as customers. It borrows private sector experience to develop, place and promote an appropriate product: in this case the product is a toilet and excreta disposal system, be it sewerage connection, pit latrine or other mechanism. Critically the facilities must be readily available at an affordable price in the right place.
Septic Tank	An underground tank that treats wastewater by a combination of solids settling and anaerobic digestion. The effluents may be discharged into soak pits or small-bore sewers, and the solids have to be pumped out periodically.
Software	the set of activities relating to improving water supply and sanitation which do not comprise the construction and use of infrastructure: the enabling environment and its systems and procedures, hygiene and sanitation promotion (including CLTS and social marketing), training, community mobilisation and capacity building
Solid Waste Management	The discipline associated with the control of generation, storage, collection, transfer and transport, processing, and disposal of solid wastes in a manner that is in accord with the best principles of public health, economics, engineering, conservation, aesthetics, and other environmental considerations, and that is also responsive to public attitudes;[24]
Urban area	Areas classified by the GAD as wards. Generally these areas have an increased density of building structures, population and better infrastructural development.
Waste water	The spent or used water from homes, communities, farms and businesses that contains enough harmful material to damage the water's quality. Wastewater includes both domestic sewage and industrial waste from manufacturing sources
Water source	The point at which water can be abstracted, such as a spring or well. The source can also be a river or lake, depending on the context.
Water supply	Water used for domestic consumption – drinking, washing, bathing and home-based economic activities.

[23] WASH POST-2015: proposed targets and indicators for drinking-water, sanitation and hygiene, Recommendations from international consultations: Comprehensive recommendations- updated April 2014, http://www.wssinfo.org/documents/?tx_displaycontroller[type]=post_2015

[24] Philippines Ecological Solid Waste Management Act of 2000

Appendix 2. Methods and data

A2.1 Methods

- Different techniques were used to estimate funding (capital and recurrent) requirements. The choice of techniques was determined by the degree of complexity in estimating expenditures. For investments in facilities with finite lives, this plan used a costing tool developed by the World Bank.In cost components where the expected life of a facility or activity is not relevant, a more simple set of formulas was used to estimate funding requirements.
- Tools used and WASH components in the study
  - The World Bank costing tool was used for the hardware components of rural water supply, rural latrines, rural solid waste management, school water supply, school toilets, water supply facilities in hospitals, toilets in hospitals, wastewater treatment facilities in hospitals, and incinerators in hospitals.
  - Other formulae were used for software components for rural, school and hospital WASH, and emergency WASH.

- **World Bank costing tool**. The World Bank costing tool is a spreadsheet file has been used extensively in the estimation of spending requirements and financing gaps for the WASH sector of the East Asian region, including Myanmar (World Bank, 2015; World Bank and UNICEF, 2015). It requires information on population and its expected growth, technology mix in the initial and target years, unit costs of technologies, and expected life of technologies. Information on the population, and composition and expected life of technologies are needed to determine the physical requirements. This result refers to people who require access because they (a) did not have access to facilities in the initial year, (b) need an upgrade of their existing facilities and/or (c) require replacement of their existing facilities. Estimates are then converted to monetary units by applying the unit costs of facilities. Figure 2 in Section 1 shows the flow of information with the costing tool.
- Additional points:
  - The costing tool was used to determine capital expenditures only. It was not used to estimate recurrent costs and funding gaps.
  - The costing tool requires information on the population of persons requiring a service. In some instances, the quantity of facilities (toilets in schools) and the number of institutions (schools and hospitals) were used in place of the population. Adjustments were as a matter of course made to the supporting information that was used in the estimation process.

