NATIONAL BUILDING RESEARCH ORGANISATION

2018 ANNUAL REPORT

Table of Contents

About NBRO

National Building Research Organisation (NBRO) was formed on 5th March 1984 following a Cabinet Decision taken on 29th September 1983. Today, after nearly 35 years in existence, the NBRO stands out as a leading R & D institution, a reputed technical service provider and the national focal point for landslide risk management.

NBRO is truly a multi-disciplinary institution, where technical experts from various disciplines team up and offer R&D, technical consultancy and testing services through its six technical divisions namely, Building Materials Research and Testing Division, Environmental Studies and Services Division, Geotechnical Engineering & Testing Division, Human Settlements Planning and Training Division, Landslide Research and Risk Management Division and Project Management Division. The three ISO-accredited laboratories, Administration Division, Finance Division, ICT & Program Unit and Internal Audit Unit support its functioning.

People seek NBRO assistance when confronted with a diversity of problems in their living environment, be that due to rumbling mountains, soft grounds, polluted air, contaminated water, poor construction and substandard building materials etc. NBRO as a dutiful service provider is always geared up to provide suitable solutions to maintain and improve the quality of life of all citizens.

NBRO carries out identification, risk assessment, hazard zonation mapping, monitoring, early warning, mitigation and awareness building related to landslides and in addition, issues Landslide Risk Assessment Reports (LRAR) for all construction and development activities in landslide-prone areas in the country as the mandated institution for landslide risk management in Sri Lanka.

NBRO is a self-funded institution and earns sufficient revenue to meet its recurrent expenditure. NBRO provides testing and technical consultancy services to the general public, public sector institutions, private companies and international institutions. With the support of its fully-equipped soil-testing laboratory and drilling equipment NBRO conducts geotechnical engineering investigations as a consultancy service, and investigations of most large infrastructure development and landslide mitigation projects in the country had been performed by NBRO. In addition, testing of building materials for suitability in construction and certification, disaster risk assessment, environmental quality assessment of water, wastewater, soil, sediment, air and emissions ensuring safety of humans and environment, and related studies leading to impact studies and status management are offered as technical consultancy services by NBRO and these bring in NBRO its much needed revenue. NBRO also offers consultancy services on project management of construction projects and also a unique service of condition reporting of buildings. Human settlements planning and developing cost-effective disaster-resilient housing are yet more services offered by NBRO.

Executive Report

NBRO in 2018 entered into a new era by initiating projects of great magnitude and commencing implementation in view of creating a disaster resilient country. Whilst staying at the forefront as a leading and efficient government institution, NBRO continued to fulfil its duties and responsibilities fully and to the best of its ability. Overcoming challenges, NBRO continued to earn high levels of income and show profits. Therefore, it gives me a great pleasure to compile and present this Annual Report and the Financial Statement of NBRO for the year ended on 31st December 2018.

NBRO recorded an all-time high turnover of Rs. 1,048 Mn in 2018 that resulted in the highest profit of Rs. 63.7 Mn in NBRO history. When compared to previous year, these indicate a 18% on growth in revenue and 45% increase in profit. Changes over past years are depicted in graphs given elsewhere in this report.

More staff was recruited with increasing workload, and within the year 2018, the staff strength increased from 462 to 483, which is the highest number of total staff strength recorded thus far.

Public and private institutions continued to offer stiff competition but the total income from testing & consultancy work increased further to Rs. 634.0 Mn which is 29% increase when compared to last year.

In general, most targets set by previous Corporate Plan were met while thriving to achieve the goals and objectives in a responsible manner in spite of pressure of ever changing socio-economic environment. Thus it was possible again to maintain NBRO's position as a reputed and dependable public enterprise in the country.

The quality and timely delivery of outputs were assured and as a measure of maintaining high standards, NBRO had all the three laboratories accredited to ISO 17025. Preliminary work of NBRO accreditation to ISO 17065 as a certification body for steel and cement has been completed at NBRO and prospective clients from industry have been apprised, while waiting now for them to lodge formal applications to NBRO. It has been further proposed to accredit inspection and investigation services offered by technical divisions to ISO 17020 and preparatory works are expected to commence in 2019.

It has been customary for NBRO to give prominence to work safety as a result of which it has been possible to achieve a low level in reported accidents and emergencies. Use of safety gear is now a common practice and attempt will be made to maintain the safety level at a high standard.

