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Introduction

Recognizing water and sanitation as one of the basic component of the primary health care, RWSS Programme was transferred in 1998 to Ministry of Health (MoH) from the Ministry of works & Human Settlement (MoWHS). Since then the MoH has been in an advantageous position to mobilize funds and accelerate its implementation by involving the health workers at the grassroots level. The MoH is responsible to improve the health of the rural population by reducing the incidence of water borne and related disease through the provision of safe drinking water and promotion of improved sanitary latrines.

During the Ninth Five Year Plan, Bhutan has achieved a number of milestones in relation to water and sanitation. We are close to achieving one of the targets for Bhutan's Millennium Development

MoH - RWSS Specific objectives are:

1. Provide universal access to safe drinking water supply to all rural population;
2. Promote improved sanitary latrines and ensure use by all rural population; and
3. Ensure more than 90% of rural water schemes are functioning and have water quality monitoring system in place.

Goals (MDG), which is for the people of Bhutan to have access to “Safe Drinking Water”. Access to piped-water supply or a protected water sources reached 83.2% in 2009 according to the MoH. The 2007 Bhutan Living Standards Survey (National Statistics Bureau (NSB), Dec. 2007) puts this even higher at 96% of the population having access to improved sanitation (99% in urban and 95% in rural areas), and access to an improved water source is 99.5% in urban areas and 88% in rural areas. Towards the end of the 9th FYP in 2008, toilet coverage in rural areas reached 90.8% of the population which is the highest in the region.

Since the start of RWSS, communities have benefitted from access to safe drinking water and do not have to carry water for long distances anymore. The level of sanitation has also subsequently improved with availability of water. Without safe drinking water and improved sanitation, people are prone to illness and suffer from various sicknesses that directly or indirectly have an effect on the convenience,

dignity and income of a person. RWSS indeed has brought change and progress in the way rural communities live today.

PHED's Objectives and Targets for the 10th Five Year Plan

The long term objective of the Division is to improve the overall health of the rural population by reducing the incidence of water borne and related diseases through the provision of safe drinking water and promotion of basic sanitary latrines.

The specific objectives of the PHED for the 10th FYP are as follows:

-  Explore alternative technologies for difficult and unreached areas to facilitate universal access to safe drinking water;
-  Strengthen sustainability of water supply and sanitation facilities;
-  Promotion of affordable and appropriate latrines in rural areas for effective health impact;
-  Improve quality of drinking water across the country through appropriate mechanism; and
-  Enhance capacity of staff working for rural water supply and sanitation facilities.

In order to achieve the above mentioned objectives the Division has adopted the following strategies:

-  Harvesting roof rainwater as one of the alternative technologies that are being tested in some critical places where gravity fed system is not feasible. This technology will be initiated nationwide particularly in the areas where people habitat on top of the ridges and the only source of drinking water is rain;
-  Pumping system is another alternative technology that will prove to be very useful in supplying drinking water in places where water sources are located below or lower than the settlements and where power supply is available;

- ❏ Community Planning and Management (CPM) workshop conducted by Dzongkhag engineers to create a sense of ownership of the rural water schemes by the communities thereby improving sustainability of the schemes. The selection of caretaker and maintenance committee is also done during the workshop;
- ❏ Community Development for Health (CDH) workshop conducted by Basic Health Unit staff in the communities to improve the sustainability and effective use of rural water supply facilities through broader community health issues (integrated water, sanitation and health management).
- ❏ Through SNV technical assistance, an approach to affordable and appropriate latrines in rural areas will be initiated and promoted for effective health impact;
- ❏ In order to improve the quality of drinking water a tool entitled “Water Safety Plan (WSP) framework, known for the most cost-effective and protective means of consistently assuring a supply of safe drinking water will be initiated and developed in Bhutanese context;
- ❏ Rural Water Supply & Sanitation Management Information System (RWSS-MIS) has been developed to monitor coverage and functionality of existing RWSS schemes in the country; and
- ❏ Capacity building of the stakeholders at various levels both In-country and Ex-country will be continued to facilitate sustainability and effective use of water and sanitation facilities through innovative learning.

Achievements



As per the geog plans submitted to GNHC, the total number of schemes to be implemented in the 9th FYP was 727 new RWSS schemes, 516 rehabilitation works and 305 spring protections. At the end of the 9th FYP, 1,208 new RWSS, 596 rehabilitation works and 1,067 spring protections were constructed, thus, constituting 166.16%, 115.50% and 349.84% increase respectively from the initial plan. The number of schemes implemented is more than what was planned but there are as many as 706 schemes which have been planned but not implemented;



Alternative technologies like roof top rain water harvesting systems, small scale electric pumping systems are being introduced in places like Yongla Goenpa in Pema Gatshel where water sources are not available at appropriate locations;



Rain water harvesting at Yongla



In addition to the regular water schemes, 28 water supply damaged by floods in the eastern region in 2004 have been also rehabilitated with funding of Nu.7 million from World Health Organisation (WHO) and about Nu.2 million from UNICEF;



In order to monitor RWSS coverage, an RWSS-MIS has been developed and introduced in all 20 Dzongkhags with training provided to one Health Worker in each BHU;



The community planning and management workshops and the community development for health workshops has been developed with the specific aim to assure community based Operation & Maintenance (O&M) of rural water supplies. These workshops have been fully institutionalized today and although O&M related problems still exist in many rural areas, it is believed that the concept/workshops eventually will fulfill the objective of sustainable RWSS schemes;

3

Observations - RWSS

3.1 PLANNING

The proposal and selection of rural water supply schemes (RWSS) within a geog at first instance takes place at the Geog Yargye Tshogchung (GYT). Considering and adapting various criteria the selection of scheme gets through the GYT process. The team then submits the proposal for RWSS selection done at the GYT within the geog, which is then decided by the Dzongkhag Yargye Tshogchung (DYT) at the Dzongkhag level. The proposal is then submitted to the Ministry of Health, Department of Public Health and Engineering (DPHE) for technical sanction.

The team's analysis on the planned activities against the executed ones in the fourteen Dzongkhags that the teams visited showed that, during the 9th FYP there has been prioritization shortcoming, unplanned activities carried out resulting in a huge deviation in terms of cost and spill-over of the activities/programmes to the next FYP.

3.1.1 Non-implementation of planned activities

During the 9th FYP, PHED had planned total of 1,548 RWSS schemes in Bhutan with an estimated budget of Nu. 172,593,000.00. Towards the end of the 9th FYP, PHED had executed only 842 schemes,

constituting 54.39% of planned schemes, thereby 706 planned schemes remain unexecuted resulting in under-achievement of the planned targets by 45.61%.