Other formula used

CLTS (Rural sanitation) *Capital expenditures for CLTS (2017-2030) =* *cost of implementing CLTS per village x number of rural villages* *Recurrent expenditures = none*
Sanitation Marketing *Capital expenditures for sanitation marketing (2017-2030) =* *ratio of sanitation marketing cost to hardware cost x annual Hardware costs x 5 years* *Recurrent expenditures = none*
Sanitation research *Capital expenditures for sanitation research = unit cost per region x no. of regions* *Recurrent expenditures = none*
Hygiene promotion *Capital expenditure (2017-2030) = fixed amount* *Recurrent expenditure (2017-2030) =* *cost per township x number of visits per township x number of townships*
School hygiene *Capital expenditures = number of teachers to be trained x cost per trainee*
Emergency WASH (preparedness) *Capital expenditures (2017-2030) = fixed amount* *Recurrent expenditure (2017-2030) = cost of re-assessment and revision per year x 14 years*
Emergency WASH (contingency stocks) *Capital expenditure (2017-2030) =* *cost of contingency stock x number of regions with contingency stocks + cost of emergency kits x 14 regions* *Recurrent expenditure (2017-2030) =* *(warehousing rental per year x 14 years + number of warehouse staff x salary per person per year x 14 years) x number of regions with contingency stocks*
Capacity development *Capital expenditure =* *training cost x number of staff x 5 trainings per year x 2 years + (computers + vehicles) x (number of townships + number of state/region + union)*
Sector management *Recurrent cost =* *Staff cost incl. overheads x number of staff x (number of townships + number of state/region + union)*
O&M cost per year: Applies to all hardware expenditures of rural water supply, rural toilets, solid waste management in rural areas, water supply facilities in schools toilets in schools, water supply facilities in hospitals, toilets in hospitals, wastewater facilities in hospitals and incinerators in hospitals. The formulae assume a constant increase in access from 2017 to 2030 and include labour costs *O&M cost per year = (O&M cost 2030 – O&M cost 2017)/2* *O&M cost (2017-2030) = O&M cost per year x 14 years*

A2.2 Data issues

- The methods and scope of the analysis requires considerable data. In many cases, detailed information was needed for various technologies at the regional level. In collecting the information, government documents and previous studies were examined and various institutions (government, development partners etc.) and experts were consulted. While some information are easy to collect, there are data which not readily available or of questionable quality.
- Where there are challenges in terms of the availability or quality of the data, the list below indicates the various measures undertaken for this investment plan:
  - Rely on previous studies in Myanmar (e.g. World Bank and UNICEF (2015))
  - Use national information in place of regional information (e.g. population growth)
  - Use information from other countries (e.g. ratio of software to hardware costs in sanitation)
  - Consult with experts (e.g., expenditures, unit costs, length of life.
  - Guesstimates (e.g. initial access rates to WASH of health facilities)

  While the values of the data inputs were validated in consultations (e.g. taskforce meetings and workshops)with experts and stakeholders, the uncertainty with the information suggests that many of the estimates in this document should be viewed more as broadly indicative of the investment requirements. These investment requirements may have to be re-estimated in the future once better data becomes available.
- Section A2.3 shows the data used in the analysis

A2.3 Annex tables

Annex Table 2. 1. Selected demographic variables for Myanmar

Region/State	Population (millions)[a]				Households (millions)[b]				Average household size 2014 (persons/household)[c]
	2014	2016	2018	2030	2014	2016	2018	2030	
Ayeyawaddy	5.3	5.3	5.3	5.2	1.3	1.3	1.3	1.3	4.1
Bago	3.8	3.8	3.8	3.7	0.9	0.9	0.9	0.9	4.2
Chin	0.4	0.4	0.4	0.4	0.1	0.1	0.1	0.1	5.1
Kachin	0.9	0.9	0.9	0.9	0.2	0.2	0.2	0.2	5.1
Kayah	0.2	0.2	0.2	0.2	0.0	0.0	0.0	0.0	4.8
Kayin	1.2	1.2	1.2	1.2	0.3	0.3	0.3	0.3	4.7
Magway	3.2	3.2	3.2	3.2	0.8	0.8	0.8	0.8	4.1
Mandalay	4.0	4.0	4.0	3.9	0.9	0.9	0.9	0.9	4.4
Mon	1.4	1.4	1.4	1.4	0.3	0.3	0.3	0.3	4.6
Nay Pyi Taw	0.8	0.8	0.8	0.7	0.2	0.2	0.2	0.2	4.1
Rakhine	2.8	2.8	2.8	2.7	0.6	0.6	0.6	0.6	4.4
Sagaing	4.2	4.2	4.2	4.1	0.9	0.9	0.9	0.9	4.6
Shan	4.2	4.2	4.2	4.1	0.9	0.9	0.9	0.9	4.7
Tanintharyi	1.0	1.0	1.0	1.0	0.2	0.2	0.2	0.2	4.8
Yangon	2.3	2.3	2.3	2.2	0.5	0.5	0.5	0.5	4.4
Union	35.7	35.6	35.5	35.1	8.1	8.1	8.1	8.0	4.4

[a] Population for 2014 was obtained from the 2014 Census. Population for other years was projected for this investment plan.

[b] Population divided by average household size.