Productivity is a major concern at NBRO as working within tight time targets and avoiding delays at work are a prime requirement at NBRO. Clients in general are satisfied with NBRO services as they are of higher quality and delivered timely. Client satisfaction is reflected by complaints being seldom, and it gives NBRO its competitive edge over other competitors, and contributing to NBRO's success in winning very competitive bids.

NBRO expanded technical consultancy services now offering a wide spectrum of testing services and serving sectors of disaster management, housing & construction, and environment. NBRO is the key technical agency among the line agencies of the Ministry. This entails NBRO to play a key role and hence, NBRO is

committed fully to fulfil mission of the ministry by addressing mainly the technical aspects pertaining to disaster management. As a result, NBRO has now become a major institution promoting disaster resilience in the country, especially focussing into creating a resilient built environment.

This NBRO's effort is reflected by its experience in recent years, plans in its Corporate Plan, and requests arising at the annual Industry Consultation Meeting with stakeholders on its Research and Development programme.

In 2018, NBRO received a government allocation of LKR 15.0 Mn. for research and development, and a further Rs. 25.0 Mn for procuring laboratory and field equipment. NBRO properly utilized these funds while concentrating mainly on disaster risk reduction related research, and investing the rest on research & development in the fields of NBRO expertise, and as requested by various stakeholders at the annual Industry Consultation Meeting for R & D.

NBRO research studies mostly focused on creating disaster resilience. In 2018, research studies covered a wide range of subject areas: threshold rainfall intensities, developing procedures for geotechnical investigation and building demolition, and utilizing fabric waste in manufacturing cement blocks. In addition, more studies were done on aerial mapping to identify rock surface stability. A model house was constructed in Tangalle for display purposes using different construction materials developed by NBRO research i.e. Bottom Ash Bricks, wall panels with EPS fillers, and wall panels with rammed earth.

NBRO conducted several training and awareness-building programmes in 2018. NBRO officers worked in landslide hazard areas to raise awareness among communities and among school children on landslide hazard preparedness. In the Community-Based Landslide Early Warning Project, recipient communities were trained on their respective early warning systems and timely evacuation. Also, NBRO conducted many training programmes on disaster resilient construction for professionals from construction industry.

CONTRIBUTION TOWARDS NATIONAL DEVELOPMENT

NBRO is a nationally important institution hence it diligently attends to its assigned duties and extends its contribution to development projects in the country.

NBRO functions as the national focal point for landslide risk management in the country. NBRO continued all landslide disaster risk reduction work including hazard zonation mapping and in addition, continued risk mapping in selected hazard-prone areas.

Landslide Hazard Zonation Mapping Project utilized funds received from the GOSL and hazard zonation maps produced by this project are frequently referred by stakeholders, including the staffs of local government bodies in planning and approval work, and planning agencies such as Urban Development Authority, and National Physical Planning Department.

NBRO continued to issue Landslide Risk Assessment Reports (LRAR) with technical recommendations to local government bodies for granting approval for construction or development activities in landslide hazard-prone areas. NBRO now has district offices functioning full time to cover all landslide prone districts for this work. In 2018, 9325 applications were received for processing and 9200 reports were issued after necessary investigations. The total number of applications processed since the inception of the issuance process in March of 2011, 73,304 applications were processed.

Monitoring of mitigated landslides under Technical Cooperation for Landslide Mitigation Project (TCLMP) implemented by Japan International Cooperation Agency (JICA) and NBRO at Badulusirigama near Uva-Wellassa University in Badulla district,

Udamadura in NuwaraEliya district and Alagumalai in Matale district continued in 2018. In this completed project, NBRO staff was trained in newer landslide stabilization techniques, and both NBRO staff and stakeholders benefitted by the training programmes and seminars arranged by Japanese experts. Phase-II of TCLMP is expected to continue.

The JICA, United Nations Development Programme (UNDP), Norwegian Geotechnical Institute (NGI), and Asian Disaster Preparedness Centre (ADPC), continued to extend their assistance to NBRO.

Many landslide mitigation and slope stabilization projects are in progress now utilizing funds given by the Government. Stabilization of identified unstable roadside slopes in the national road network in the central hills is done collaboratively by NBRO and the Road Development Authority (RDA) with the financial assistance of JICA and by the World Bank are in progress as well. Mitigation projects near 18 selected schools in Kandy district with funds from the World Bank through the Climate Resilient Improvement Project (CRIP) are nearing completion.

