



Content

2 Seminar on Construction Safety

JICA and the Department of Roads, MoWHS, jointly organized the Seminar on Construction Safety in Thimphu

4 His Excellency Zhabtog Lyonpo's visit to Japan

His Excellency Zhabtog Lyonpo visited JICA Headquarters on the invitation of JICA to attend the seminar on Comprehensive National Development Plan 2030

6 Visit to Japan by Roads Engineer

A team on engineers from the Department of Roads visited Japan to learn about the roads and bridge maintenance system



The Annual Performance Agreement for the Ministry of Works and Human Settlement was signed between H.E the Prime Minister and the Zhabtog Lyonpo and between the the Zhabtog Lyonpo and the Secretary. The event was held on 27.02.2019 at the Royal Banquet Hall.



11 Water Woes: Investments, Infrastructures, Policies and Advocacies

In this op-ed Mr. Garul Dhoj Bhujel, Sr. Statistician, PPD, shares about the water issues in thromdes, the policy gaps and what the government could do to alleviate the water issues.

Seminar on Construction Safety

The second seminar on Construction Safety was held on 28th January 2018 at Taj Tashi. The seminar was jointly organized by the Department of Roads and the JICA. The objective of the seminar was to create awareness on the safety measures that need to be put in place in construction sites, and share information on sound safety practices adopted in JICA projects in Bhutan and elsewhere.

The Hon'ble Minister, Ministry of Works and Human Settlement was the Chief Guest for the event. In his key note address, His

Excellency highlighted the importance of construction safety and the need to enhance the safety practices in the construction industry.

Chief Representative, Mr. Koji Yamada highlighted not just on the personal safety of the individual worker but the threat to family security, the community security and the human security which could result from the negligence of safety practices in the construction sites. He shared how the JICA volunteers were working to ensure minimum safety practices in the

places they were working.

Mr. Yamda, a Project Formulation Adviser of JICA, based in Myanmar office, highlighted the construction safety practices which are undertaken in the Japanese ODA projects around the region after the heavy fatalities suffered from the collapse of the Can Tho Bridge in Vietnam in 2007.

Mr. Tshering Tobgyel, Lecturer from the College of Science and Technology presented on the current scenario of construction sector in Bhutan. The representative from the Ministry of

Pg 5



Group photo of the participants with H.E. Zhabto Lyonpo at Hotel Taj

Joint Coordination Committee (JCC) meeting on Capacity Development on Countermeasures of Slope Disaster on Roads in Bhutan



The First JCC Meeting held in MoWHS conference Hall

The first Joint Coordination Committee (JCC) meeting on Capacity Development on Countermeasures of Slope Disaster on Roads in Bhutan, was held on 31 January 2019.

The four year technical cooperation project is aimed at improving DoR's capacity in implementing effective slope disaster countermeasures along highways through the delivery of six expected outputs, which are:

- Conditions of ex-ante traffic control clarified
- Suitable bio-engineering works selected against "debris slope failure"
- Standards for cut slope angles for "debris slope failure" and

- "rock slope failures" revised
- Suitable countermeasure works implemented for "rock slope failure (rock fall)"
- Suitable drainage works and facilities installed for "debris flows"
- Information system on slope disaster and traffic controls on roads improved.

The first Joint Coordination Committee meeting was attended by members from JICA expert team, officials from JICA Bhutan office and counterparts from DoR HQ and Regional Offices, representatives from the Ministry of Finance, Gross National Happiness Commission and Ministry of Agriculture and Forest.

The projected started on 21 January 2019.

His Excellency Zhabtog Lyonpo's visit to JICA Headquarter, Japan



His Excellency Zhabtog Lyonpo led a delegation comprising of 14 officials to Japan to attend a seminar on 'Knowledge sharing for the formulation of Comprehensive National Development Plan (CNDP) for Bhutan 2030 upon the invitation of JICA. The seminar was held in JICA headquarters in Tokyo on 7 March 2019.

Mr Itsu Adachi, Director General, Infrastructure and Peace Building Department of JICA gave the opening remarks. H.E. Zhabtog Lyonpo in his address thanked the JICA for its support in the formulation of CNDP 2030. He shared that Bhutan needed a holistic documents like CNDP to address rural-urban and regional migration leading to regional imbalances, and coordinating developments in the country.

The project manager and the team leader, Chhado Drukpa, also presented on the outcomes and the expectations to implement the CNDP in Bhutan. The seminar

ended with a panel discussion.