[c] Sourced from the 2014 Census

Annex Table 2. 2. Technology mix for rural WASH facilities

Item	Water supply			Toilets	
	Tap water/ Piped	Tube well, borehole	Other improved [c]	Flush toilets	Water-sealed latrines (improved)
Access in 2030 (% of population)[a]					
Ayeyawaddy	15%	50%	35%	10%	90%
Bago	20%	60%	20%	10%	90%
Chin	90%	0%	10%	10%	90%
Kachin	20%	30%	50%	10%	90%
Kayah	30%	10%	60%	10%	90%
Kayin	20%	20%	60%	10%	90%
Magway	20%	70%	10%	10%	90%
Mandalay	20%	70%	10%	10%	90%
Mon	20%	5%	75%	10%	90%
Nay Pyi Taw	25%	70%	5%	10%	90%
Rakhine	15%	5%	80%	10%	90%
Sagaing	20%	70%	10%	10%	90%
Shan	25%	25%	50%	10%	90%
Tanintharyi	15%	15%	70%	10%	90%
Yangon	20%	35%	45%	10%	90%
Union	20%	45%	34%	10%	90%
Expected life (years)[b]	15	15	15	20	10

Notes:

[a] Projected.

[b] Expected life for water supply facilities and toilets were obtained from the DRD and World Bank and UNICEF (2015), respectively

[c] Other improved water supply facilities include protected wells and springs, and ponds that have a treatment system.

Annex Table 2. 3. Selected information for WASH in schools

Item	Primary	Middle	High school
Number of students			
2014[a]	5,098,211	2,839,722	919,644
2016[b]	5,116,129	2,946,336	998,475
2018[b]	5,151,965	3,159,566	1,156,138
2030[b]	5,366,980	4,438,942	2,102,111
Number of teachers			
2014[a]	204,223	81,917	35,935
2016[b]	205,664	88,308	42,673
2018[b]	207,104	94,699	49,411
2030[b]	215,748	133,044	89,841
Number of schools			
2014[a]	39,173	2,560	1,965
2016[b]	39,449	2,760	2,333
2018[b]	39,726	2,959	2,702
2030[b]	41,384	4,158	4,913
Number of students/toilet			
2014[c]	50	50	50
2016[b]	50	50	50
2018[b]	50	50	50
2030[d]	20	25	25
Number of teachers/toilet			
2014[e]	9	6	10
2016[b]	9	6	10
2018[b]	9	6	10
2030[f]	10	10	10
Proportion of schools with adequate water supply (%)			
2014[c]	59%	59%	59%
2016[b]	59%	59%	59%
2018[b]	59%	59%	59%
2030[d]	100%	100%	100%
Expected life (years)[e]			
Toilets	10	10	10
Water supply facilities	15	15	15

[a] Source: DHREP.
[b] Projected.
[c] Estimate for primary schools was taken from UNICEF (2011). Ratios for middle and high schools were assumed to be the same as primary schools...
[d] Source: WASH Strategy.
[e] Assumption.
[f] Based on WASH Strategy.

Annex Table 2. 4. Selected information for WASH in hospitals and health centres

Item	Sub-health center	Rural health center[g]	Station hospital[h]	Township hospital
Number of health centers				
2014[a]	6,733	1,418	530	241
2016[c]	9,243	1,810	610	247
2018[c]	9,243	1,810	610	247
2030[b]	25,560	4,647	610	325
Required number of toilets/health center	6.25	12.5	25.8	52.5
Number of toilets				
2014[d]	22,819	11,086	7,869	6,484
2016[c]	22,819	11,086	7,869	6,484
2018[c]	22,819	11,086	7,869	6,484
2030[e]	45,637	22,173	15,738	12,968
Proportion of facilities with adequate water supply (%)				
2014[f]	57%	93%	91%	91%
2016[c]	57%	93%	91%	91%
2018[c]	57%	93%	91%	91%
2030[c]	100%	100%	100%	100%
Expected life (years)[f]				
Water supply	15	15	15	15
Toilets	15	15	15	15
Wastewater facilities	na	na	25	25
Clinical/hazardous waste disposal	10	10	10	10

[a] Ministry of Health;
[b] Estimated based on geographical requirements provided by the ESD.
[c] Based on WASH Strategy.
[d] Assumes that existing facilities only have half of the required number of toilets.
[e] Assumes that facilities in 2030 have the required number of toilets.
[f] Assumption.
[g] The dataset for 2016 includes 32 urban health centers for this level.
[h] The dataset for 2016 includes 61 urban health centers for this level.