As a corporate social responsibility, NBRO invests some of its own surplus funds for urgent disaster response needs like conducting investigations on collapse of buildings, for raising awareness of communities, and for training programmes conducted in disaster resilience building perspective.

EXTENDING NBRO EXPERTISE

NBRO continued to provide its technical expertise to development projects and to provide solutions to issues of public concern. NBRO continued providing its technical assistance to stabilize failed slopes in Kandy - Mahiyangana road and in other major road networks under Climate Resilience Improvement Program (CRIP) of the World Bank and landslide Disaster Protection Project (LDPP) under JICA assistance. Mitigation of unstable slopes in and around 18 schools in the Kandy district are being carried out under CRIP and all said project will be completed by mid-2019, Finding suitable solutions for the safe decommissioning of the Meethotamulla Waste fill will also be carried out. NBRO staff continued to carry out the loss and damage assessment surveys aftermath of various disasters like landslides and floods.

NBRO also studied the subsurface of Jaffna Peninsula to locate underground cavities and to carry out pond rehabilitation work and provided required geotechnical engineering know-how. NBRO collaborated with Norwegian Geotechnical Institute (NGI) in conducting such studies, and NBRO received as a donation a new antenna for the GPR for borehole scanning.

OUTCOME

The country experienced extreme weather conditions from time to time in 2018. Several landslide, slope instabilities and flood related incidents causing property damage were reported. Timely actions taken by NBRO for evacuation significantly decreased the loss of lives by landslides. NBRO attended to all related activities, ranging from response, investigation for further instabilities, loss and damage assessment, resettlement planning, and reconstruction advisory.

The Government has taken a decision that not only the victims of recent disasters, but also the families now living in areas with high risk in the hill country should be resettled.

NBRO prepared a document titled Resettlement Framework as a guideline for parties involved in such resettlement work and carried out necessary training and awareness building activities to popularize this guideline among the beneficiaries and local government officials who expedite the resettlement work.

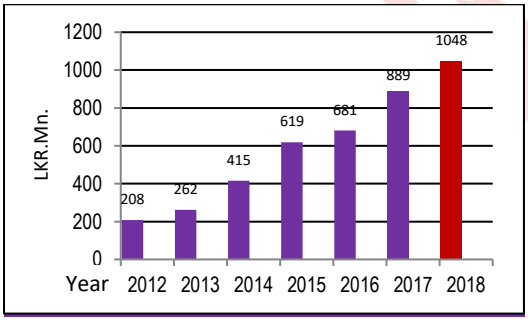
NBRO prepared suitable house plans with resilient features that were subsequently approved by the Cabinet. NBRO also

provided necessary training on disaster resilient construction techniques and related technical assistance to persons involved in resettlement work. NBRO assisted in the selection and risk assessment of suitable relocation sites, and provided necessary guidance on land sub-division, drainage, cut-slopes, and retaining structures. Thus, NBRO contributed vastly to the resettlement effort in the country.

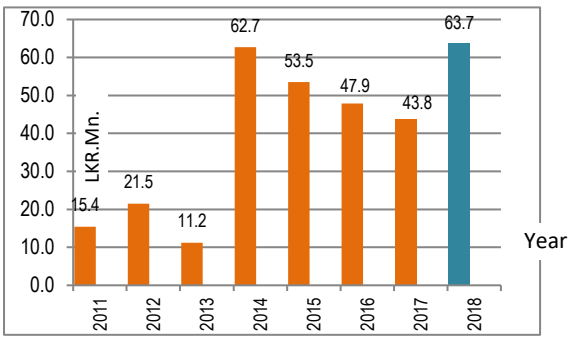
In this context, NBRO formulated projects for the resettlement of communities and projects for mitigation that are being considered as mega scale projects namely "Construction of Precast Disaster Resilient Housing for families living at high risk" and "Reduction of Landslide Vulnerability by Mitigation Measures".

