



NATIONAL BUILDING RESEARCH ORGANISATION

# NEWSLETTER

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*Connecting People to Nature*

*In the City and on the Land,  
From the Poles to the Equator...*



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# Dear Readers...



This month's newsletter unfolds news articles mainly focused on environmental studies and services with regard to disaster management. The environmental degradation caused by human, and its strong link to occurrence of manmade disasters and intensification of natural disasters as a result of current global climate change are quite evident. Also, several disaster incidents have occurred due to the ignorance in complying with the environmental norms. NBRO has been capitalizing continuously on diverse aspects of disaster risks related to environmental issues of national importance. Realizing NBROs' responsibility to address emerging trends of catastrophes due to severe environmental nonconformance, studying environmental issues in disaster dimension have been conceived to the scope of projects and activities aiming to minimize such events. Many projects are looking at a range of environmental issues and disaster risks such as risk on natural water resource health, safety of potable water, profiling drought and water security of vulnerable communities, urban air quality and health impacts, emerging trends of chemical disaster risks, outlook on healthy green developments, and a wide range of environmental services are undertaken as research and consultancy. The articles featured in this newsletter give an insight in to some on-going projects and newly-devised projects areas that scientists of NBRO are currently engaged.

We welcome you to enjoy reading this newsletter and provide your valuable feedback to incorporate in our future activities.

Best Wishes,  
Eng. (Dr.) Asiri Karunawardena  
Director General  
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## CONTENT

- *Facing Climate Change Challenges in Disaster Management* pg.03
- *Air Quality Monitoring and Management of Urban Environmental Quality* pg.04
- *NBRO's Role in Managing the Recent Landslide Event* pg.05
- *Trends of Chemical Disaster Incident Occurrences in Industries and Related Facilities* pg.06
- *Post Disaster Waste Management (PDWM) in Sri Lanka; A Neglected Context* pg.07
- *Is Quality of Bottled Water Safe???* pg.07
- *Ensuring Safe Drinking Water by Re-establishing Quality Surveillance Programme on Greater Colombo Pipe -Borne Water Supply System* pg.08
- *Urban Flood Control by Sustainable Management of Urban Wetland Ecosystems* pg.08
- *Consultancy on Reservoir Water Quality and Sedimentation Studies (DSWRPP-1/CS/QCBS/5-1)* pg.09
- *NBRO initiate Studies on Risk Assessments for Industries and Related Facilities due to Natural Disasters* pg.09
- *NBRO Stepping to a New Milestone in Laboratory Services by Accrediting Environmental Laboratory in Conformance to ISO 17025* pg.10
- *Product Certification Scheme for Construction Materials by NBRO* pg.10
- *Inception Meeting of the Sri Lanka Community Landslide Risk Mitigation Project* pg.11
- *Training Program on Knowledge Co-Creation Program (Young Leaders) for Sri Lanka on Disaster Management* pg.11
- *Testing services provided by the Environmental Studies and Services Division* pg.12
- *R&D Capacity of the Environmental Studies and Services Division* pg.12

# Facing Climate Change Challenges in Disaster Management



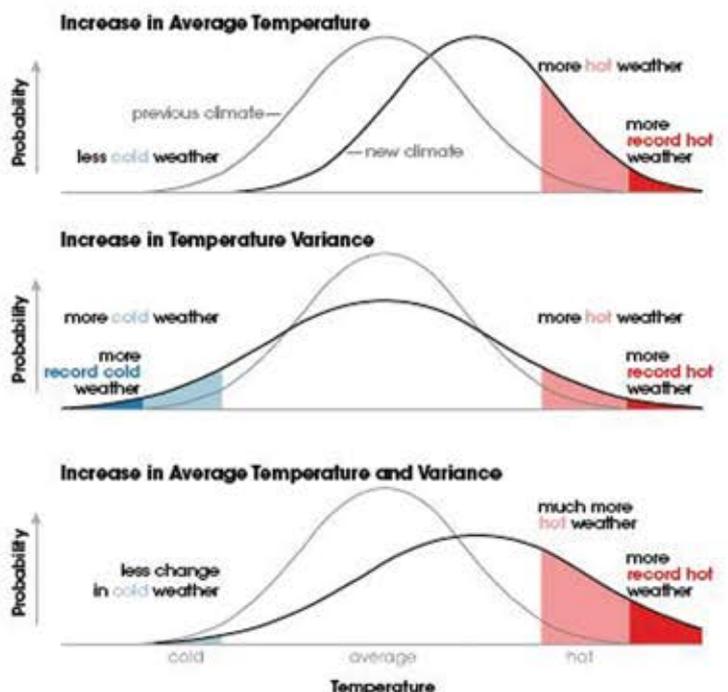
Figure 1: Parched land in a drought affected area (Source: DMC, Sri Lanka)

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The combined effect of climate change and the anthropogenic factors has changed the face of current global natural disaster occurrences further challenging the achievement of Sendai framework goals (Sendai Framework for Disaster Risk Reduction 2015-2030). The intensity and magnitude of weather driven disasters appear increased victimizing people and infrastructure, putting heavy toll on debts impacting national economy every year. The 2016-2017 national disaster update displayed simultaneous occurrence of multiple disaster situations island-wide with floods, landslides and drought. The floods and landslides caused by torrential rains with gale force winds in May, 2017 in Western, Southern and Sabaragamuwa provinces of Sri Lanka have left 71 people dead, 127 missing, and over 319,000 displaced from homes while over a 427,000 people affected as at May, 2017 (Source: Ministry of Disaster Management). The unpredicted rainfall exceeding 300mm within less than 24 hrs tripped the current capacity of rainfall early warning system senseless resulting devastated disaster situation leaving little opportunity for early evacuation.