Annex Table 2. 5. Unit cost information for rural WASH facilities

Item (unit of measurement)	Water supply [a]			Toilets [b]	
	Tap water/ Piped	Tube well, borehole	Other improved [c]	Flush toilets	Water seal toilets
Capital expenditure, hardware (US$/household, 2015 prices)					
Ayeyawaddy	212	143	82	296	38
Bago	198	133	75	276	35
Chin	137	-	79	283	36
Kachin	202	140	89	343	44
Kayah	202	131	95	343	44
Kayin	186	132	90	323	42
Magway	440	258	88	316	41
Mandalay	384	225	77	276	35
Mon	171	121	82	296	38
Nay Pyi Taw	431	371	86	309	40
Rakhine	176	119	77	276	35
Sagaing	412	241	82	296	38
Shan	183	126	86	309	40
Tanintharyi	187	129	88	316	41
Yangon	232	156	90	323	42
Capital expenditure, software (% of total project cost)[d]	10	10	10	n/a	N/a
Recurrent expenditure, hardware (US$/household/year, 2015 prices)					
Ayeyawaddy	39	37	8	15	4
Bago	36	34	7	14	4
Chin	11	-	8	15	4
Kachin	43	41	9	18	5
Kayah	43	40	10	18	5
Kayin	40	39	9	17	4
Magway	52	44	9	16	4
Mandalay	46	39	8	14	4
Mon	37	36	8	15	4
Nay Pyi Taw	51	48	9	16	4
Rakhine	37	35	8	14	4
Sagaing	49	42	8	15	4
Shan	39	37	9	16	4
Tanintharyi	40	38	9	16	4
Yangon	43	40	9	17	4

[a] Capital expenditures (hardware) were provided by the DRD. Annual recurrent costs include maintenance and operations expenditures. Annual maintenance costs are assumed to be 5% of unit capital costs. Operations costs include estimates for labor and energy which were provided by the DRD.

[b] Capital expenditure costs are from the World Bank and UNICEF (2015).Recurrent costs for hardware assume that annual operation and maintenance costs are equivalent to 5% of capital costs. The proportion is based on the proportions used by the DRD.

[c] Other improved water supply facilities include protected wells and springs, and ponds that have a treatment system.

[d] Assumption.

Annex Table 2. 6. Other unit cost information

Item (unit of measurement)	Type	Unit[a]	Value
Other Rural WASH			
Solid waste[b]	Capital	US$/household	17
Solid waste[b]	Recurrent	US$/household/year	19
Sanitation marketing[c]	Capital	Ratio to annual hardware cost	1.2
Sanitation research[d]	Capital	US$/region	100,000
CLTS[e]	Capital	US$/village	1,152
Hygiene promotion[d]	Capital	US$	150,000
Hygiene promotion[f]	Recurrent	US$/visit/township	59,208
Sector management: Operations			-
Salaries of staff: Township team[g]	Recurrent	US$/township/year	18,807
Salaries of staff: Region team[g]	Recurrent	US$/region/year	18,807
Salaries of staff: National team[g]	Recurrent	US$/year	18,807
Office operating costs: Township team[h]	Recurrent	US$/township/year	27,000
Office operating costs: Region team[h]	Recurrent	US$/region/year	27,000
Office operating costs: National team[h]	Recurrent	US$/year	18,000
Sector management: Capacity building			
Training costs: Township team[i]	Capital	US$/year	6,979
Training costs: Regional team[i]	Capital	US$/year	6,979
Training costs: National team[i]	Capital	US$/year	6,979
Computer equipment: Township team[j]	Capital	US$	4,000
Computer equipment: Regional team[j]	Capital	US$	4,000
Computer equipment: National team[j]	Capital	US$	4,000
Vehicles: Township team[k]	Capital	US$	48,000
Vehicles: Regional team[k]	Capital	US$	48,000
Vehicles: National team[k]	Capital	US$	48,000
WASH in schools			
Toilets[l]	Capital	US$/person	7
Toilets[l]	Recurrent	US$/toilet	174
Water supply [m]	Capital	US$/school	5,224
Water supply [m]	Recurrent	US$/school/year	261
Hygiene training of teachers[n]	Capital	US$/trainee	9
Extra-curricular hygiene programs: Primary[o]	Recurrent	US$/school/year	174
Extra-curricular hygiene programs: Middle[o]	Recurrent	US$/school/year	348
Extra-curricular hygiene programs: High school[o]	Recurrent	US$/school/year	522
WASH in hospitals			
Toilet[p]	Capital	US$/toilet	15
Toilet: Sub-health center[q]	Recurrent	US$/toilet/year	294
Toilet: Rural health center[q]	Recurrent	US$/toilet/year	294
Toilet: Station hospitals[q]	Recurrent	US$/toilet/year	285
Toilet: Township hospital[r]	Recurrent	US$/toilet/year	350