The PHED did not execute the planned RWSS schemes in more than 300 villages as proposed, thereby depriving them of RWSS facilities. The

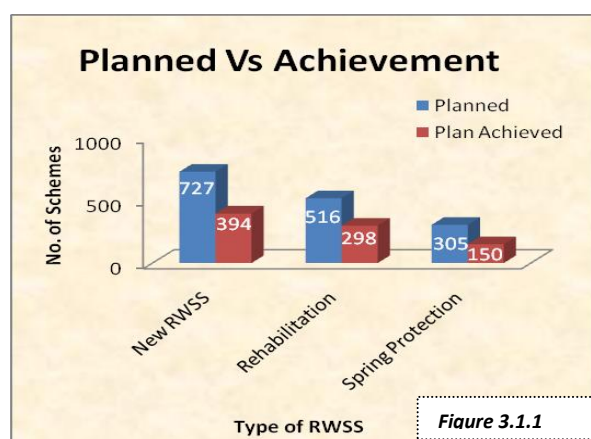


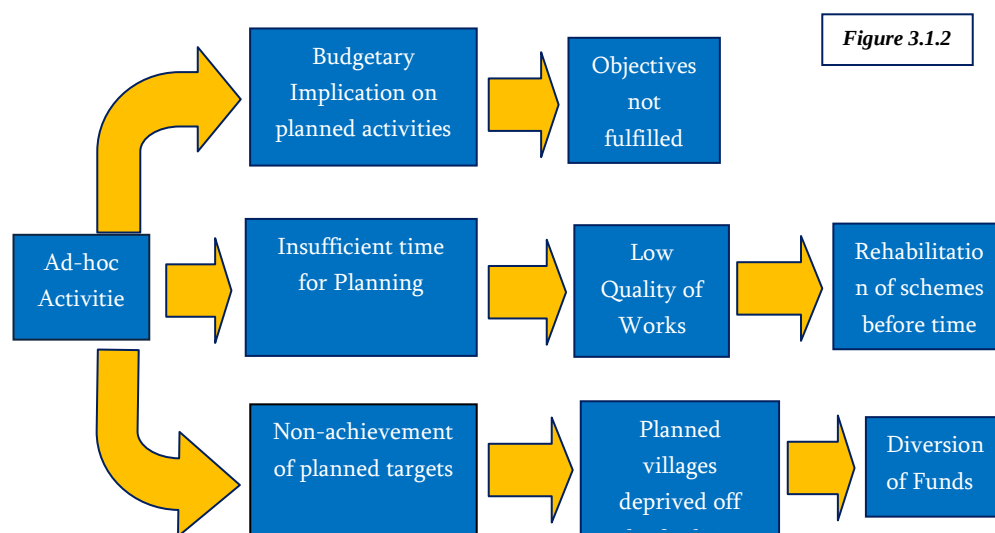
Figure 3.1.1 depicts the achievements against planned target and ad-hoc activities carried out. Details for the above are given in **Annexures A1, A2 and A3**.

3.1.2 Unplanned/Ad-Hoc activities carried out

During the 9th FYP, PHED had taken up 2,029 numbers of unplanned RWSS schemes worth Nu. 314,102,054.32 as exhibited in *Figure. 3.1.1*. A change in the priority of the activities during the time of implementation lead to huge numbers of ad-hoc schemes. The cost of actual execution in the end of 9th FYP was Nu. 465,450,391.74¹ against the planned budget of Nu.172,593,000.00. This has resulted in the overall cost escalation by 169.68%.

Audit attributes ad-hoc schemes as one of the main reasons for non-implementation of 9th FYP targets. This indicates that, proper planning and prioritization of RWSS schemes have not been carried out. The execution of ad-hoc activities could also lead to higher costs for maintenance in the future as well as deprival of benefit of the schemes to the communities which were included in the original plans.

Figure 3.1.2 shows the shortcomings of undertaking ad-hoc activities



¹ For the purpose of comparison, the executed cost represents only the costs of material supplied by Government.

3.1.3 Inappropriate Budget Estimates

During the 9th FYP 1,548 RWSS schemes were planned with a total budget estimate of Nu. 172,593,000.00. While reviewing the 9th FYP documents of the Geogs, it was observed that same amount of budget was estimated for almost all types of schemes as shown in table. RAA is of the view that, considering the difference in the number of beneficiaries, distances from access points to villages and sources, transportation, labour and material costs, the budget estimates for each scheme should ideally be different. However, it seemed that these factors were not considered. Implementers acknowledged the inappropriateness in the budget estimate and attributed it to inadequate project survey due to lack of time and resources.

Type	No. of Schemes	Budget Estimates (mm)
New RWSS	1	0.132
Rehabilitation	1	0.122
Spring Protection	1	0.013

Inappropriate budget estimates have resulted in huge variations between the overall estimated costs and actual costs. It can be concluded that the planned budget estimates were not prepared with detailed pre-feasibility and technical study.

3.1.4 Variations in cost of schemes

During the 9th FYP PHED had planned a total of 727 new schemes, 516 rehabilitations and 305 spring protections. While reviewing the budgets estimates of planned schemes against planned schemes executed, the RAA observed huge variations in the planned budget estimates and actual expenditure. Cost variations were also observed between planned schemes executed and ad-hoc schemes executed. On two types of schemes, i.e. 'New RWSS' and 'Rehabilitation' schemes the average cost of executing each scheme was higher than the budget estimated for a planned scheme as given in Table 3.1.4.

Inappropriate systems of budget estimation were observed as one of the main reasons for huge variations between the planned budget estimates and the actual cost of implementation. The variations in the cost of

implementing planned schemes and ad-hoc schemes may also be attributable to lack of proper planning for the ad-hoc activities.

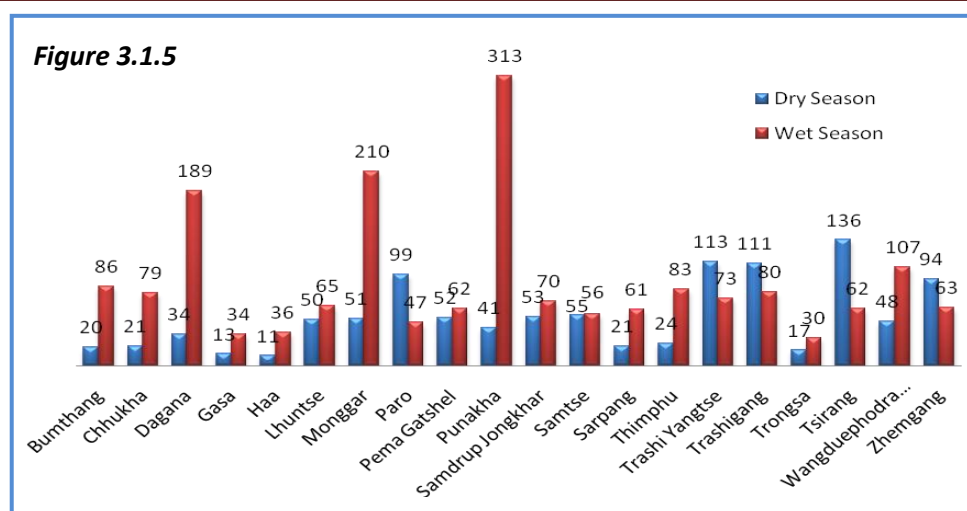
Table 3.1.4 below shows the average cost variations between planned budget estimates and actual costs of planned schemes executed during the 9th FYP.