REVENUE

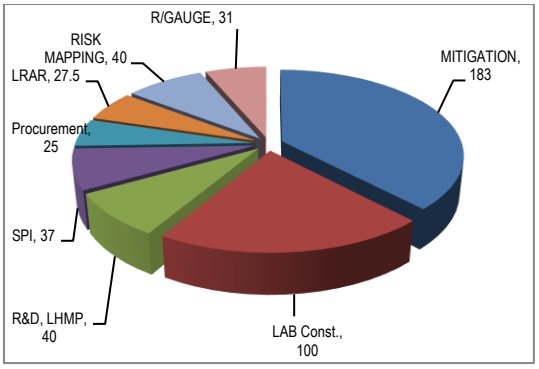
NBRO generates revenue to meet its recurrent expenditure mainly by provision of consultancy & testing services offered to state and private sectors. NBRO heavily relies on its self-earned revenue to provide for staff salaries and most institutional expenses.



Total Operating revenue for last 7 years



Profit & loss record for last 9 years



Govt. Grant for projects - 2018

Since 2010, NBRO has been able to earn a net profit each year. Consolidated revenue of the year under review is Rs. 1,048 Mn. which is the highest reported in the history of the NBRO and it shows a growth of 18% over the revenue of previous year. The revenue component from provision of testing and technical services is Rs. 634.0 Mn., which is showing a growth of 29%.

CONSTRAINTS

The following are identified as obstacles that hinder the progress of NBRO.

- Draft Bill of NBRO has been compiled waiting for the approval of the Cabinet for presenting to the Parliament.
- Staff turnover at NBRO, especially leaving of experienced staff continued to rise as the NBRO cannot offer fringe benefits and high remuneration when compared to other government statutory bodies and private sector organisations. Recruitment of experienced persons is difficult and new recruits often lack of sufficient experience.
- NBRO earns recurrent expenditure by providing testing and technical consultancy services. As regulations restrict, it is difficult for NBRO to be very competitive in bidding for consultancies.
- All District offices are maintained in private buildings with high rentals. Changing occasionally makes capacity building difficult. Plans are to construct its own district offices in the landslide-prone districts. Kandy and Badulla district offices will be constructed in 2019.

- Payment to NBRO staffs for extended working hours is rather limited.

INITIATIVES FOR PRODUCTIVITY IMPROVEMENT

The following productivity enhancement actions were taken to increase NBRO's performance in the year 2018.

- ✓ All three laboratories acquired accreditation
- ✓ Testing facilities were strengthened with new laboratory and field equipment using the Capital Equipment Grant from the General Treasury
- ✓ Donations received under technical cooperation projects enhanced technical capacity of NBRO
- ✓ NBRO staff had many opportunities in 2018 for short-term foreign training and international exposure, and in addition, many higher study opportunities aboard and this resulted in staff motivation
- ✓ Now the design unit of NBRO is strong and contributing heavily the mitigation of landslides and unstable slopes
- ✓ NBRO continued further renovation and construction work of its laboratory building complex.

FUTURE PLANS

- ➢ NBRO Annual Action Plan 2019 was prepared to set the direction and facilitate future actions
- ➢ NBRO will accelerate preparation of hazard maps and risk profiles
- ➢ NBRO will carry out pre-approval geotechnical risk assessments for high-rise and large building complexes to ensure the safety and minimum disturbance to surrounding neighborhoods and adjoining properties
- ➢ NBRO will pioneer in introducing a guideline for building demolition work
- ➢ NBRO will carry out condition assessment reporting of public buildings and houses of the underprivileged as a state-funded project
- ➢ NBRO will conduct studies on chemical hazard management in Sri Lanka
- ➢ In 2019, the projects to stabilize unstable roadside slopes funded by the World Bank and the JICA will be completed
- ➢ NBRO will carry out hard and soft landslide mitigation and related capacity enhancement of NBRO with JICA assistance through 3-year TCLMP - II
- ➢ NBRO will continue to provide assistance to NDRSC for resettlement of landslide victims and vulnerable communities
- ➢ NBRO will carry out the mitigation of priority projects listed in "Integrated Landslide Mitigation Project". Mitigation of 147 identified landslides & unstable slopes and protection of railway line will be carried out under "Reduction of Landslide Vulnerability by Mitigation Measures Project" with financial assistance of Asian Infrastructure Investment Bank (AIIB)
- ➢ NBRO will extend technical expertise to infrastructure development projects and assist RDA & other agencies in slope stabilization and construction work.

APPRECIATION

I take this opportunity to thank the Hon. Duminda Dissanayake, and Hon Ranjith Maddumabandara, the ministers in-charge of Disaster Management, Hon. Ranga Bandara, State Minister of Disaster Management, and Eng. Sisira Kumara, Secretary of the Ministry of Disaster Management and Chairperson of Interim Management Committee (IMC) of NBRO whose direction and guidance have paved NBRO the way to this success.