Recurrence of prolonged drought is a common phenomenon in many dry zone districts of the country. A research done by NASA shows shifting of the average temperature distribution to hotter weather conditions with extreme temperatures. As a result, the globe experience more hotter days with high temperature extremes. The impacts would be heat strokes, water scarcity, drought and wildfires in some parts of the world. On the other hand, the increased ocean temperature causes evaporation of water and water vapor in the air fueling heavy stormy weathers (rains, winds, hurricanes and tornados) specially in Asian climate. The local disaster profiles of 2017 and that of past consecutive years have shown close relationship to global temperature variations and the climatic change impacts which cannot be underestimated. Understanding these trends, planning to face the potential future risks have become important in effective disaster management. As numbers of victims increase day by day, the disaster management approach should change from current

conventional norms to more technologically advanced, quick action strategies to tackle the situation. Improving current hazard prediction capability, Disaster Risk Reduction (DRR) capacity development as a whole considering general public, vulnerable communities and local stakeholders should be a priority concern to reduce long lags in disaster response time. Significant gaps in DRR knowledge among general public, vulnerable communities and local stakeholders have seriously hampered taking correct decisions at grassroots level to best manage a potential disaster situation. Therefore, transferring scientific knowledge of DRR to above groups and accurate prediction on disaster risk in quantifiable, spatial and temporal scales are a must for effect DRR in the country.



Global temperature variation: Earth Observatory: NASA

# Air Quality Monitoring and Management of Urban Environmental Quality

A frontier of Urban Air Quality Monitoring in Sri Lanka: Introduction of monitoring PM<sub>2.5</sub> in the urban air of major cities of Sri Lanka by Environmental Studies and Services Division, NBRO

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Air pollution is one of the serious issues that human beings are facing. Air pollutants are potentially hazardous to human health, plants, animals, materials and surrounding environment including building, roads, etc. The use of fossil fuels in most industries, transport sector and energy production are the major sources of air pollutants. Among these emission of Sulfur dioxide (SO<sub>2</sub>), Nitrogen dioxide (NO<sub>2</sub>), Particulate Matter (PM) and Carbon monoxide (CO) etc. from vehicles make the largest sources of air pollution.



Figure 1: Cities with air emissions from urban traffic

Urban air quality management (UAQM) is an effective and efficient tool employed in managing acceptable urban air quality. However, the UAQM practices are specific to the country needs and requirements. Majority of the developed countries have full-fledged UAQMP with a regulatory management framework. However, developing countries are still working in formulating effective and efficient UAQMPs to manage their deteriorating urban air environment. The successful implementation of UAQMPs depends on the strength of its key components such as goal/objective, monitoring network, emission database, air quality modeling, control strategies and public participation, etc. The importance of air pollution monitoring networks in urban areas is therefore a primary concern due to their significance in ensuring healthy urban air quality, managing sector based pollution sources, understanding the trends of pollution, evaluation of human health risks, planning new projects and reduction of monitoring cost, etc. Measurement of air pollution and estimating its consequences is a way to manage and control air pollution sources. Establishing a proper Air Quality Monitoring Network (AQMN), therefore, plays an important role in developing policies and strategies for achieving air quality standards. The Environmental Studies and Service Division of NBRO along with the financial assistance of VET Trust Fund has launched a project to develop and optimization methodology for configuring the AQMN in urban areas in Sri Lanka by using multiple cell approach to identify spatial and seasonal variation of air pollutants in urban air. The project applies passive sampling and monitoring techniques (developed by NBRO scientists) to collect air quality data and GIS tool to determine zones of air quality with level above

thresholds. The major concern of pollutants are those linked to vehicular emissions and fossil fuel burning; SO<sub>2</sub> and NO<sub>2</sub> concentrations in a major urban areas in Sri Lanka.

Presently, the monitoring network cover 9 major urban areas in Sri Lanka namely Colombo, Gampaha, Horana, Kalutara, Ratnapura, Galle, Kandy, Kurunagala and Anuradhapura and measure the key air pollutants, Sulphur dioxide (SO<sub>2</sub>) and Nitrogen dioxide (NO<sub>2</sub>)

levels. The financial assistance to maintain the monitoring network is provided by the Vehicular Emission Testing Trust Fund through the VET office at Department of Motor Traffic. Particulate Matter (PM) is one of the very important and critical pollutant in urban air which is related to human health. Generally, two size ranges, known as PM<sub>10</sub> (aerodynamic diameter ≤ 10 μm) and PM<sub>2.5</sub> (aerodynamic diameter ≤ 2.5 μm), are widely monitored. These particles reduce the visibility of the air and appear hazy when levels are high. PM<sub>2.5</sub> is the particulate which is found to be unhealthy for sensitive groups as they exist in very fine particles or droplets in the air. Due to their fineness, these particles are able to travel deeply into the respiratory track and reach the lungs. Exposure to fine particles can cause short-term health effects such as eye, nose, throat and lung irritation, coughing, sneezing, runny nose and shortness of breath. Studies also suggest that long term exposure to fine particulate matter may be associated with increased rates of chronic bronchitis, reduced lung function and increased mortality from lung cancer and heart diseases.