Item (unit of measurement)	Type	Unit[a]	Value
Water supply: Sub-health center[s]	Capital	US$/facility	624
Water supply: Rural health center[s]	Capital	US$/facility	1,247
Water supply: Station hospital[s]	Capital	US$/facility	5,224
Water supply: Township hospital[s]	Capital	US$/facility	5,224
Water supply[d]	Recurrent	% of capital cost	5
Wastewater treatment: Station hospital[t]	Capital	US$/facility	3,098
Wastewater treatment: Township hospital[t]	Capital	US$/facility	5,163
Wastewater treatment: Station hospital[t]	Recurrent	US$/facility/year	155
Wastewater treatment: Township hospital[t]	Recurrent	US$/facility/year	258
Incinerator: Township hospital[u]	Capital	US$/facility	10,000
Incinerator: Township hospital[v]	Recurrent	US$/facility/year	1,500
Emergency WASH			
Preparation of WASH plan for emergencies[d]	Capital	US$	1,000,000
WASH plan annual assessments/revisions[d]	Recurrent	US$/year	100,000
WASH kits[d]	Capital	US$/region	20,000
WASH emergency stocks[d]	Capital	US$/location	500,000
Warehousing[w]	Recurrent	US$/location/year	10,448
Staff[x]	Recurrent	US$/person/year	1,567
Warehouse supervisor[y]	Recurrent	US$/person/year	3,135

[a] Numbers expressed in US$ are valued at 2015 prices.
[b] Calculated using data from Nguyen et al. (2012).
[c] Implemented over 5 years. The ratio was calculated using data from Robinson (2012).
[d] Assumption.
[e] Costs were based on CLTS projects implemented by UNICEF in Myanmar.
[f] Calculated using data from the DPH, MoH.
[g] Represents the salary of 10 staff, each receiving MMK 200,000/month.
[h] Represents costs of office operations and vehicle maintenance.
[i] Represents the costs of various workshops for training 10 staff members over a period of a year. These costs include per diems, rental of training facilities, meals, transport, hotel accommodation and fees of trainers. Costs were drawn from workshops conducted by the UNICEF for government officials.
[j] Represents the costs of four computers, including the printer and computer software.
[k] Represents the costs of two vehicles, each worth US$24,000.
[l] Based on costs provided by the DBE from toilets in urban and rural schools. Toilets in urban schools include a septic tank while those in rural schools include a concrete ring tank. Per capita costs were calculated by dividing the costs of the facilities by the number of users. Recurrent costs of MMK200,000/toilet/year were provided by the DBE.
[m] Assumed equal to the cost of tubewells in hospitals. Recurrent costs of MMK300,000/facility/year were provided by the DBE
[n] Calculated using basic information from the DBE, MoE.
[o] Costs provided by the DBE; [p] Costs provided by the ESD
[q] Maintenance costs were assumed to be 5% of capital costs. Operations costs were approximated by labor costs.
[r] Cost of water supply facilities in hospitals but pro-rated for the number of patients and staff.
[s] Assumed equal to the cost of tubewells in hospitals Source: ESD;
[t] Based on estimates shown in Borda (undated). Estimates were prorated to the size of township and station hospitals in Myanmar. Recurrent costs were assumed to be 5% of capital costs.
[u] Cost provided by the DPH;
[v] Assumed to be 15% of capital cost, as suggested by the DPH.
[w] Rent for a 400 square meter warehouse.
[x] Assumes 5 staff/location. This already includes security.
[y] Assumes one manager/location.