I also wish to thank members of IMC and Audit & Management Committee, the Director Generals of Department of Budget,

Department of General Treasury, National Planning Department, External Resources Department (ERD), Disaster Management Centre, and the Department of Meteorology, At this juncture our gratitude is also extended to our international stakeholders, the World Bank, JICA, ADPC, NGI and AIIB for providing technical and financial assistance for various projects and programs. In addition, I express my sincere thanks to our stakeholders and valued customers for their continued confidence on us. I am grateful to the dedicated employees of NBRO without the help of whom we will not be able to perform so well and achieve the challenging targets set so high for the 2018.

Above of all, superiority of our performance is attributed to this remarkably competent team, their knowledge, skills and professionalism which is the backbone of NBRO.

Director National Disaster Relief Services Centre (NDRSC) who deserve great appreciation.

We will continue working cooperatively to improve the NBRO performance further in the coming years and accomplish the mission and objectives set by our Corporate Plan. We are sure that our team members will be very are supportive of each other and collaborate across teams in sharing ideas and achieving great outcomes.

Eng. (Dr.) Asiri Karunawardena
Director General

Vision, Mission and Corporate Goals

VISION

"Creating a safer built environment"

MISSION

Promote and sustain research and development and provide technical services for disaster risk reduction and safer built environment

CORPORATE GOALS

- To become the national leader in building disaster resilience & DRR Research
- To become a technically proficient institution
- To become a leading technical services provider
- To be a high performer as the national focal point for landslides and associated geo-hazards
- To continue as a centre for technological information

Management of NBRO

MINISTER IN CHARGE OF THE SUBJECT

Hon. Duminda Dissanayake
Hon. Minister of Disaster Management

Hon. Range Bandara
Hon. Dy. Minister of Disaster Management

Presently a Cabinet approved Interim Management Committee (IMC) with Secretary of the line ministry as the Chairman guides and directs the administrative, financial and management functions of NBRO.

INTERIM MANAGEMENT COMMITTEE (IMC)

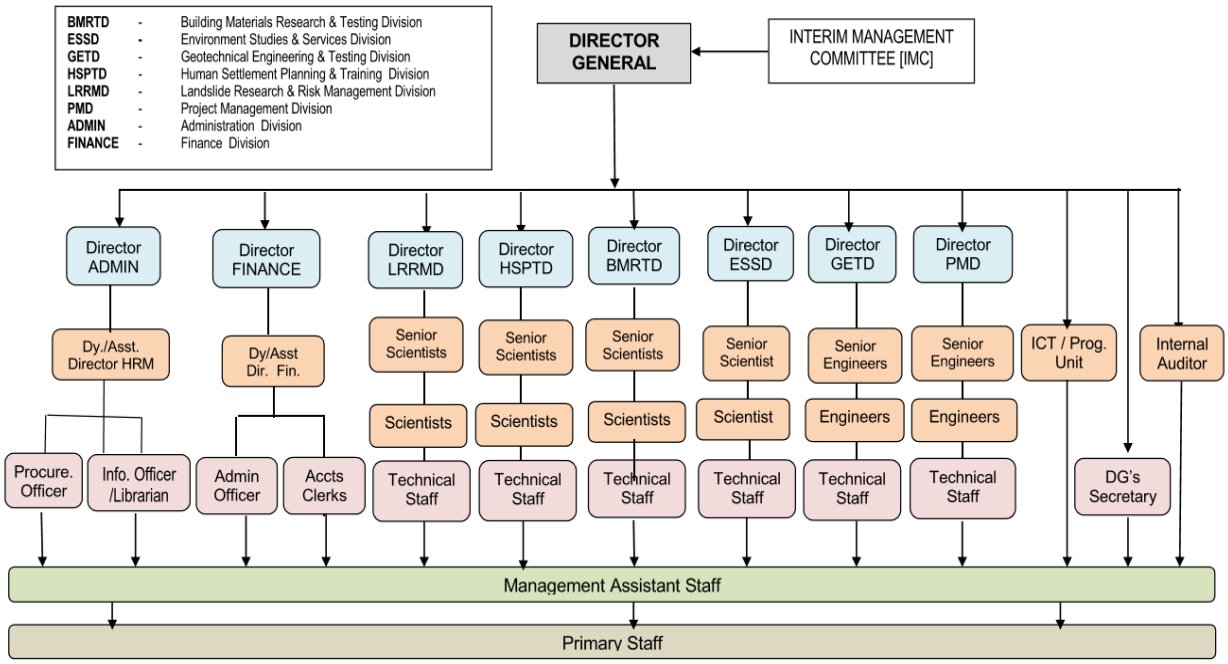
Eng. Sisira Kumara (Chairman) Secretary, Ministry of Disaster Management	**Eng. (Dr.) Asiri Karunawardena** Director General, National Building Research Organisation
Dr. S Amalanathan Director General, Disaster Management Centre	**Mrs. Samanthi Meethalawa** Asst. Director, Department of National Budget
Eng. C D W Alahakoon Addl. Secretary (Technical), Ministry of Housing and Construction	**Mr. H U R Fonseka,** Chief Accountant, Ministry of Disaster Management
Mr. M. Premalal Director General, Department of Meteorology	**Mr. H K Balachandra** Director General, Construction Industry Development Authority