Table 3.1.4				
Type	Planned budget estimates		Planned schemes executed	
	No	Cost	No	Cost
New RWSS	727	105,361,000.00	394	98,345,049.14
Average cost	1	144,924.72	1	249,606.72
Rehabilitation	516	56,410,000.00	298	49,716,217.20
Average cost	1	109,321.71	1	166,832.94
Spring Protection	305	10,822,000.00	150	3,287,071.08
Average cost	1	35,481.97	1	21,913.81

3.1.5 Inappropriate timings for conducting preliminary surveys for drinking water source

Selection of drinking water sources for RWSS Schemes requires perennial sources that will provide water all year round. This is verified by conducting surveys prior to construction for schemes. Surveys to measure quantity of water available during lean seasons ensure that water is available all year round and that quantity is enough for both drinking and sanitation purposes during dry periods. The surveys make sure that only the best available source is used for providing drinking water supply to communities.

The analysis of data collected for 2,877 schemes, as illustrated in Figure 3.1.5 shows that 62.86% of RWSS surveys for water source selection during the 9th FYP were done during ‘Wet Season’ from June to February, while the ideal time for carrying out survey is noted to be during ‘Dry Season’ or lean periods from March to May during a year where only 37.03% of schemes were surveyed. Survey dates for 3 schemes were not available.



The RWSS-MIS inventory maintained by PHED confirms that one in four schemes is listed as ‘*Low Functionality*’ or ‘*Non-functional*’. While correlating 196 defunct schemes against the survey dates, 189 schemes were found to have been surveyed during the wet season. Details of the same are given in **Annexure B**.

The resultant effect of these inappropriate surveys is that tap stands are left dry during winter and spring. This results in failure of schemes that is expected to solve the village’s water scarcity problems.

3.2 RESOURCES

3.2.1 Inadequate resources for management of RWSS Schemes

3.2.1.1 Equipments

The water quality testing equipments help obtain scientific and accurate results and having basic test kits and equipment in districts and regions ensure a more accurate result for the water quality tests carried out prior to RWSS implementation. The results can help implementers decide whether to treat, abandon or change sources. As per the RWSS Policy water quality tests are mandatory to be carried out prior to start of works for RWSS, however many are constructed without a test for the want of equipment and test kits.

Besides water quality testing equipments in the regions what most schemes also lacked was a basic tool kit containing repair & maintenance tools for use by the caretaker. All schemes upon completion appoint a care taker for the schemes who is trained as well as equipped with a tool kit so that minor

repair & maintenances and emergencies can be taken care of by a qualified person as and when they arise.

For example most schemes in Punakha had a caretaker but only the geog as a whole had two toolkits. Since the tools are shared by more than one scheme it was observed that the tools were not taken care of properly and lacked proper handing-taking and safekeeping.

Safe drinking water is a must have for everybody and measures to ensure that the sources are fit for consumption must be strictly adhered too.

3.2.1.2 Human Resource

The audit team also noted that besides testing equipment there was shortage of qualified technicians to operate the equipment as well as interpret the results and accordingly take necessary actions. While some Dzongkhag Hospitals had well equipped laboratories as well as portable test kits to carry out the necessary tests, it did not have the manpower required to physically visit scheme sources for testing.

For example in Sarpang Dzongkhag the District hospital had only one Lab Technician qualified to carry out these tests, but the hospital's routine tests and duties kept the lab technician occupied throughout the day. The only times that tests were conducted was when there were outbreaks of water borne diseases or requests from concerned communities. Most of the far flung communities and villages were usually not visited by the health officials or qualified technicians to carry out this basic mandatory test.

3.3 COMPLAINTS TO SECTOR POLICY

3.3.1 Water Quality Test for determining Safe Drinking Water not satisfactory

Clause 5.6 of the RWSS Sector Policy states that all sources selected for RWSS schemes should be tested and confirmed safe for consumption prior to construction of scheme. The Ministry of Health (MoH) considers the bacteriological contamination tests as the most important parameter for

water quality in Bhutan based on requirements derived from the WHO guidelines for Drinking Water Quality. Chemical parameters are not tested.

In most Dzongkhags, there were no records to show that water quality tests (WQT) were done for RWSS schemes, if any. Few schemes where sources had been tested prior to setting up of scheme were usually in villages or communities that were close to the Dzongkhag Hospitals.



Mobile Water Testing Kit

Most communities interviewed by audit teams were found using water sources that their ancestors had been using earlier. No tests had been conducted to confirm that the quality of water had not deteriorated since then. Lack of WQT could result in people consuming unsafe water which leads to various water borne diseases.

3.3.2 Ineffective enforcement of the Memorandum of Understanding

The RWSS Programme Project Completion Certificate is an agreement between the beneficiaries, dzongkhag PHE staff and the PHED head quarter. *Clauses 5.2 and 5.3* of the agreement clearly stipulate the roles and responsibilities of the RWSS Maintenance Committee and the Caretaker. The responsibility of the care taker is to ensure that the scheme functions properly at all times and report major problems to the RWSS Maintenance Committee which is then brought to the notice to the Geog administration and then to the Dzongkhag Administration.

DPHE's situation analysis at the end of 9th FYP

All the rural population has access to clean drinking water supply and basic sanitary latrines, which is properly maintained and effectively used.

However, in practice, the agreement was not enforced effectively, as many of the schemes did not identify appropriate RWSS Maintenance Committee and caretakers as required by the agreement. Interview with the beneficiaries indicated caretakers refuse to carry out their responsibilities

properly as they were not compensated as decided in the agreement. Inadequate knowledge sharing, skills and trainings were the main factors that contributed for the ineffectiveness of the management group.

The ineffective enforcement of the agreement may result in untimely deterioration of the schemes as regular inspections and minor maintenance are not carried out on time. It also indicates lack of close supervision and monitoring mechanisms from the geog administration in enforcement of the agreement.

3.3.3 Geog administration not aware of the RWSS Sector Policy

The RWSS Sector Policy applies to all aspects of planning, design, construction, use, management, operation, maintenance, rehabilitation and financing rural water for domestic use in the rural areas of the country, including water resources and associated legal aspects. Nevertheless, transforming the policy requires close understanding of the policy and good collaboration between the stake holders. As a decentralisation policy, like any other activity, the selection and implementation of the RWSS in the Geog lies with the Geog Administration. The RWSS schemes implemented has undoubtedly benefitted the rural lives but it was astonishing to witness that the Geog Administrations are not aware of the RWSS Sector policy which guides the planners and implementers on all the aspects related to RWSS. Proper awareness has not been created on the RWSS Sector Policy.

3.3.4 Water supply and sanitation in institutions do not meet minimum standards

As per *Clause 5.4* of the RWSS Sector Policy, PHED has the responsibility to design the water supply for institutions vis-à-vis schools, religious institutions and road-side camps. The minimum standard in schools is VIP latrine with a compartment for every 50 users and aqua privy toilet with one compartment for every 50 users for residential institutions.