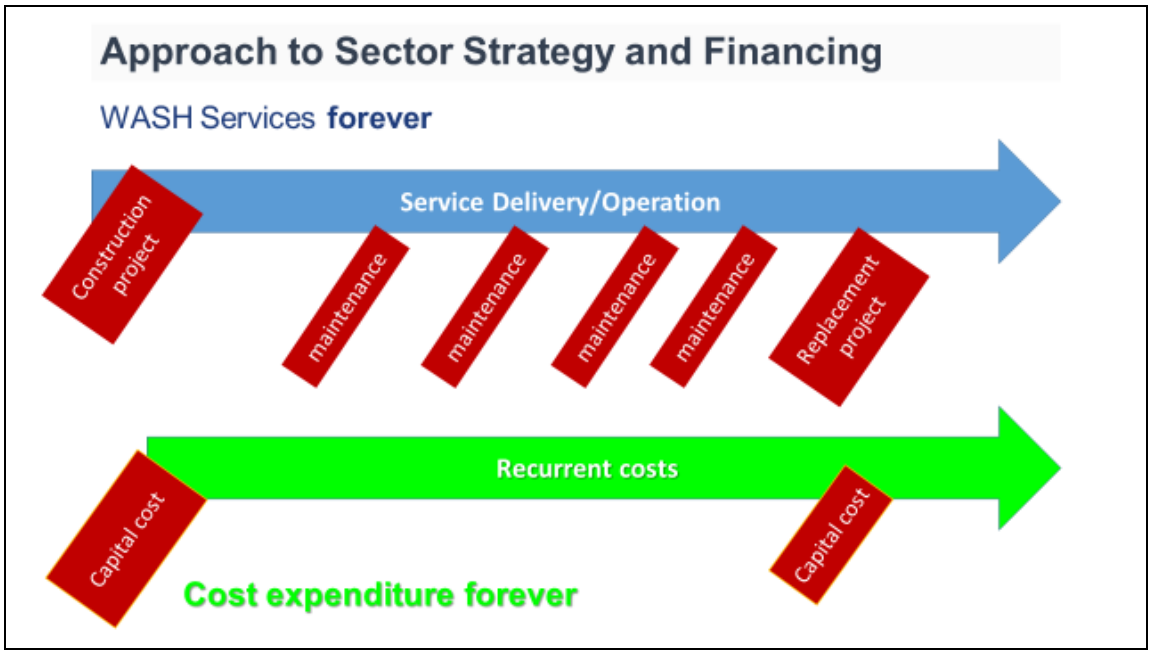
Appendix 3.Background information on investment planning

Investment Plan approaches to finance

Financing is essential for the sustainability of WASH services. But within this financing, the affordability of the service is equally important for sustainability. Unless all components of the services are affordable, to national government, local government, community and households, so that people can and do pay for them, they will deteriorate and eventually fail.

For the investment planning, it is necessary to consider the whole cost of the service, not just the capital cost. So, as well as the capital cost of construction and the associated up-front software costs of community engagement and hygiene promotion, the costs of operation, minor maintenance, major maintenance and eventual replacement costs must be considered. This is illustrated in Figure 1.

Annex Figure 3.1



The challenges of financing WASH[25]

Water is generally considered to be the part of public infrastructure posing the greatest financing challenge in developing countries. Water and sanitation services are on the boundary between economic infrastructure (e.g. transport, electricity, telecommunications) and purely social infrastructure (e.g. health and education). In economic infrastructure there is either a high degree of user charging (e.g. power, public transport, ports, and telecommunications) or substantial public budgetary provision (roads). In social infrastructure there is normally exclusive or heavy reliance on public finance.

[25] This section is taken from: EUWI-FWG, 2011, Financing for Water and Sanitation: A Primer for Practitioners and Students in Developing Countries, EU Water Initiative Finance Working Group and Global Water Partnership, http://www.gwp.org/Global/About%20GWP/Publications/EUWI/EUWI%20FWG%20Primer%20on%20Financing%20Final.pdf

W&S falls between these cases; politicians and water users alike are ambivalent about how far water should be treated as a basic right, whether it should be provided free or with a subsidy, or whether it is a commercial service to be charged for. The result is often an uneasy compromise where water services are priced below economic levels and the sector is chronically under financed.

Other features of W&S that affect its financing are:

- Water is often a public monopoly, and there is political interference in its supply and pricing.
- Many of the benefits of water are not reflected in its price.
- The infrastructure required for water services is costly, amortised over long periods, and its financial returns

Financing of sanitation has further challenges. In some respects, sanitation has suffered from its traditional link with water: it has been overshadowed, treated as a "poor relation", and its needs not sufficiently differentiated. Sanitation deserves to be treated as a separate subject, with its own challenges, institutions and policies, without losing sight of its close relationship with water supply. Traditional approaches to sanitation have focused on supply and financing has been viewed largely as an issue of subsidising technical solutions. This has led to the wrong kinds of facilities being provided, that are unused, neglected or even diverted for other purposes (e.g. storage).