AUDIT & MANAGEMENT COMMITTEE

Mrs. Samanthi Meethalawa Director Department of National Budget	**Eng. (Dr.) Asiri Karunawardena** Director General National Building Research Organisation
Mrs. A B R Amarakoon Audit Superintendent Government Audit Branch	**Mrs. R A N D Ranatunge** Chief Internal Auditor Ministry of Disaster Management
Mr. H K Balachandra Director General Construction Industry Development Authority	**Mrs. Kumudu Randeny** Director (Finance) National Building Research Organisation

Mr. H. L. Ruwanthilaka
Internal Auditor
National Building Research Organisation

Organisation Structure



SENIOR MANAGEMENT

Eng. (Dr.) Asiri Karunawardena	**Director General**
Mr. R M S Bandara	Director, Landslide Research & Risk Management Division
Mr. K C Sugathapala	Director, Human Settlements Planning & Training Division
Ms. Sardhanee V Dias	Director, Environmental Studies & Services Division
Mr. Kithsiri N Bandara	Director, Geo- Technical Engineering & Testing Division
Ms. Sunethra Muthurathna	Director, Building Materials Research & Testing Division
Ms. J. K. Jayawardena	Director, Project Management Division
Mrs. Kumudu Randeny	Director, Finance
Mr. Sarath Cooray	Acting Director, Administration

Operational Highlights - 2018

National Building Research Organisation (NBRO) in 2018 carried out its duties well and made a sturdy progress. The highlight was the evacuation of 23 residents in Norwood in the district of Nuwara Eliya to safety in the wake of the impending landslide in September 2018. R & D work progressed well leading to a two-day NBRO Annual Research Symposium. The NBRO maintained its position as a leading technical service provider in the country, earning over Rs. 1048 Mn as consultancy revenue in 2018.

NBRO is the research arm and the only technical agency in the line ministry. NBRO was able to provide solutions to many issues in the country especially utilizing combine capacities of multi-disciplined technical divisions backed by their modern facilities. NBRO's expertise is now offered as technical services mainly in the fields of geotechnical engineering, building materials technology, human settlements planning, environmental management & project management. NBRO specializes now in emerging fields to address many other issues in the country, especially in landslide mitigation technology, detecting ground subsidence, creating disaster resilience and promoting drought adaptation, which other institutions do not have the technical expertise and equipment capacity.

During the year under review NBRO carried out the following specific tasks in line with its designated functions, Corporate Plan and Annual Action Plan.