Though PM is a key air pollutant there is no continuous database on Particulate Matter to understand their impact to urban air quality and the related health effects. Through the existing continuous passive sampling monitoring network of VETFF project monitoring capacity of NBRO will be further strengthened with the capacity enhancement to monitor Particulate Matter (PM<sub>2.5</sub>) in above urban areas. Procurement is in progress to purchase five PM<sub>2.5</sub> monitoring units. The unit comprises of advanced sensors with the capability to track 24 hour average PM<sub>2.5</sub> levels. The program is scheduled to commence from August 2017.



Figure 2; Passive air sampling technology developed at Environmental lab: NBRO



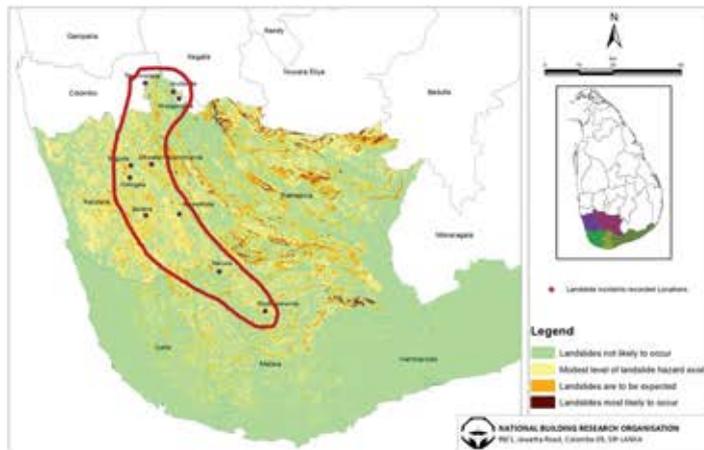
Figure 3: PM 2.5 particulate monitoring unit

# NBRO's Role in Managing the Recent Landslide Event

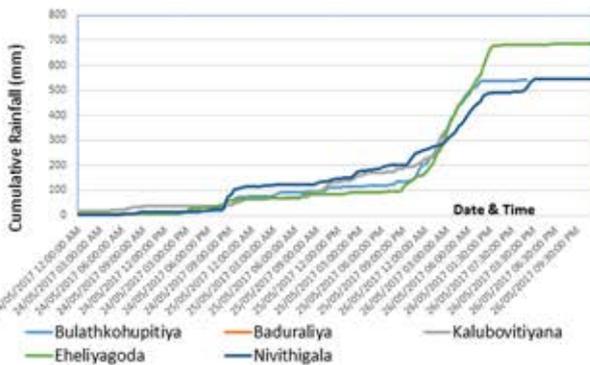
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The heavy rains that befell during 24<sup>th</sup> and 26<sup>th</sup> May 2017 managed to wreak havoc on the western and southern regions of the island. This intense and unprecedented rainfall was the cause to many landslides and slope failures, resulting in heavy losses to life and properties, mainly in Rathnapura, Kalutara, Galle, Matara, Hambantota, and Kegalle districts. Neluwa, Morawakakanda, Bulathsinhala, Baduraliya, Yakupitiya, Kiribathgala, Dewoldola, and Toranagoda are some of the most disastrous landslide locations that reported high death tolls.

As the National Focal Point for managing the landslide disaster, National Building Research Organisation, has been playing a major role in addressing both the pre-and post-landslide situation in the country. The first signs of an impending disaster were brought to the attention of NBRO at 2100hrs on 24<sup>th</sup> May, 2017 when Rathnapura and Kegalle districts reported a rainfall exceeding 75mm. Accordingly, landslide early warnings were issued for the DS divisions under potential landslide risk. However, with the continued bad weather condition, early warning messages had to be updated and issued for several more districts within the next 24 hours. By early hours of 26<sup>th</sup>, extremely high rainfalls exceeding 300mm were received by several districts within a very short time span, changing the situation completely and giving rise to quite a number of disastrous landslides and slope failures.



Locations of major landslides occurred during 24<sup>th</sup>- 26<sup>th</sup> May, 2017 overlain on 1: 50000 Landslide Hazard Zonation map



Rainfall recorded from some of the highly affected DS divisions during 24-26 May 2017

Though the heavy rains had subdued, the danger still prevailed in the affected regions during the first half of June due to the continued lower intensity rains and NBRO had to keep issuing landslide early warnings for several weeks after the major rainstorm during 24<sup>th</sup>-26<sup>th</sup> May.