On 8 March His Excellency visited the Kashiwanoha Open Innovation Lab and the Nagareyama City Clean Center. Kashiwanoha is a smart city promoting Environmental-Symbiosis that is environmentally friendly and focuses on fostering growth fields that become sources of new vitality. His Excellency also visited the Clean Center in Nagareyama to observe the waste management system of the city. The delegation was briefed about the strategies in alleviating population decrease and promoting regional revitalization in Nagareyama City.

On the final day His Excellency visited the FabLab at Kandnishiki. The FabLab helps startups and multinational companies to diversify and customize the consumer products. His Excellency also visited the Tokyo Kotsu Kaikan, the PR hub shops that displays and sells famous products of various districts across Japan.

As recent trends show the increasing rural-urban migration in the country poses threat to the very national policy of balanced regional development, and that of the survivability of the rural areas and the sustainability of the urban areas. The objective of the Comprehensive National Development Plan (CNDP) is to promote a well-balanced regional development in the country.

After its approval the ownership of the CNDP 2030 will lie with the GNHCS which would take lead role in its implementation. The CNDP 2030 has been included as one of the indicators in 12 FYP by the GNHCS. On the part of MoWHS and especially Department of Human Settlement, the core group would work towards breaking the CNDP publication into sector specific plans and strategies. Based on the CNDP, National Spatial Plan and Regional Plans would also be prepared. These documents would initiate implementation of CNDP spatially.

Seminar on Construction Safety

Pg 2 Labour and Human Resources made a presentation on the existing safety regulations and standards of Bhutan and the challenges of enforcing it.

The safety officer from the Construction Development Corporation Ltd. presented on the safety practices they have in place while implementing construction projects. A junior engineer from the department of roads who was attached at bridge construction site being constructed by the Japanese contractor presented the lessons he learnt

and observed during his attachment.

Mr. Rinchen Khandu, Executive Engineer with the Department of Roads presented on the way forward for incorporating safety aspects in the construction sites. The seminar ended with sharing of ideas on how to further the cause of safety in the Bhutan's construction industry.

The first seminar was held on 7th December 2017, in Le Merridan, Thimphu, as the Seminar on Construction safety and Health.

Visit to Japan by Roads Engineer

Under the JICA CAMBRIDGE Funding, 11 Engineers from 9 Regional Office and Bridge Division, Department of Roads, attended the Co-Creation Program on "Construction and Maintenance of Bridges" from 25th February 2018 till 8th March 2018. The program was coordinated by JICA in cooperation with Hanshin Expressway Company Ltd. The program was designed to give wide knowledge on construction and maintenance of Bridges through lectures, followed by site visits.



Outline of Hanshin Expressway

Hanshin Expressway Company Ltd., was established in May 1962. It covers 260.5 km of highway covering Osaka, Kobe and Kyoto out of which 80.7% is Viaduct Bridge. The core responsibility of the company is to maintain the highway facilities and construct new highway bridges. The concept of Road Maintenance Cycle and its importance was introduced. For effective maintenance cycle, it is important to have a Maintenance Information System database. The maintenance cycle consists of inspection of bridges, design and plan for repair works, maintenance project and re-evaluation after the routine/ large

scale maintenance has been carried out.

Bridge Maintenance Management:

i. Introduction of Inspection:

The type of inspection followed by Hanshin Expressway Company Ltd was introduced. The methodologies of periodical inspection were new ideas for the participants. Preparation of inspection site is one of the important aspects for inspection of any structures. Safety and health management during the inspection is accorded high priority and well considered before initiating any inspections. The type of inspection equipment used during the periodic



◎ The urgent repair works (3) ~ Lubrication of bearings ~



(Use+Merit+Performance+Ingredient)
Smooth movement by resolve of scale rust or adherent dirt using permeation type rust inhibitor lubrication.
Good rust inhibitor by water replaceability

(Remarks)
Not for rubber bearings

○ Location(Object) of use
Steel bearings (roller bearings)



inspection of the bridges were displayed.

ii. Urgent repair works on inspection site:

Urgent repair works on site is carried out employing effective method using approach opportunity of close visual inspection. Some of the urgent repair works on site are concrete surface protector, steel surface protector, lubrication of bearings, rubber deterioration repair, graffiti eraser, fall protection wire, birds protection net, Looseness preventive nut, removal of unnecessary things, and cleaning of the beams.

Bridge Maintenance in Mountainous area (Totsukawa Village)

To see how maintenance is practically carried out, the team visited the maintenance site at Totsukawa. The team was familiarized on the plans and designs for maintenance of bridge. From the site visit, the team learnt the importance of ensuring safety at the construction and maintenance site.