Compared to water supply, the benefits of which are largely private, the safe disposal of human waste and household wastewater has large external benefits to society, which can justify public subsidies for sanitation targeted at poor communities.

Financing policy issues

There is no blueprint for an "ideal" system of water financing, just as there is no blueprint for a model organisation of a water sector – every country is different.[26] Policy issues that may be relevant to Myanmar include[27]:

- Public finance for public goods.
  There are good reasons for public budgets to prioritise public goods and activities with strong external benefits. A public good is a good or service that can only be provided by public authorities, since it is not profitable for a private agent to supply (e.g. because it is not feasible to charge, or because no one can be denied access to it because of non-payment). Examples include goods and services with external benefits such as clean water, sanitary disposal of waste, promotion of household hygiene. These cases confer wider social benefits, such as improved public health and the avoidance of epidemics.
- Financial self-sufficiency.
  Providers of water services should be able to count on sources of income from tariffs, budgetary allocations and ODA and other philanthropic sources for a sufficient future period to enable them to carry out their functions, including investment, efficiently. Agencies need freedom from political interference in their day-to-day business. Whether tariff income should cover full costs (however defined) is a matter for public policy; if subsidies are to be provided they should be transparent, reliable and predictable.

- Cost recovery from users.

[26] EUWI-FWG, 2011
[27] EUWI-FWG, 2011

Cost recovery from users should, however, be subject to affordability, with appropriate use of tariff structures. Targeted subsidies and cross-supports to reduce any hardship amongst vulnerable populations. Some people

Subsidies

In economics, a subsidy is a form of financial assistance paid to an individual, a business or an economic sector in order to achieve certain policy objectives. For example, a subsidy can be used to support businesses that might otherwise fail, or to encourage activities that would otherwise not take place. This definition implies that any financing for sanitation which does not flow directly from the immediately benefiting household to the service provider can be defined as a subsidy.[28] The different types of subsidy are shown in table.

Annex Table 3.1. Classification of subsidies

Direct subsidies	Direct subsidies involve the payment (in the form of cash or vouchers) directly to the recipient household which is then able to 'spend' to access a range of services.
Infrastructure subsidies	The use of public money to construct new infrastructure is one of the most familiar forms of subsidy. In **rural areas** and some urban contexts the most common form is payment of part or all of the cost of household toilets. This is generally described as a subsidy for the 'private' element of the system and is justified on the grounds that cost is the most significant barrier to certain households accessing services. Targeting may be done through means-testing, geographical targeting, or by subsidizing only certain levels of services (a basic single-pit latrine for example). In **urban areas** public funds are typically mobilized to pay for shared elements of networks (sewers and treatment for example) and such subsidies are (perhaps erroneously) regarded as normal and proper, even when the benefit is primarily a private good for those fortunate enough to be able to connect.
Connection subsidies	Many urban utilities charge households to connect to networked sewerage services. Households are often charged a 'fee' for the new connection, plus part or all of the capital costs of connecting the house to a sewer in the street and often must also pay a 'deposit' on some or all of the assets provided. Typically these connection costs can be very high and are often regarded by utilities as an important income stream. From the householders point of view however high one-off connection fees can form a very real barrier to connecting to the public services. In effect payment for connection represents a cross subsidy from the unconnected to the connected who are often benefiting from artificially low tariffs (see consumption subsidies below).
Operational subsidies	Operational subsidies involve the payment of money to a service provider to offset some or all of the costs of supplying a service. For example, in urban areas, a utility service provider may receive annual payments from central government to offset operational losses from its business or to pay for an artificial lowering of water or sanitation tariffs. This tends to be a blunt instrument with poor targeting, resulting in a disproportionate benefit to the rich. Operational subsidies for utility operations and software services are often ignored in policy debate.
Subsidies to small-scale operators	A less common form of operational subsidy is provided to bring down the costs of operation of small-scale service providers (the types of small enterprises that build latrines or empty latrine pits for example). These can be provided in the form of subsidized training and the provision of central business development services such as business planning, accountancy and auditing, although these may sometimes be included in the software for a sanitation programme. More pertinently here such subsidies may also be provided in the form of guarantees and subsidized loans to

[28] Evans, B., C. v. d. Voorden, et al. (2009). Public Funding for Sanitation: the many faces of sanitation subsidies. Geneva, Water Supply & Sanitation Collaborative Council.