Moreover, National Building Research Organisation has been exerting their fullest efforts to address the post-landslide disaster situation in the country. To date, NBRO has received close to 2500 special landslide investigation requests. More than 1500 have already been investigated and majority of the investigation reports have been issued. Initially, ERRs or Emergency Response Reports are issued for each case, for evacuation of risked communities having the priority of saving lives. Subsequently a detailed investigation report is issued for the same location, giving a concise account on each individual case and recommend measures to minimize further threats to the entities at risk by technically evaluating the nature of the instability. To this end, teams of officials from LRRMD head office and its 10 district offices have been daily and diligently engaged in special landslide investigation work for the past month.

Owing to the demanding nature of the post-disaster situation in the country, NBRO sought assistance from other parties like Geological Surveys and Mines Bureau, University of Moratuwa, University of Peradeniya and Central Engineering Consultancy Bureau to expedite special landslide investigation work in the affected districts.

Meanwhile, National Building Research Organisation continues to stay on constant alert 24x7 for any more warning signs of impending disasters, by closely monitoring the daily rainfall with the help of 105 rain gauges stationed at risky areas. These monitoring data allows NBRO to issue early warnings as soon as the rainfall reaches the set threshold values. The communities at risk, on the other hand, also have a part to play, by staying vigilant for telltale signs of landslide activations and be ready to immediately evacuate to a safer location should the need arise.

Having a significant land portion of the country identified to be under landslide risk with communities already settled in these regions in a haphazard manner, it is a physically unrealistic feat to seek permanent relocation solutions for all. The most plausible option available is the concept of 'living with landslides' by encouraging the risked population in the country to be disaster aware. Therefore, by improving capacities of the people in different means such as community based awareness, establishing vigilance groups and community leaders, community based early warning systems, NBRO continues its attempts to create a safer built environment in Sri Lanka.



Landslide at Udakaravita, Nivithigala, Rathnapura District

Landslide at Wewalkandura, Kalwana, Rathnapura District



Landslide at Kosgulana, Kalutara district

Investigations at landslide near Pahiyanigala

# TRENDS OF CHEMICAL DISASTER INCIDENT OCCURRENCES IN INDUSTRIES AND RELATED FACILITIES

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Performance of the chemical and process industrial sector is a key factor in the economic growth and technological advancement of a country. At the same time, the use of wide range of chemicals having different toxicities in these processes poses a significant risk related to safety aspects of human, property and environment.

Future projections is that there will be a significant growth in industrial sector and major cities in many provinces will be densely populated according to population growth forecast in line with urbanization. Under this scenario the speculation would be an increasing probability of chemical disasters along with the potentially high magnitude of related chemical disasters.

By means of the research assessment of 'Review of industrial accidents over past decade (2006 – 2016) in Sri Lanka' conducted by the National Building Research Organisation (NBRO), several important facts and trends have been revealed.

Accordingly a total of 86 chemical accidents leading to some degree of disasters in chemical industries and related facilities throughout the country have been recorded during the past decade. The temporal distribution of those incidents shows an increase of occurrences over the time and year 2016 with notably higher occurrence compared to other years (Figure 1).



Figure 1: Temporal distribution of recorded industrial and facility chemical disasters (2009-2016) in Sri Lanka

'Manufacture of chemicals and chemical products' is the highest vulnerable industry category where more than 25% of recorded chemical incidents have been reported. Manufacturing installations of industries are the most frequently subjected source to chemical disasters which is more than 70% out of the total recorded incidents while 'Material storage facilities' and 'Transportation' accounts for the rest.

The majority of the industries and related facilities are located in the Western province, where the occurrence of recorded chemical disasters over the past decade has reached 65% out of the total. Meanwhile, the potential human exposure risk to chemicals

from chemical disasters remains high due to high population density in the region.

In many cases the effect of the chemical incidents has crossed the boundaries of the factory premises, exposing the surrounding communities to chemicals. In some of those incidents exposures have even expanded beyond the immediate neighborhood by migration through river flow, ground water and wind.

Process and safety system failures have been the most frequently occurring initiator for chemical disasters (95%) where 'Natural Calamities' and 'Terrorist Attacks/Sabotage' accounts only for 5% of the total recorded incidents. The most frequent causative factor for chemical disasters has been the fire with more than a 60% out of the total recorded incidents while explosions, leaks in the storage vessels or pipe lines, and accidental spills together accounts for the balance 40%.

Under the current situation, introduction of disaster management aspect to the management of chemical disasters in industries and related facilities has been identified by the Environmental studies and Services Division (ESSD) of the National Building Research Organisation (NBRO) as a timely needed objective. And the NBRO has the capacity and ability to cater this need in both technically and professionally, by means of being the technical arm of the Ministry of Disaster Management. Accordingly, there are ongoing researches conducted by ESSD with the aim of catering the same objective.



Figure 2: An Oil layer on the Kelani River

(<http://www.ft.lk/article/480043/Coca-Cola-under-CEA-scrutiny>)



Figure3: Attempts to douse the emanating fumes, occurred in Garbage Dumping Site, Badulla, 2016

(<http://www.sundaytimes.lk/161016/news/hazardous-badulla-smog-still-hugs-town-212729.html>)

# Post Disaster Waste Management (PDWM) in Sri Lanka; A Neglected Context

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Post disaster waste generation; a disaster neither natural nor manmade, is caused by hazards either natural or manmade. It is a well-known fact that landslides and flood hazards are becoming a common occurrence in Sri Lanka. During each and every time of such occurrence huge amount of waste materials are generated and continue to remain in the post-disaster environment. Hence, immense attempts have to be made to clear and clean the affected area during the recovery phase of the post disaster environment.