The team also visited the Sarukai Bridge maintenance site. Following type of direct inspection were implemented for maintaining of Sarukai Bridge like close visual inspection and hammering test of the entire bridge, crack check of steel members

(close visual check and magnetic particle test), coating deterioration check (close visual check and coat film check), bolt rupture check (close visual check and hammering test), stagnant water check in box-shaped structure (high-performance infrared camera and fiber scope).

Routine Road Maintenance Management

The primary objective of road maintenance management is to sustain safe, secure and comfortable road conditions, keep structures and facilities in good conditions, identify damage in the early stages for its repair, implement preventive measures against any accident, and minimizing any impact to the surrounding environment. The maintenance management method followed by Hanshin Expressway are road cleanup, Inspection, repair and reinforcement work, preventive maintenance work, arrangement of emergency response team, anti-seismic reinforcement work, and information distribution service. The team was emphasized on importance of slope inventory and slope management.

On the second week of the training, the effect of overloaded vehicles on the highway, which is more prominent in Bhutan, was

discussed. In Japan, for the highly loaded vehicles, special permission is required detailing the description of vehicle, route map, and automobile inspection certificate from the road administration to pass through that particular road. To crackdown heavy loaded vehicles, regular inspections are carried out at toll gates. Automatic axle weighing system are also installed in vehicles. For the first time defaulters, written guidance and corrective measures are performed. Penalties from publication on websites to fines of maximum of JPY one million is imposed for repeated defaulters.

In Japan, the more prominent damages on concrete structures include cracks, exposed rebar, rebar corrosion, delamination and missing of concrete, exposed sheath and anchorage zone, cavity, honeycombs, water leakage, efflorescence, neutralization chloride damage and alkali-silica reaction. Some of the repair works done on cracks are by putting resin in cracks to avoid rebar corrosion by water intrusion; repairing partial missing concrete members by applying zinc rich primer and epoxy bonding coat and then filling with polymer cement. The neutralization (concrete varying from alkalinity to neutrality by carbon dioxide reacting with an alkali ingredient in the concrete) which results in rust and cracks are repaired by phenolphthalein method. The chloride damage which also results in rust and cracks are repaired by spraying cryoprotectant. The damages of scouring at bridge is mainly due to degradation and aggregation which takes place for a long period of time which may be due to human induced factors or natural elevation changes, contraction scour which is the removal of materials from the river bed and banks either taking away all or some part of the width and local scour due to increase in the flow of water which takes place around the bridge parts such as piers, abutment, embankment and spurs. The countermeasures to such cases could be providing

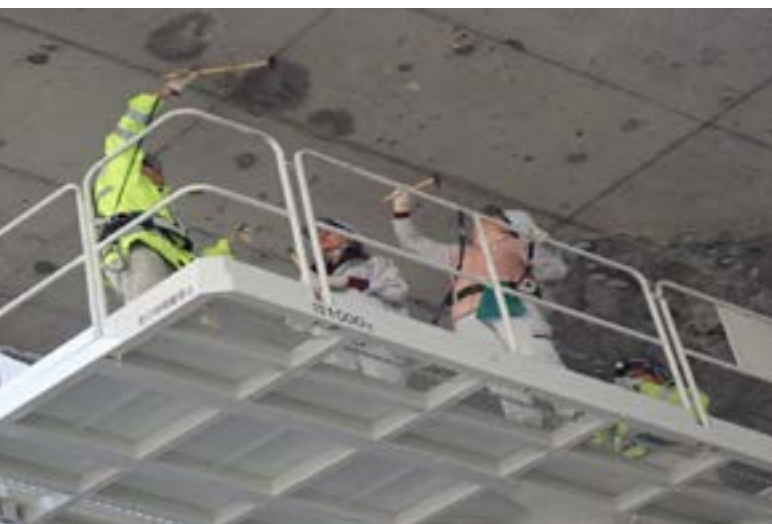
longer bridges, providing superstructures at elevation above flood stage at extreme stage, providing spread footing on soil or rocky areas which are at the verge of erosion and providing rip-rap apron at pier.

Hanshin expressway earthquake museum

In 17th January, 1995 at around 5:46am, the Great Hanshin- Awaji earthquake of magnitude 7.3 hit the prefecture Kobe, Osaka. There were major damages to the structures mainly the bridges and roads of Hanshin Expressway. At the museum, the structures which were constructed by Hanshin Expressway and damaged due to earthquake are kept on display along with the information of innovative methodologies of reconstruction and of seismic strengthening technologies which were provided after the earthquake. The museum provides educational facility for disaster prevention and management.