PHED and dzongkhags have the right to inspect and instruct the responsible agency or contractor on the provision, adequacy and quality of water and sanitation facilities for schools, religious institutions, road camps and construction camps. *RWSS Sector Policy (2002)*

However, instances were observed by RAA, where the water supply and sanitation facilities in many such institutions did not meet the set standards. Proper water supply and sanitation facilities in these institutions demand immediate attention, so as to protect this section of society from common health problems related to unsafe drinking water and hygiene. The most common diseases found in these institutions were typhoid and diarrhoea which are water borne diseases. One of the main reasons cited by the respondents was drying up of water sources in addition to lack of fund.



However, RAA felt that lack of proper coordination & communication between PHED and agencies concerned and non-involvement of PHED in design and construction of such facilities are also other main causes for such situations.

3.3.6 Catchments areas around water source not designated and protected

Catchment area around the water source should be properly designated and protected after construction of the water supply facilities i.e. it should be free from human and animal activities upstream, cutting and removal of trees and other disruptive activities.

Animals having direct access to the water seems to be one of the major risks,' says Dyel Hampson, a PhD student at the University of East Anglia and lead author of the paper, published in Water Research. 'The simple solution of fencing off cattle from rivers is probably one of the most effective ways farmers have of reducing faecal matter contaminating watercourses. From the farmer's point of view, it is a solution that they can get on and do'.

In Bhutan, no cattle owner would even consider putting their animals in pasture where there is no water. Catchment areas around the water source have been found not properly designated and protected. Out of 109 schemes visited by audit it was found that 18 water source catchment areas were not properly protected as required. Details are given in **Annexure C**.

Human sewage and farm manure are the two main causes of faecal pollution in the United Kingdom (UK). Recent research suggests that some of the biggest gains in keeping our waterways clean could come from a more traditional technology like fences.

3.4 OPERATION AND MAINTENANCE

3.4.1 Lack of sense of ownership amongst beneficiaries

A common belief amongst beneficiaries is that government constructed infrastructures are owned by the government and that they are responsible for its maintenance and rehabilitation. As per *Clause 9.1* of the RWSS Sector policy, full legal ownership of schemes is vested with the community after completion. The schemes are handed over by Dzongkhag Administration to beneficiaries by signing the MoU/*Genjas* prepared by PHED.

Beneficiaries still live and see the ownership and responsibility for the maintenance and rehabilitation of the drinking water schemes as being that of the government.

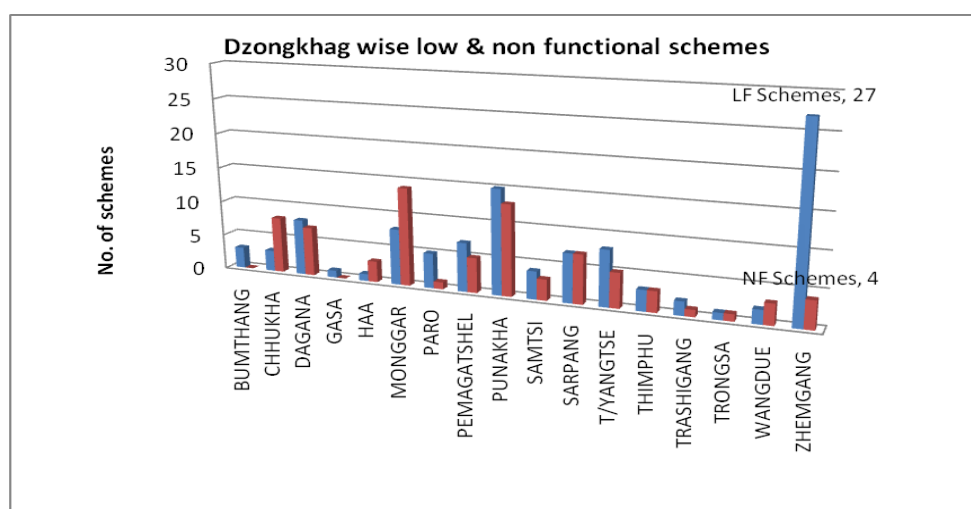
Although water management committees and caretakers have been appointed for schemes, the team noted many instances where people have been requesting Dzongkhag Administrations for minor repairs and maintenance works. It has also been observed that when these requests are not entertained by the Dzongkhag Administrations the beneficiaries make little or no effort to fix problems. Many tap stands of many schemes were found without repair and the government efforts futile.

3.4.2 RWSS schemes not delivering services to the public

As per the data base maintained by the PHED, there are a total of 4,372 RWSS schemes in the country out of which 1,157 schemes were found either with '*low functionality*' or '*non-functional*'. Schemes with *low functionality* refer to those schemes where there is a risk for failure. The schemes were found deteriorating fast. *Non-functional* schemes are those where water supply and sanitation is in reality not functioning.

The non-functional schemes constitutes 11.90%, while 14.56% being schemes that is deteriorating fast which will become unusable if not maintained, hitting the percentage to as high as 26.46% or even more. The total cost of the schemes not delivering services is Nu. 62,579,226.84.

During the site visits the audit teams came across some unlisted non-functional schemes. The data for these schemes have been updated and details along with the cost are given in **Annexure D**.²



The chart above depicts Dzongkhag wise details of the schemes with 'Low Functionality' and 'Non-functional'. Implementers attributed this to untimely maintenance and drying up of the sources.

3.4.3 Non management of Maintenance funds for RWSS schemes

The RWSS Sector Policy's *Clause 4.5(3)* requires a maintenance fund to be collected and managed by a duly constituted committee appointed at the time of signing the Project Completion Certificate. The fund is to be used for minor maintenance and expansion of schemes, remuneration of care takers, providing higher level of service and for the contribution to capital costs when scheme is due for rehabilitation.

On site visit and review of documents, it was noted that most schemes do not have a management committee and those beneficiaries with a committee have not collected and managed the maintenance fund.

² The list excludes Samdrup Jongkhar and Lhunthe Dzongkhags as the data for the same was not available.

While the Memorandum of Understanding (MoU) requires a Maintenance fund to be collected and managed, it does not legally bind the implementers for consequences arising out of non-compliance. Audit is of the opinion that non-management of Maintenance funds for RWSS schemes could eventually impede the sustainability of the schemes.

3.4.4 Rehabilitation works done without following due process

As per RWSS Sector Policy *Clause 5.2.1* schemes over ten or more years may be considered and prioritized for rehabilitations. The Policy also states that a scheme is designed to function well for at least a minimum of 15-20 years prior to rehabilitation works.

Upon examination of the schemes that were rehabilitated in 9th FYP, it was observed that out of 596 schemes, 77 schemes were rehabilitated within 10 years of time at the cost of Nu. 25.94 million (*Annexure E*) There by, not following the criteria specified in the Sector Policy. In addition the teams also observed that all rehabilitation works were fully financed by the government whereas *Clause 6.2(5)* of the RWSS Sector Policy requires communities to provide 10% of material replacement costs for rehabilitation.