Post Disaster Waste Management (PDWM) in Sri Lanka has not yet been clearly discussed, addressed or mandated. Hence, proper handling and managing of waste generated in disaster situations has become an essential and critical need of both affected and unaffected public in the country. Therefore, detailed scientific studies on understanding the nature and behavior of Post Disaster Waste (PDW) is a timely concern and application of technological advancements in clearing and cleaning of PDW

should be proposed based on such studies. Hence, PDWM; a new prospective scientific field in waste management sector of Sri Lanka, have a tremendous potential in widening the horizons of economic and systematic disaster management strategy in the country.



Landslide occurred in Koslanda, Badulla, 2014  
(<http://newsfirst.lk/english/2014/11/60-estates-badulla-face-threat-landslides/62530>)

## IS QUALITY OF BOTTLED WATER SAFE???

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Every cell in the body needs water and that is why it is so important to drink a sufficient quantity of water daily. The brain consist 90% of water and when the body is under supplied the brain cannot function well and signs of dehydration manifest.

Although 70% of the earth is covered with water, most of it is not available for human consumption without being processed first. Of the planet's water, the oceans make up for 97%, while glacial shield hold another 2%. Only about 1% is soft water from lakes, rivers and underground sources but even out of tiny amount an increasingly large volume is unsafe for human consumption.

Due to the vast expansion of industries, agriculture, population growth and increasing use of harmful chemicals as well as geographical factors contamination of drinking water occurs through a range of chemicals, microbial and physical hazards which cause health risks when present at high levels. Due to these reasons providing safe and accessible drinking water has become a major challenge world over.

This situation linked with the prevalence of market trends has caused the business of bottled water to flourish. Consumption of bottled water has been increasing consistently over the last decade even in countries where pipe-borne water quality is considered good. Bottled water industry has grown dramatically in the last few decades and today millions of people around the world in developed and developing countries consume bottled water regularly. Most people believe that bottled water is safe and hence it has become an increasingly popular beverage all over the world.

In Sri Lanka bottled water is regulated by the Ministry of Health through the Food Regulations 2005 framed under the Food Act No.26 of 1980 which regulates bottled water as a 'food' and manufacturers are obliged for producing safe wholesome and honestly presented products. However there is no study that has shown that the bottled water is safe or more natural than tap water.

Therefore, the Environmental Studies and Services Division of NBRO conducted a study on water quality of common available bottled water brands in Sri Lanka. The main physical, chemical and bacteriological parameters were selected according to the Sri Lanka Standard, SLS 894:1990 –Specification for bottled water. According to the results obtained from the study some parameters were within the limits specified in the Sri Lanka standard while some were not. Therefore we recommended there should be a regular assessment from the source to the final end product to ensure the quality of water for drinking purpose. Hence the stringent rules and regulations must be maintained on this industry to confirm their product to the relevant national standards and updated typical parameters available should be readily available to the general public as well as enforcement agencies within shelf life of the bottled water as well as source water to ensure the safety of the water for drinking purpose.



# ENSURING SAFE DRINKING WATER BY RE-ESTABLISHING QUALITY SURVEILLANCE PROGRAMME ON GREATER COLOMBO PIPE-BORNE WATER SUPPLY SYSTEM

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With its many uses water is essential for life, but it can also spread illnesses when it is contaminated by disease causing organisms making available water the most precious global resource. Clean and safe water to sustain better human health and life is a critical challenge.

There should be a sufficient water supply per person and for domestic uses and to be safe. That is water to be free from micro-organisms, chemical substances and radiological hazards that constitute a threat to a person's health. The World Health Organization (WHO) Guidelines for drinking-water quality provide a basis for the development of national standards that, when properly implemented, will ensure the safety of drinking-water.

In Sri Lanka, National Water Supply & Drainage Board (NWS & DB) established under Act No. 02 of 1974 is responsible for develop, provide, operate and coordinate water supply and to distribute water for public, domestic and industrial purposes. Over the past years, the NWS & DB has implemented programmes to provide services to meet customers. Water suppliers are responsible at all times for the quality and safety of the water that they produce. At present, NWS & DB and few others such as Municipal Councils carry out monitoring quality of the water distributed to the public. Water quality testing in the rural schemes is carried out on ad hoc basis by Public Health Inspectors (PHIs), but normally only when an epidemic of water borne diseases is detected or in cases of suspect contamination of the water sources.

However, according to the World Health Organization (WHO), surveillance of drinking-water quality can be defined as the continuous and vigilant public health assessment and overview of the safety and acceptability of drinking-water supplies (WHO, 1976). In piped systems it involves the regular analysis of parameters related to both the quality of the water (including the quality of the intake water) and the functioning of the system itself. The key purpose of monitoring is to ensure that when a problem appears, system

managers can take appropriate measures to correct it before unsafe water is delivered to the consumer.

The potable water quality in the Greater Colombo Piped water was monitored by National Building Research Organisation from 1988-2009 as an independent Surveillance body. The programme included daily collection, and analysis of nearly 300 samples monthly, immediate response reporting and reporting monthly. The program was adjourned in 2009.