Akashi-Kaikyo Bridge

Akashi-Kaikyo Bridge is the longest suspension bridge in the world and it is located in Akashi Strait between Kobe and Awaji Island in Hyogo prefecture, with total and central span of 3911 m and 1991m respectively. The bridge construction began in May, 1988 and was completed in April, 1998. The epicenter of 1995 earthquake was around Akashi strait with 10km to 20km depth. During the earthquake, the bridge was under construction with both the towers completed and main cables being built. The earthquake changed the span lengths and foundation got moved with the ground bearing sliding between them. Since, the effects were minimal, the construction continued with some changes in girder length, the length between the towers. The aim is to keep the bridge in good condition for another 200 years by systemic and repeated



Bridge inspection



inspection, maintenance and operation.

Quality Management of ready-mixed Concrete

The participants visited Minato Plant at Osaka and learned about the concrete manufacturing plant (polycarbon silica) and also the system integrated in the cooperate office for quality production of concrete. The team experienced the new quality testing system such as air void test which were unknown before.

There are four types of inspection in Japan, namely, initial inspection, periodic inspection, routine inspection, and detail inspection

where as in Bhutan there are no systematic methods. Urgent repair method is also one of the repair method in which repair work is done immediately after the inspection by the inspector. This method includes spraying of concrete and steel surface protector, lubrication of bearings, and graffiti eraser. In order to prevent further deterioration of the structures, it is very important to have systematic inspection methods. There are lots of repairing tools which is suitable and applicable to Bhutan. There is a need for some of the inspection tools such as truck with lifting cage, overhang inspection vehicle, digital binocular, video scope for narrow space, electromagnetic induction, and electromagnetic radar.

Water Woes: Investments, Infrastructures, Policies and Advocacies

Garul Dhoj Bhujel, Sr. Statistician, PPD

The expenditure made by the government to address water issues has not translated into the desired output to provide 24x7 access to safe and reliable drinking water. This has put enormous pressure on the government to address the water issue.

As important it is to have infrastructures related to water, it is equally important to have policies and advocacies for water management and sustainability. However, at present it seems that we are undermining the importance of policies and advocacies for water. The absence of such policies and advocacies has resulted in water mismanagement, loss of government revenue, and exploitation of natural water resources resulting in tragedy of the commons.

However, the third parliamentary election in 2018 saw many common pledges being made by all the four contesting political parties. One amongst them was to address the water related issues in the country. Perhaps, a commitment and the political will from political parties give the much-needed impetus to address issues related to water. Thus, this may be the right time for Bhutan to take a step further to address water problems.

One Mandate; Two Responsible Agencies

One of the many reasons that have led to water problems in the country could be because of different agencies responsible for the same mandate, i.e., to provide safe, adequate and potable water supply. The Water Act of Bhutan 2011 specifically mandates the Ministry of Works and Human Settlement to ensure safe and potable water supply and management in urban towns. Whereas, the Act fails to designate any competent

authority or agency for water supply and management in rural areas. Rather, the act designates Dzongkhag Tshogdu (District Level Committee) and Gewog Tshogdu (Block Level Committee) supported by multiple layer of administration to collaborate with Ministry of Health to ensure safe and potable water supply and management in other areas including rural areas. Such an institutional arrangement has resulted in lack of coordination and trust among the agencies involved for water management. This has led to agencies to function independently and carry out their respective sectorial responsibilities, often resulting in duplication of efforts and poor resource management. Accordingly to address this issue and to maintain a clear working modality between MoWHS and MoH, a memorandum of understanding (MoU) was signed between MoWHS and MoH in August 2018. The MoU was signed to undertake integrated planning and coordinated water and sanitation infrastructure development by the MoWHS to provide safe and reliable drinking water and sanitation services to all and leaving the mandate of water quality tests and monitoring to MoH.

The MoU signed between the two ministries is just an interim measure until necessary amendments are made in the Water Act 2011.

Non-Revenue Water

Bhutan has one of the highest per capita availability of water in the world, yet many of the towns and villages do not have access to 24x7 drinking water.

Over the years the demand for water has been increasing in Bhutan with improvement in living standards. Though it has not been

Types of Inspection

Methodologies of Periodical Inspection

Truck with lifting cage



Overhung Inspection Vehicle



Fiberscope device for narrow space



Ninja-tech



established that water consumption increases with living standards, but many researchers and studies have mentioned that the water demand increases with higher standard of living. Therefore, to meet the demand of its communities and residents, people may have started to construct their own water supply sources resulting in tragedy of the commons.

On the other hand, to meet the demands of its residents in the Thromdes, people especially the house owners may have resorted to illegal tapping, bypassing of water meters, illegal connections, diversion of water, and non-installation of water meters. Such actions of the people have led to loss of revenue for Thromdes. The performance audit report 2017 for Thimphu Thromde mentions that such activity has resulted in loss of Thromde revenue amounting to Nu. 28.497m for Thimphu Thromde.