The reasons noted for these early rehabilitations are inadequate planning, inferior workmanship, low quality of infrastructure and lack of maintenance fund in most schemes. Timely repair and maintenance of schemes could have increased the lifespan of many schemes. If proper monitoring and supervising systems are not instituted during the time of construction, the number of such incidences might increase in future. This could also affect the schemes that are well over 10 years of time and require genuine rehabilitation and also have budgetary implications on the new schemes.

3.5 MONITORING & SUPERVISION

3.5.1 Inadequate monitoring and supervision at the ministerial, Dzongkhag and geog level

One important aspect for a smooth and effective work is the monitoring and supervision with adherence to the given specifications and guidelines. While schemes have been already constructed, interviews with the beneficiaries revealed that regular and timely monitoring was generally lacking in the Dzongkhags visited by the teams. In some cases, it was found that the work was being carried out at the will of the plumber at site. As such, the executions of works are not in accordance to the design and drawings. One example to cite such scenario is the *Shaphangma* RWSS scheme under Drametse geog in Mongar.

The Project with the total cost of Nu.2,721,187.07 specify 1 FCR, 30 numbers of BPT and 31 numbers of public tap stands constructed at the site. While the team conducted the physical verification, against the record of 31 public tap stands, 30 BPTs and 1 FCR, the team found only 9 public tap stands and there were no BPT and FCR constructed. Site visits by the Dzongkhag officials is essential to monitor these kinds of situation and condition. During audit, it appeared that most Dzongkhag officials were not aware of the case until the audit teams conducted field visit.

3.6 SANITATION

3.6.1 Inadequate sanitations practices and facilities in rural communities

Bhutan's sanitary conditions vary from place to place and for the rural communities a lot still remains to be improved. A basic pit latrine is all that one needs in villages to meet sanitary requirements. Most villagers were aware of the benefits of improved sanitary practices/facilities, but they still lacked good sanitation habits. While open defecation cases are few in number they still exist.



Hanging Toilet in Barilum, Kabjisa, Punakha.

The audit team observed that especially in Dzongkhags where resettlement programmes have being launched, a large number of resettled households do not have a basic pit latrine. Lack of toilets was very obvious and efforts put in by the households to construct one were very little or none. The most hindering factor was that these resettled families came from the poorest sections of our society and lacked resources to improve their immediate living conditions.

The government has provided them with means to attain economic gains in the long run, but given the present scenario these populations still require support to attain some basic sanitation facilities. Lack of proper sanitation will have health and hygiene implications in the rural communities.

4

Specific Observations-RWSS

4.1.1 RWSS schemes not found at site

According to PHED's inventory database on RWSS and primary source inventory maintained with the District Health Sectors, team verified the existence of the schemes at site. During site visits conducted by the audit teams for the schemes spread across the country, four RWSS were not found at site. The details of which are as tabulated below:

Proj. No	Proj. Name	Village	Geog	Dzongkhag	Total Cost
06/14/SP/37	Kharigup	Kharigup	Chali	Mongar	84,539.77
07/14/13	Kharigup	Kharigup	Chali	Mongar	249,135.46
02/14/01	Charpazhing	Charpazhing	Chali	Mongar	375,168.29
05/16/05	Chugchi CP.School	Chugchi	T/Yangtse	T/Yangtse	155,859.81
TOTAL					864,703.33

During physical verification of the sites, the above mentioned schemes were non-existent. Interviews with beneficiaries and discussions with the Dzongkhag and geog officials revealed that the basis for proposing and approving those were also not known as Charpazhing village and Chugchi Community Primary School never existed. Such information will not only distort the overall picture on the performance of the programme but also jeopardize the adequacy and correctness of the RWSS Inventory management system.

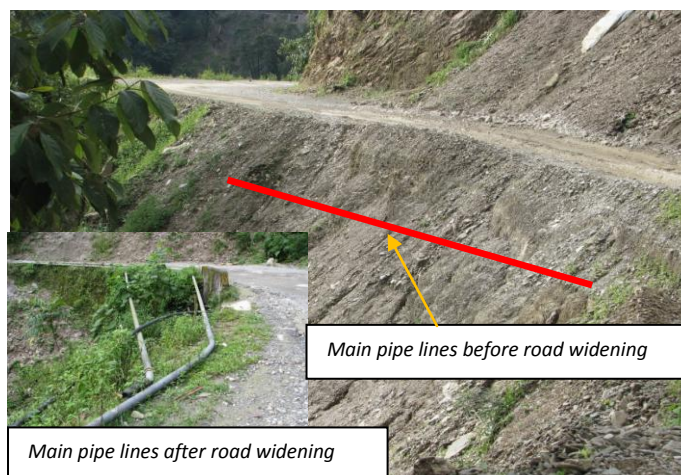
4.1.2 RWSS schemes damaged by other developmental activities

The total finalized budget of Nu. 148 billion for the 10th FYP, identifies construction of farm roads and safe drinking water supply as the top priority. About 1,500 km of farm roads have been targeted for the Plan, however, there are no definite numbers with regards to rural water supply, but the government has committed that every family in the country would have safe drinking water by 2013.

During the site visits, the audit team noted that farm road constructions had damaged some RWSS schemes. Other developmental activities also affected the drinking water schemes such as construction of national high

ways, feeder roads, sub stations and quarrying. While developmental activities are necessary, there seems to be lack of proper coordination and formal communication amongst the agencies involved.

One of the most prominent examples of such incidences is the Deothang Scheme worth Nu.5,652,235.00 constructed in 2006, which caters the drinking water needs for 111 households with population number of 1,084. The DANTAK's road widening project had damaged more than 800 meters of



pipe lines due to excavation and dumping of debris alongside the road, making the scheme completely nonfunctional.

The geog administration had informally communicated with the officials of the project but failed to get a positive response. Public had also contributed Nu. 58,000.00 and repaired the damaged pipe lines, but due to the continuous activities of the project, it could last only for a month. The lists of eight schemes that have been damaged by such developmental activities observed during site visits are given in **Annexure F**. Many damaged schemes had remained defunct for considerable period of time apparently due to lack of proper co-ordination, communication and accountability amongst agencies carrying out developmental activities.

4.1.3 Unique site conditions not taken into consideration at the time of planning and designing

All RWSS scheme water sources are required to designate and adequately protect the catchment and water source areas. Concrete infrastructure at the source also requires adequate designs to prevent pollution and disturbances.

During site visits, audit observed that many regions in Dagana and a few in Samtse had common problems of fresh water crabs at water sources disrupting many RWSS schemes. From interviews with RWSS focal persons, villagers and water caretakers it was understood that the generally accepted quality of workmanship and infrastructure in other regions are not sufficient for these areas. This was found to be the main reason why crabs damaged the concrete infrastructure at the source easily and rendered them useless shortly after construction. Even with frequent repairs and maintenance, there is but little effect

The presence of crabs in these regions is a major cause for disruption of RWSS schemes and also a nuisance to beneficiaries. This has resulted not only in the loss of resources invested but also affects the daily lives of the communities using the sources due to constant leakages, seepage of water underground and change of water's course in some instances.