NBRO, under the Ministry of Disaster Management, proposes reestablishing Water Quality Surveillance programme for Greater Colombo Pipe water supply. The main role of surveillance in the management of community water supplies is to assess the safety and acceptability of the water distributed to the public so that consumers are consistently and reliably protected from the health hazards of contaminated supplies. For that following activities will be carried out.

1. Measure the water quality from the production to consumer end and provide information to the supply agency especially on microbiological quality and free residual chlorine levels.
2. To locate and identify sources of water pollution that poses a threat to source water. This will be done by measuring background conditions of water quality and determining long-term trends. The main reason for the assessment of the quality of raw water is to verify whether the observed water quality is suitable for use as a raw water for public supply. The intended monitoring will be used in determining trends in the quality of the water and how that quality is affected by the release of contaminants, other anthropogenic activities, and/or by waste treatment operations.
3. The surveillance of water quality includes monthly reporting to the water supplying agency with water quality trends in the distribution system and sources, pathways, and loading of pollutants entering the watershed.

This supports the authorities to the protection of public health by improving the quality. Since the actions may be taken by water supplying authorities promptly, outbreaks of waterborne disease can be prevented.

## Urban Flood Control by Sustainable Management of Urban Wetland Ecosystems

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In Sri Lanka, wetlands in urban peripheries are at an immense anthropogenic stress as they are often subject to exploitation and illegal encroachments. Despite their intrinsic value, unplanned developments and conversion continue to spatially limit urban wetland areas and nutrient-loading runoff, untreated wastewater, spread of alien invasive species, waste dumping, etc. pollute wetland water.

Due to the spongy nature of wetlands, urban wetlands act as flood and storm water retention areas absorbing the large volume of runoff accumulated during heavy and prolonged precipitation extremes resulted by climate change. However, these key hydrological characteristics of wetlands are often ignored increasing flood risk of urban municipalities even after a short intensive rainfall event. With the recent disaster situation, it is evident that urban flood events have potential to cause massive damages to properties and even loss of human lives. Therefore, it is important to conserve and rehabilitate the remaining areas of urban wetlands.

Recognizing the true significance of urban wetlands as flood retention areas and its vital ecosystem services, Environmental Studies and Services Division of National Building Research Organisation is planning a study aimed to develop a management

plan for urban flood retention areas. Wetland biodiversity, habitat types, hydrological profiles, water and sediment quality, institutional assessment of wetland management, wetland ecosystem valuation, socio-economic surveys, and communication strategy including urban planning aspects will be studied in detail under this project. The main outcome of the project; a site-specific integrated management plan focused on creating and increasing positive ecological, economic and human impacts on wetlands, will provide most appropriate solutions sustainable.



Spread of alien invasive species

# CONSULTANCY ON RESERVOIR WATER QUALITY AND SEDIMENTATION STUDIES (DSWRPP-1/CS/QCBS/5-1)

## Environmental Studies and Services Division

Water quality deterioration and sediment accumulation of reservoirs are few of the concerns currently faced by the water resource management authorities of Sri Lanka. With the realization of this need, Dam Safety and Water Resource Planning Project of Sri Lanka (under the Ministry of Irrigation and Water Resources Management) formulated a study on Reservoir Water Quality and Sedimentation to assess the water pollution and sedimentation issues in selected hydropower and irrigation reservoirs of the country and to develop a framework to strengthen the water quality monitoring and reservoir water resource management capacities of management authorities; the MASL and the Irrigation Department of Sri Lanka.

National Building Research Organisation successfully completed the project achieving key projects tasks depicting the NBRO's technical capacity in undertaking projects in multiple disciplines related to water resource management.

Under this project following key tasks were performed by the NBRO.

1. Establishing modern water quality monitoring laboratory facilities and staff capacity development at (MASL) Digana and Thambuththegama and establishment of bathymetry units in MASL Digana and Irrigation Department (ID), Colombo

2. Water quality, sediment quality & limnology characteristics assessment in Polgolla, Kalawewa and Kothmale reservoirs and stream water quality assessment of Polgolla, Kalawewa and Kothmale reservoirs

3. Simulation of reservoir and catchment water quality using DYRESM-CAEDYM model and MIKE HYDRO BASIN model

4. Reservoir sedimentation study - Modelling of sediment yield from the catchment (HEC-HMS model), sediment flow and routing through the river network up to the reservoir (HEC-RAS model), and sediment flow pattern and deposition in the reservoir (SMS\_SRH-2D model)

5. Bathymetry surveys and assessment of storage depletion and updating the area capacity curves of Polgolla, Rantambe, Kalawewa and Inginiyitiya reservoirs

6. Propose a comprehensive catchment management plan considering watershed pollution, sediment management and policy development for Polgolla Reservoir

This study was conducted by the Environmental Studies and Services Division of NBRO with a team of in-house and external experts.