While all four Thromdes have installed water meters, its coverage is very low with the exception of Thimphu Thromde. The water meter connection is 87 percent-ages for Thimphu Thromde as compared to other three Thromdes, where the connection is less than 50 percentage. On the other hand, many of the dzongkhag municipalities do not have water meter installed in their jurisdiction.

Water Tariff

The Water Act of Bhutan 2011 and The Water Regulation of Bhutan 2014 mandates competent authority to impose and collect water tariffs for its maintenance and service costs. The municipalities are levying the service fees as per the act and regulation but yet they are not able to meet the cost for its operation and maintenance. One of the reasons cited by Royal Audit authority was mainly

due to lack of monitoring by the responsible authority. For example, a performance audit report carried out by RAA for Thimphu Thromde mentions that lack of monitoring by the Thromde authority has resulted in loss of government revenue amounting to Nu. 20.365 million. The report further adds that Thromde lacks proper mechanism to penalize the offenders. However, the report cannot be generalized for other Thromdes and urban towns in the country.

For the rural areas, the rural water users are responsible for the routine maintenance of their water facilities. However, neither the Act nor the Regulation indicates that the water tariff should be levied for rural water supply. The Regulation mandates the formation of Water Users' Association in rural areas and one of their functions is to keep books of accounts on the money received and disbursement made by the association, but it fails to mention how should they levy the fees on the use of water by the individual households. Such scenario of not being able to keep the book of accounts and lack of monitoring might give rise to

Water Meter Connection in Four Class 'A' Thromdes			
Thromde	Household Units	Metered Household Units	Percent
Gelephu	4109	1129	27.5
Phuentsholing	7759	1459	18.8
Samdrup Jongkhar	1563	586	37.5
Thimphu	25664	22315	87.0
Water Meter Connection in Four Class 'A' Thromdes			
Source: Access to 24x7 Safe Drinking Water Flagship Program-12th FYP			

moral hazard among the rural water users.

Water Management Practices

A Survey by Water and Sanitation Division under Department of Engineering Services in 2016 for Thimphu Thromde states that only 11% of the population residing in Thimphu Thromde had the knowledge about the water management practices. The figure clearly indicating that the awareness with regard to water saving practices is very low in the capital city where most of the important institutional offices are located. However, the figure cannot be generalized to other urban towns, as such survey has yet to be carried out in other urban towns in the country.

Climate Change

Holistically, climate change has played a major role in creating water problems. This has resulted in erratic rainfalls, frequent flashfloods and drying of streams in the country. These have all aggravated to water shortages of drinking, irrigation and other purposes. However, climate change is a trans-boundary issues that require the action of other member countries too. As a small country sandwiched between two economic giants, the efforts put by Bhutan to address climate change seems negligible. Therefore, this piece will not discuss on the climate change and its impact on water but rather it will discuss about the policy gaps, rules and regulations related to water services and provisions in Bhutan.

What can be done?

Since the present government has made it their priority to address water issue in the country, they should start by making amendments in the Water Act 2011. The present MoU has reconciled and streamlined both the ministries with specific mandates and to share the information and report of implementation and issues related to water

and sanitation. However, the amendments made should clearly specify that the rural and urban water supply would be in one department or commission (if at all the present government decides to form a commission as pledged). This would ensure that adequate expertise and capacities could be developed in one institution over time.

This would also ensure that all the components related to water like water supply, wastewater treatment and disposal, and storm water disposal shall be under one department of commission.

To address the issue of non-revenue water, the respective agency should penalize the people who are caught making illegal connections. Such penalty should also be levied upon the workers who are making these illegal connections. In order to enhance its monitoring activities, Thromdes should enhance its manpower capacity to monitor on regular basis.

Though at present the residences of urban centers are paying for the water related service, it's high time that a minimal tariff be imposed for wastewater treatment and storm-water disposal. It is also important for the government to impose minimal amount of water tariff to the rural water users to avoid moral hazard. This should be clearly reflected in the Water Regulation and Water Act.

In order to make people aware on the importance of water, the government should start a campaign to increase public awareness of the importance of water and wastewater management to lead a productive and healthy life. Such campaign could start with educating school children for long-term and sustainable knowledge, which could influence their water behaviors for the rest of their lives. Similarly, an adult program should also be started so that people realize the importance of clean 24x7 water supply and wastewater treatment.

Published by:
Policy and Planning Division
Ministry of Works and Human Settlement
Po Box 791
Thimphu: Bhutan

Email: ppd@mowhs.gov.bt