4.1.4 Insufficiency of Water for communities close to urban centers

As per the RWSS Policy 2002, schemes are planned and designed considering an assumed 2% growth rate of population per year. This attributes to increase of households in communities after children move out to settle with their own families. In addition the earlier schemes usually had one tap stand shared by two or more households. At present one tap stand per household is planned as it ensures better care and maintenance of the infrastructure. The tap stand is always located outside the house but within the premises.

However, areas close to urban centers have proper houses constructed with attached bathrooms and kitchen that have provisions for water connections. This is not planned or provided for by the RWSS schemes. While people cannot be denied the benefits of improved living standards, it becomes an issue when there is not enough water at the source.



Improved homes in Jigmeling, Sarpang.

Tapstand in Haa.

In geogs like Katsho, Gelephu and Chengmari which are very close to the Dzongkhag Administrative Centres and municipalities there are demands for accommodations which have led to construction of buildings with multiple dwelling units. This has significantly increased the demand for water which a single or shared tap stands is not expected to provide for. People of Chengmari receive water two times a day but still do not have enough for drinking and basic cooking. For bathing and other household chores people have resorted to using other sources of unsafe water.

This crisis is at present, just the tip of the iceberg and in the long run could turn out to be a very pressing issue. In order to meet these demands the RWSS schemes in similar regions may need to plan a different approach and accordingly implement so as to provide uninterrupted water supply to the communities.

5

Observations - Municipals

5.1 Drinking Water Supply Management

5.1.1 Insufficiency of potable drinking water in Thimphu

According to data made available to audit by Thimphu City Corporation (TCC), the current estimated population in the core area is about 79,000. The core area has 2,798 water supply connections as of April 2010, which covers only 90% of the core city area. Production of potable water from the two Water Treatment Plants in Thimphu in 2009-2010 was about 4.5 million cubic meters and consumption was about 3.4 million cubic meters. Over a million cubic meters constituting to about 25% of potable water produced per year are either lost or wasted.

Since the expansion of Thimphu city from 8sq.km to 27sq.km in 1999, constructions of buildings have substantially increased to accommodate the rising populations in the extended areas. These areas still rely on traditional sources and/or old RWSS schemes

One of TCC's objectives is to provide planned growth of Thimphu City and provide efficient and effective services to the residents.

set up decades ago, which was designed for a lower number of households with a much smaller population. Although TCC has put in place interim measures to meet demands through repair and maintenance of water sources, the water provided to over 500 households in these areas is not treated. Audit has also noted that since they fall under the municipal area, people in the locality are also deprived of the RWSS schemes.

It's been more than a decade since the city's expansion but till date water supply issues have not been addressed adequately. Without universal coverage of all urban areas with potable water supply TCC has not been efficient and effective in providing uninterrupted service of safe drinking water. The erratic water timings have led to daily hassles for the households in Thimphu. Poor quality of drinking water would lead to health, hygiene and sanitation problems in the localities.

5.1.2 Inadequate infrastructure causing insufficiency of water in Paro

Paro Municipal Corporation (PMC) uses the *Pa-Chu* river bed to source drinking water to the whole town. The 6000 plus dwellers of Paro receive water two times a day. The present water supply system's network and infrastructure was designed and constructed in the 1980s. An additional reservoir tank was constructed at Bondey in 2002-03 and Tshongdue's main supply upgraded in 2004-2005.

During audit it was observed that the PMC is not able to meet current demands of Paro town. The reasons noted were the significant increase in population and buildings, old water supply systems designed for a smaller population, the municipal's boundary demarcation and disturbances due to addition of new water connections. The existing water pumps and tanks were found insufficient to provide 24 hours water supply. It was also noted that PMC was supplying the town's water to some rural households as well. The rural-urban demarcation although maintained do not clearly distinguish the two who live in very close proximity. Through interviews with the municipal staff it was found that any new water connection to the existing system required shutting down of the entire town's water supply system. This was required in order to cut, join and weld pipes for new connections. Provisions for new connections do not exist in the present layout of pipelines.

Due to inadequacy of infrastructure the Paro town currently has acute water shortage problems and is a hassle for the town's entire population who pay for these services. Also, by providing municipal water to rural households it affects the supply of water for the town. This is already an inconvenience for the municipal and could become a pressing issue if not addressed soon.

5.1.3 Unprotected water sources

"The first barrier to the contamination of drinking water involves protecting the sources of drinking water."

A good water source protection is an important part in the management of water supply. Sources require adequate protection to ensure that the sources do not get contaminated to keep users safe from water borne diseases. Well planned source protections can prevent sources from drying up and keep the water flowing

perennially. A planned and protected source is one that is *likely* to provide "safe" water. Instances of unprotected drinking water sources in Municipalities noted by the Audit team during the field visits are given below:

5.1.3.1 Thimphu Municipality:

The Jungshina Water Treatment Plant (WTP) collects water from the tail race channel of the Samtenling Mini Hydel. The water runs along the road in an open channel from the hydel to the intake chamber without any covering. The access point is very close to the road. While there is a fence, it does not prevent miscreants from causing intentional hazard to



Source for Jungshina WTP flows in an open channel.

the water supply source. The open channel is also susceptible to contamination and pollution from rain, overflow of excess water from the ground during monsoon, debris and dirt.

5.1.3.2 Paro Municipality:

The source for Paro town's drinking water supply is the *Pa-chu* river. It uses pumps to draw groundwater from the river bed which is then chlorinated prior to its supply. Audit observed that the pumping station located along the river bank falls down stream of the town's landfill. The present landfill is not designed to handle waste and there is no protection to prevent toxic leachates into the water table. This could turn out to be a major health concern for the town's population.

5.1.3.3 Monggar Municipality:

A distinctive instance was noted in Monggar Dzongkhag where the drinking water source and a community forest have been found in the same area. Logging activities were being carried out in and around the vicinity of the drinking water source of the Monggar municipality.

Location	Const. year	Const. cost	Cost of O&M	WTP capacity	Population served	Households benefitted
Yakpogang	2004-05	9.8 million	50,000.00	3 mld	>5000	254

Forests endow with a cushion to filter water and to hold soil in place. In addition they sustain water and soil resources through recycling nutrients. In watersheds where forests are degraded or destroyed, minimum flows decrease during the dry season, leading to drought, while peak floods and soil



Logging in and around the vicinity of water

erosion increase during the wet season. Dzongkhag Administration should look into this matter or else the watersheds will soon be destroyed. The local people will be deprived of the most vital resource for survival.