Reservoir water quality monitoring session in Kalawewa



Limnology field monitoring training session conducted for MASL officers



Water Quality Lab Complex of MASL

## NBRO initiate Studies on Risk Assessments for Industries and Related Facilities due to Natural Disasters

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Risks arise due to natural hazards such as earthquakes, floods and landslides where the occurrence of such events will cause natural disasters. When industries and facilities are located in zones prone to these natural disasters, the impacts on the industries are much high and it may even cause much more critical secondary catastrophes such as chemical and technological disasters, with the involvement of chemicals and advanced technologies within the facilities.

At present, with the increasing trend of the occurrence of both natural and manmade disasters, disaster risk assessments have attained a greater interest among the communities and hence the capacity building in Disaster Management sector of the country must be given a superior attention. Realizing the need of a professional body to holistically address the issue, National Building Research Organisation (NBRO) have developed the capacities to conduct Risk Assessments for industries and related facilities due to natural disasters complying with international standards.

Having identified the essentiality of this aspect Hayleys Fabric PLC – Neboda has made the early initiation to obtain a risk assessment for their facility which was conducted by Environmental Studies and Services Division of NBRO with the collaboration of Geotechnical Engineering Division (GED) and Human Settlement Planning and

Training Division (HSPTD). This assessment accompanied comprehensive studies on critical natural disaster risks: earthquake risk, tsunami risk, risk due to soil structure/ saturation & ground water table, riverine flood risk, flash flood risk, and landslide risk along with the assessment on applicability of legislations enacted in Sri Lanka related to the existing situation of the factory. By means of those studies, the final report suggested several recommendations in order to manage and prevent disaster situations within the facility.

Considering the prevailing trends of disasters of the country, conducting Risk Assessments for all the industries and related facilities prone to natural disaster risks is essential by which the necessary mitigatory and preventive actions can be identified early and catastrophic multistage disaster situations can be prevented. Consequently, the importance of the implementation of Risk Assessments for industries/ related facilities is emphasized to ensure the safety of facility, environment and community.



# NBRO STEPPING TO A NEW MILESTONE IN LABORATORY SERVICES BY ACCREDITING ENVIRONMENTAL LABORATORY IN CONFORMANCE TO ISO 17025

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Sri Lanka as a developing country there are plenty of construction projects going on and many to come in near future. Since most of the project investors are from overseas, foreign construction companies as well as local companies are in the field with modern engineering technologies and latest construction standards which are focused on safety robust durability. Whatever the construction it should facilitate safe living or handling to the end user. That can be achieved by maintaining the quality at each level. Quality comes to act in many ways such as the quality of Raw materials being used; Quality of the method used, Quality of the Man power engaging in construction, etc. The three laboratories in NBRO are providing quality service to the construction field beginning from the feasibility and from evaluation up to the end use of a construction. All the three laboratories are in the process of getting and maintaining accreditation status from Sri Lanka Accreditation Body (SLAB).

The SLAB has granted Environmental Studies and Services Division (ESSD) the ISO 17025 accreditation status for many parameters in water quality determination in July 2017. With this the laboratory services is in conformance to ISO 17025 and the overall service quality is traceable to international national standards.

The Building Materials Research and Testing Division (BMRTD) obtained the accreditation status for Crushing strength of concrete cubes as well as the tensile property determination of steel bars as per local and international standard methods. This is the first and the only laboratory in Sri Lanka to hold the accreditation status for tensile property determination.

Geotechnical Engineering Division (GED) upgraded its laboratory quality management system in accordance to ISO 17025 and expect to obtain accreditation status for important soil engineering parameters in this year.

Obtaining and maintaining accreditation status of a laboratory builds the customer confidence on the laboratories work. The accreditation status will help the customers to find the competent service provider to get their work done accurately and with a high reliability.



Triaxial testing for engineering properties of soil: GETD lab



Compressive strength determination - Concrete cubes: BMRTD lab



Chemical Oxygen Demand test for water pollution determination: ESSD lab1

## Product Certification Scheme for Construction Materials by NBRO

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The main objective of NBRO is to spread and promote the culture of disaster mitigation, preparedness and safety through innovative disaster education, research and training by rendering highly specialized professional services at the cutting edge of science and technology. At present, customers from wide range of disciplines from both private and state sector organizations seek services of NBRO.

NBRO is now enhancing its services to a wider scope of activities by introducing the Conformity Assessment for construction materials. This organization already developed required infrastructure facilities (Highly qualified staff, modern machinery, conducive working environment, established procedures and guidelines etc.) to provide services to ensure the quality of construction materials manufactured in Sri Lanka as well as imported ones. Considering above facts NBRO has implemented a product certification scheme for essential construction materials to promote good production practices which will ultimately benefit the consumer.

The construction materials which the product certification can be obtained are; Steel, Cement, Cement blocks, PVC pipes, Clay roofing tiles, Manufactured sand, Wall putty and Eco-bricks.



Steel



Clay Roofing Tile



Manufactured Sand



Cement



PVC Pipes



Cement Blocks



Eco Bricks



Wall Putty



Cement Testing



Roofing Sheet Testing

National Building Research Organisation (NBRO), the mandated organization for landslide risk management in Sri Lanka had the inception meeting of the Community Landslide Risk Mitigation Project implemented with the financial assistance of the World Bank. The aim of the project is to help Government of Sri Lanka (GOSL) in undertaking a systematic approach for reducing the impacts of landslides as landslides are considered to be a major natural hazard. This World Bank initiatives also expected to help the GOSL in unifying the efforts of all related government agencies and other stakeholders in landslide risk management in Sri Lanka and establish a comprehensive framework and an operational long-term action plan.