	purchase start up equipment for small operators, which will have the effect of reducing the costs of services to the end user.
Cross-subsidies	A cross-subsidy occurs when one group of users contribute to part of the costs of providing services to another group. Cross-subsidies through the tariff in the water sector are relatively common and theoretically in some urban areas there is also a cross subsidy for sanitation – with high-volume water consumers paying more for sewerage services than those who consume less, even though each group benefits equally from the operation of the sewerage network and treatment plant.
Consumption subsidies	In many urban areas tariffs for sewerage services are kept artificially low. This represents a subsidy towards the cost of 'consumption' of the service, or a consumption subsidy. When prices are kept low in this way, the service provider will inevitably sustain losses. These losses must either be covered through operational subsidies to the supplier or they will result in systematic underinvestment in routine maintenance and rehabilitation of the network.
Output-based subsidies	Output-based subsidies are delivered against services successfully delivered (effective sanitation) rather than inputs (excavation, pipes and toilets). Thus an output based subsidy might be paid to a utility company when they have connected poor households to the sewerage network and demonstrated that a service is being provided for a pre-agreed period. Output-based subsidies can also be provided to operating companies running sewage treatment facilities or private pit-emptiers (for instance through voucher schemes) if they can increase the amount of faecal sludge delivered to the plant from poorer neighbourhoods using on-site sanitation. In rural areas similarly, an output-based subsidy might be paid to a local government or service provider if they can achieve 100% reduction in open defecation in certain communities.
Regulatory advantages	Inadvertent subsidies occur when policy is used to favour certain types of service delivery. For example in urban areas large-scale utility providers may benefit from regulations that grant them operating monopolies in certain areas, or from technical norms and standards that favour networked sewerage over more decentralized sanitation. These types of regulations tend to encourage the tolerance of inefficient monopoly utilities. They may also raise the operating costs of smaller service providers (by requiring them to meet unreasonable standards to participate in the market) and therefore constitute a subsidy to the larger-scale operators.
Subsidized credit	A final mechanism for the delivery of public funding into the sector is through subsidies and guarantees to micro-finance institutions (MFIs) who can then lend money for sanitation investments to households at reduced interest rates. MFIs may also provide other important services, such as micro-savings and micro-insurance which can also enable more households to make needed investments and manage their sanitation facilities over the long term. Channelling public money through MFIs has the dual advantage that it stimulates the development of micro finance services

Source: (Evans, Voorden et al. 2009)

Approach to financing

IRC International Reference Centre for Water & Sanitation in the Netherlands has developed a "life-cycle" costs approach for costing water supply and sanitation project under a project called WASHCost. This provides "a framework for analysis of cost data from water, sanitation and hygiene in rural and peri-urban areas in developing countries. The framework was developed to support the comparison of costs of services consistent with contemporary accounting and financing practices."[29]

[29]Catarina Fonseca, Franceys*et al.*, 2011, *Briefing Note 1a: Life-cycle costs approach: Costing sustainable services*, IRC International Water and Sanitation Centre, NL

"Life-cycle costs (LCC) represent the aggregate costs of ensuring delivery of adequate, equitable and sustainable WASH services to a population in a specified area. These costs include the construction and maintenance of systems in the short and longer term, taking into account the need for hardware and software, operation and maintenance, capita maintenance, any cost of capital, and the need for direct and indirect support, including source protection, training and capacity development, planning and institutional pro-poor support."[30]

These cost are usually separated into capital and recurrent:

- **Recurrent costs** are the continuous expenses involved in operating WASH systems, including wages and salaries, fuel, electricity, chemicals and other materials, spare parts and minor capital items necessary to maintain and repair systems. Some recurrent costs are overhead items, which are fixed and do not vary with the level of service (e.g. administration salaries, office rent, research, monitoring, meter reading, routine maintenance). Other items are variable and rise and fall with the volume of service provided (e.g. chemicals for treatment, electricity used for pumping). The most sustainable source of finance for variable costs is user charges, including cross-subsidies between different consumer categories.[31] For household sanitation, recurrent costs include cleaning, pit emptying and repairs.
- **Capital costs** are for large items of investment, including major repairs and replacements, modernisation and rehabilitation.[32] They also include software associated with infrastructure development, and aspects of institutional development.

[30] Catarina Fonseca, Franceys*et al.*, 2011, *Briefing Note 1a: Life-cycle costs approach: Costing sustainable services*, IRC International Water and Sanitation Centre, NL
[31] EUWI-FWG, 2011
[32] EUWI-FWG, 2011