5.2 Sanitation Management

5.2.1 Lack of facilities to manage effluents from workshops.

All municipal corporations are responsible for the management of wastes in urban centers. While solid wastes are dumped at a landfill and sewerage in a Sewerage Treatment Plant, effluents generated from workshops consisting of automobile fluids with harmful chemical contents still lack proper management. Effluents from automobiles can neither be flushed down a sewer nor dumped in a landfill and requires separate management system or technology.



Effluents from workshops in Olakha flow into stream.

In Thimphu, wastewater and effluents from workshops can be seen contaminating the *Olarongchu* stream. The new area identified for workshops at Olakha does not have a wastewater treatment plant or facility specifically for these effluents. The area falls along the national highway

and is an eye sore for visitors entering the country's capital. The situation is same in all six urban centers that audit visited.

Lack of facilities to manage effluents and allowing toxic chemicals to enter our water bodies and soil cover, harms and degenerates the quality of both soil and

water. Pollution and eutrophication of water and soil endangers all living organisms and eventually also affects the survival of many people and communities dependent on these waters. Without suitable mechanisms in place, when incidences of such cases rises, Bhutan's water bodies and soil could one day reach a point where restoration and maintenance of the chemical, physical, and biological integrity of the nation's waters and soil is beyond our capacities and the rectification costs sky high or in rare cases not possible at all.

5.2.2 Non-Maintenance of public toilets

Municipal authorities are responsible for maintaining the cleanliness of urban places that have thousands of commuters moving around for work, business and other reasons daily. The public require adequate sanitation facilities like public urinals and toilets to ensure that human excretions are safely managed and disposed. Uncontrolled open defecation and urination are breeding grounds for germs and diseases which lead to major outbreaks that affect the health of societies. Municipal authorities need to ensure that hazards from unhygienic sanitation practices in towns are prevented.



Public toilets in Thimphu are Dirty and unkempt. Bathroom and urinals filled with clothes in Paro & Gelephu.

Public toilets of the six towns visited by audit were found unkempt and unhygienic. In Thimphu, the newest public toilet that was constructed at the new truck parking area below Changzamtog in 2008 was found vandalized and abandoned, even the outsourced Bath and Toilet complex at the vegetable market area, was found in a dismal state with unwashed toilets and bathrooms during the visit. Some public toilets were found defunct. While broken faucets, broken wash basins and dirty toilets were common, lack of a good caretaker in most municipal managed public toilets were noted as the main reason for non-maintenance.

The dirty state of public toilets discourages public from using these facilities and instead resorts to fouling surrounding areas, alleys between buildings, bushes along roads and parks. Unhygienic toilets are causes for numerous diseases and this eventually leads to high incidences of sanitation related illnesses and burden the free healthcare facilities provided by the government. Many of the problems with public toilet management can be solved by appointing a dedicated caretaker.

5.2.3 Unplanned and inadequate designs resulted in hazardous landfill

The Paro municipal corporation is responsible for the town's solid waste collection, emptying of septic tanks and their disposals. However, the municipal lacks a properly identified landfill area. The present site is neither planned nor designed to be used as a landfill. The dumping ground is neither demarcated nor fenced to keep out animals and trespassers. Both solid waste and septic waste disposal is done at the present location. The dumping ground is inclusive of a 23 decimals private land and is located upstream from the town's main drinking water supply source.



As the landfill is not designed to handle the wastes, improper disposals may poses many health risks to the town's population as it is located very close to the main town. The private land that is part of the landfill is also slowly becoming toxic and may turn out to be unfit for other activities later

on. Also, the location of the landfill falls above the town's main pumping station that provides the whole town with drinking water.

Serious concerns may arise due to its location as it is very close to the main town and also upstream from the pumping station. Besides harbouring of disease vectors such as rats and flies, the decaying organic wastes generate methane, a greenhouse gas that is more potent than carbon dioxide. Since there is no segregation of waste, numerous chemicals also get mixed up in the landfill. Serious accidents or mishaps arising out of these can endanger the lives of the town's inhabitants.

Also, seepage of toxic leachates into the water table which is the source for the town's drinking water supply can prove hazardous to the entire town's health. Without proper infrastructure to handle wastes, contamination of the soil and groundwater by leakage cannot be avoided. Toxic contaminations of soils are known to have ill effects even after many years of the site being discontinued for such uses.

6

Recommendations

1. *Planning and prioritization should be carried out properly*

Proper planning and prioritization of RWSS schemes have to be carried out at the Geogs, Dzongkhag and Ministerial level. With 10% of the total population still to be provided with drinking water facilities and 26% of already constructed schemes being non-functional, it is important for the Geogs and Dzongkhags to properly plan and prioritize RWSS schemes.

RGoB with scarce resources, need proper assessments of use of such resources. Such attempt would result in serving the un-served and underserved communities and ultimately reducing the disparity amongst villages and geogs. This would ensure that safe and clean water is extended to all rural areas and communities. It will also help the implementation of RWSS in an economical, efficient and effective way.

2. *Huge variations in budget estimates and actual costs should be reviewed and corrective actions taken*

There were huge variations between budget estimates and actual cost of materials supplied for each RWSS scheme by the Government. As compared to average estimated cost of Nu.144,924.72, the average cost of executing one new RWSS scheme amounted to Nu. 249,606.72 representing over 172.23% of the estimated cost.

The PHED and Dzongkhags should study the reasons for such huge variations between the estimates and actual cost. The estimate should be prepared on a more realistic basis besides initiating appropriate cost control measures to ensure that schemes are implemented within the budgeted amounts.

3. *Surveys should be conducted during the right season*

There were inconsistencies during planning and surveys conducted for the construction of RWSS schemes. While implementers attributed surveys conducted during the wrong time to inadequate time and resources, Audit is of the opinion that surveys carried out during lean seasons of the year give the best results which eventually are also economical.

Thus, the Dzongkhag authorities are advised to conduct surveys during the right seasons.

4. *Water quality testing to be carried out at regular interval*

Water quality testing prior to the start of scheme ensures availability of safe drinking water. Regular testing can confirm that water quality has not deteriorated over time and adequate actions can be taken to rectify, treat and/or prevent further contaminations that will in turn protect the users from diseases.

The DPHE should ensure that WQT prior to the construction of RWSS is done in strict compliance to the policy. Further, a study should also be done to determine the extent of frequency of WQT required and accordingly carry out tests from time to time to ensure safety of users.

5. *Dzongkhag officials should conduct timely monitoring and supervision.*

On site visits, the team found four schemes (3 in Monggar and 1 in Trashi Yangtse) which were not physically found at site. These schemes were listed in the PHED's RWSS inventory of executed schemes. PHED and Dzongkhags concerned should revisit the RWSS inventory, investigate and study the reasons for non-existence of these schemes. Accordingly the inventory should also be updated so as to give the correct picture of RWSS coverage and achievements.

The quality of construction should also be closely supervised and monitored during the time of construction. Good quality of constructions would ensure the longevity of the infrastructure created and sustained provisions of its services.