This project is being implemented by NBRO with technical assistance of Asian Disaster Preparedness Center (ADPC) and Norwegian Geotechnical Institute (NGI). The inception meeting was held on 8<sup>th</sup> May 2017 at the BMICH, Colombo and representatives of around thirty (30) stakeholder agencies attended. Additional Secretary of Ministry of Disaster Management (MDM) officiated as the meeting chair and the NBRO;ADPC & NGI experts presented the project tasks and the proposed methodologies for project implementation.



Eng. (Dr.) Asiri Karunawardena, Director General, NBRO addressing the gathering

## INCEPTION MEETING OF THE SRI LANKA COMMUNITY LANDSLIDE RISK MITIGATION

## Training Program on Knowledge Co-Creation Program (Young Leaders) for Sri Lanka on Disaster Management

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Scientist, Environmental Studies and Services Division

Japan International Cooperation Agency (JICA) under the international cooperation program of the Government of Japan arranged a training program to enhance the knowledge on Disaster management of young officers of Sri Lanka through hands-on experience in disaster management and mitigation practices in Japan. Two of NBRO scientists; Vimukthi Sumanasekara of Environmental Studies and Services Division and Danushka Jayathilake of Human Settlements Planning and Training Division, participated in this training program along with 15 other young Sri Lankan officers from stakeholder institutions of disaster management in the country. The training program was conducted in Hiroshima JICA center and recent disaster affected areas of Hiroshima city and was held from 30<sup>th</sup> January to 17<sup>th</sup> February of 2017. During this period, the participants were able to gather theoretical knowledge on disaster management aspects of infrastructure development, disaster management system of Japan, disaster prevention and reduction measures, emergency response systems, etc. through the lectures conducted by the senior academic staff members of leading Japanese

universities and decision makers of government and non-government institutes related to disaster management of Japan. The program also included field visits to Naka Fire station, ancient disaster mitigation site of Miyajima Island, modern disaster mitigation sites of Hiroshima City, etc. which aid in obtaining hands-on experience on successful application of theoretical disaster management knowledge on practical settings.



The team of participants of the training program with the JICA coordination team

# Testing Services provided by the Environmental Studies and Services Division

## Air quality testing and monitoring services

- Ambient air quality
- Indoor air quality
- Stack emissions (flue gas analysis)
- Noise level (day and night) Air
- Vibration level
- Lighting level
- Relative Humidity and Temperature

## Water quality testing services

- Suitability of Drinking Water - Compliance to the SLS 614: 2013
- Industrial wastewater (Raw and Treated) – According to the Gazette extraordinary Act 1534/60 (Wastewater Discharge Standards)
- Suitability of water for construction purposes - Compliance to the British Standards (BS 3148)
- General ambient water quality – Compliance to Proposed Ambient Water Quality Standards for Inland Waters - Sri Lanka (2001), CEA
- Solids in Water
- Heavy metals in water (Detectable at mg/L and µg/L levels)
- Microbiological quality of water (Drinking water and wastewater)

- Eutrophication potential of lotic and lentic water bodies – Compliance to Carlson Trophic State Index (CTSI)
- Limnological Parameters
- Metallic ions and Non-Metallic ions in water

## Construction material quality testing services

- Chemical quality of Soil - Compliance to BS 1377
- Chemical quality of Aggregate/Sediment/Sludge
- Resistance to acidified water of Asbestos – Compliance to the SLS 9: part 2:2001
- Suitability of Cement for construction purposes – Compliance to the SLS 107: 2008

## Other services provided

- Environmental Impact Assessment, Initial Environmental Examination and SEA
- Wastewater Treatment
- Air quality, Noise and Vibration control
- Stack emission control
- Green Technology
- Site remediation advisories
- Industrial waste minimization and industrial environmental risk assessment

## R&D Capacity of the Environmental Studies and Services Division

ESSD aims to strike a balance between fundamental and applied research to tackle environmental issues of national significance, find solutions on risk on environmental quality, gather scientific data to fill data gaps required in environmental management and informed decision

making. As ESSD holds a team of experts with the multi-disciplinary scientific backgrounds, application of interdisciplinary and cross-sectional approaches in research has become convenient.

### Research areas

- Water Quality
- Watershed Management
- Greywater footprint
- Nutrient enrichment and assimilation capacities of water bodies
- Environmentally sustainable resilient developments and system management
- Climate change impacts and water safety of drought prone areas with special reference to Anuradhapura District
- Urban air quality
- Industrial chemical disaster risk assessment
- Hazardous Material Risk

### Ongoing research projects

- Application of ecosystem resilience approach to analyse water resource health of Pinga Oya watershed
- Systematic Diagnostic Assessment of Industrial and Facility Related Chemical Disaster Risks in Sri Lanka
- Management of indoor environmental quality in office buildings by using mechanical methods and phytoremediation plants
- Monitoring of ambient air quality in main urban cities in Sri Lanka by using passive sampling techniques (funded by Vehicular Emission Testing Program of Department of Motor Traffic)