6. RWSS schemes should be handed over to the beneficiaries.

The Ministry and Dzongkhags should ensure that the schemes constructed are properly handed over to the beneficiaries. All RWSS schemes need to be handed over to the public in proper and formal manner as specified by the project completion certificate prepared by PHED, MoH. There were cases where schemes were not handed over properly which may give rise to the lack of sense of ownership and accountability. This would also help in carrying out minor maintenance by themselves and in reporting the major blocks to the Dzongkhags.

7. RWSS Sections of the Ministry and Dzongkhag should be strengthened.

In view of its significance and considering the huge amounts of funds allocated for RWSS schemes constructions, there is an enormous increase in the volume of activities. The current capacities need to be reassessed for effective implementation and monitoring of the RWSS schemes.

The existing capacities of human resources need to be reviewed and strengthened to appropriately address the problems. The system of appointing RWSS focal persons in some of the Dzongkhags could be one of the options.

8. RWSS-MIS needs to be updated regularly.

The existing Rural Water Supply & Sanitation - Management Information System (RWSS-MIS) was found not updated. It is essential that the inventory of RWSS schemes is kept updated for present and future use. The information should be correct and reliable to avoid inconsistencies. The information will help decision makers for easy monitoring, prioritization and equitable and judicious resource allocation in future.

9. PHED needs to develop an appropriate budget estimate systems.

Budget cost estimates of all schemes were found almost the same in all geogs and Dzongkhags in the 9th FYP irrespective of differences and peculiarities. The Ministry should review the present system and develop mechanisms to ensure that the budget estimates are prepared appropriately capturing all the relevant costs and considering all specific peculiarities such as distances from source, site conditions, etc.

This would help the Ministry in comprehending the actual number of schemes that can be actually achieved in one FYP and plan accordingly. It could also help the Ministry in determining the methods and practices followed in different Dzongkhags, and adopt rationalized and cost effective approaches of budget estimates in future.

10. Impact assessment of RWSS Schemes should be undertaken.

Although there is no requirement for the DPHE to carry out an Impact Assessment of RWSS schemes, studies to establish the impact of RWSS schemes should be carried out. It is essential to know that the investments made by the government have yielded its intended results.

A proper study into the benefits accrued from RWSS schemes would ascertain whether the intended and desired objectives were met or not and whether the living conditions of the people have improved and by what extent.

11. National Water quality standards require to be developed.

At present no national water quality standard has been developed or framed which would act as a benchmark for comparison. National water quality standards require to be developed in close consultation with National Environment Commission Secretariat (NECS) or competent authorities to ensure that a standard is set for safe drinking water. This benchmark will allow comparison of quality of drinking water against the best and/or acceptable quality.

12. Sanitation facilities need to be seen as an integrated package with other public health activities.

Rural sanitation is understood as having a mere facility of a pit latrine. There is no subsidy provided for construction of pit latrine. Although termed as Rural Water Supply and Sanitation schemes, there are no or few sanitation activities and conditions are pathetic in some regions.

The supply of drinking water and sanitation facilities needs to be seen as an integrated package with other public health activities. The government could look into the possibility of providing subsidy to rural communities for construction of such facilities.

13. Adequate communications and coordination should be established with other agencies to avoid damage of RWSS schemes.

Audit has come across eight schemes that were disrupted by other developmental activities, out of the 109 schemes visited. Increase in the number may be anticipated as the economy is still in a developing stage. DPHE should look for proper mechanisms to communicate and coordinate with other developmental agencies, so as to avoid over-lap of activities causing damage to each other, particularly with RWSS activities. In case of unavoidable circumstances, DPHE should arrange for provisions to ensure that developmental agencies concerned repair or adequately compensate for the damages caused by their operations. This will lessen the resource and budgetary burdens on repair and maintenance.

14. Unique site conditions should be taken into consideration during the planning and designing stage.

Many regions in Dagana and a few in Samtse have water sources where fresh water crabs are frequently disrupting RWSS schemes. The planners and designers require to take into consideration these unique peculiarities and problems. The design and quality of infrastructure should be enhanced to make it stronger against damage by such creatures.

A healthy environment is very essential in the production and retention of water. Thus it would be also desirable to carry out studies to understand how much water can be tapped without constraining the environment. This would not only help in

providing water to beneficiaries but also in maintaining the ecological balance and causing as little disturbances as possible to the flora and fauna around the water source areas.

15. PHED and Geogs should give priority to planned activities.

PHED could achieve only 54.39% of planned activities in the 9th FYP. Ad-hoc activities had been seen as the main reasons for under-achievement of planned activities. PHED and Geogs should give priority to the planned activities before taking up the ad-hoc activities.

16. Thimphu City Corporation should identify new sources of drinking water or improve and upgrade present sources.

The TCC is yet to attain universal coverage of safe drinking water in Thimphu city. It needs to strengthen and upgrade their water supply systems and reduce system losses and wastages. Trapping leakages can save water to ensure 100% coverage of at least the core Thimphu city. Special efforts should be made by TCC to reach out to public in the extended areas. New sources should be identified or present available sources enhanced with basic treatment facilities to provide safe drinking water.

17. Municipal authority in Paro should enhance the current water supply system.

Since the current source for water supply is the *Pa-Chu* the quantity required to meet daily demands is currently available from the main river. The municipal authority needs to consider enhancing the present system by constructing additional pumping station and increasing the number of reservoir tanks.

The municipal authority in consultation with competent authorities needs to look into augmenting the existing capacities of water supply by constructing additional infrastructure or identifying new sources.

The water supply network and pipelines should also be enhanced to maintain provisions in the network for connecting additional households without disrupting services.

18. *Paro town's landfill needs to be relocated.*

The municipal authority's present dumping ground in Paro is located very close to the main town. The municipal authority needs to identify and relocate the municipal landfill far from the main town and human settlement. Proper studies and assessments also need to be done so that the landfill is adequately designed to handle not just solid waste but also waste from cesspools in the absence of a proper sewerage network and sewerage treatment facility.

19. *Municipal authorities should set up treatment facility for management of wastewater effluents.*

Wastewater and effluents from workshops are at present unmanaged. They degrade the environment and have many health hazards. The municipal corporations in consultation with NECS or any other competent authority should set up a waste treatment unit or facility to handle wastewater/effluents generated by automobile workshops. This would ensure that effluents do not pollute streams and surrounding soil cover.

The TCC, at the time of reporting this audit was in the process of putting in place an "Oil-and-grease Separator" at the Olakha workshop area, if successful, the solution should be shared and replicated in other urban areas of Bhutan. Starting early will ensure that problems are handled before it gets out of hand.

20. *Dedicated Caretaker should be employed for improvement of municipal Public Toilets.*

The municipal managed 'Pay & Use' public toilets are not used and maintained currently. Municipal corporations should employ dedicated caretakers for public toilets to ensure better care and maintenance of the toilets. The municipal authorities also need to carry out regular monitoring and supervision activities to make sure toilets are clean and usable by the general public. Awareness campaigns from time to time should be conducted to encourage people to practice good sanitation habits and promote the use of such amenities available in towns.