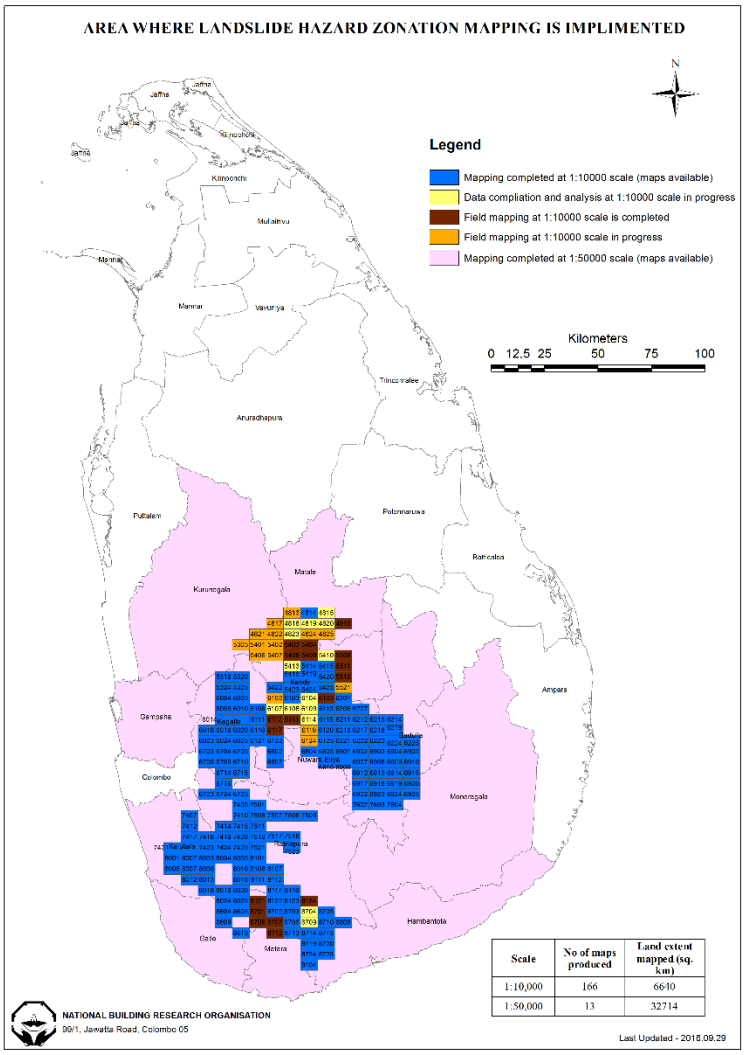
GOSL Funded Projects

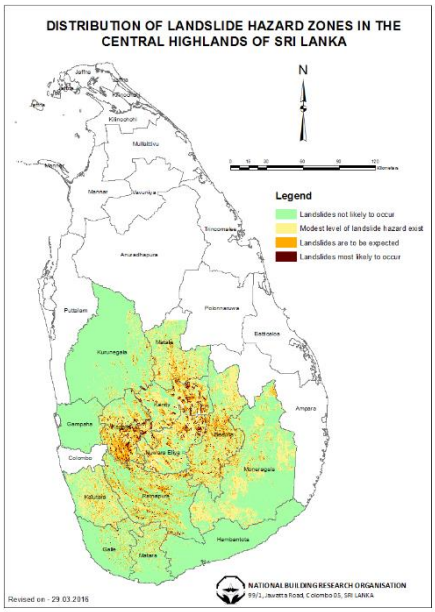
Landslide Hazard Zonation Mapping Programme (LHMP)

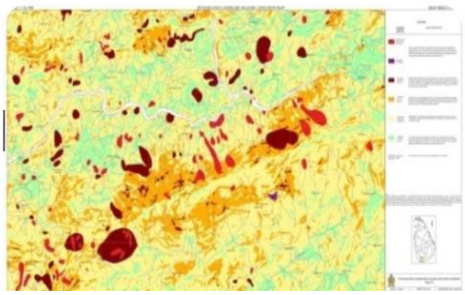
Landslide Hazard Zonation Mapping Project (LHMP) is a project funded by the government and continuing since 1992. It identifies spatial distribution of landslide hazard and as an outcome, produces landslide hazard maps. Thus far under this project, landslide hazard zonation maps to the scale 1:50,000 have been prepared to cover a total of 32,593.1 sq. km in 13 districts identified as having the landslide hazard risk. In addition, maps to the scale 1:10,000 have been prepared to cover prioritized areas covering a total of 6,840 sq. km.

In 2018, the project received a Government grant of Rs. 20.0 Mn. and as the outcome, 12 map sheets each covering 40 sq. km in 1:10,000 scale were prepared in the districts of Ratnapura, Kalutara and Nuwara Eliya. Total area covered under 1:10,000 scale was 480 sq. km. In addition, 27 sq. km was mapped covering Ratnapura MC area in 1:5,000 scale.

The maps produced by this project are used in the issuance of landslide early warning, and in landslide investigation work leading to hazard risk assessment, issuance of Landslide Risk Assessment Reports (LRAR), and identification and prioritization of potentially dangerous sites for mitigation. The maps are also used in national and regional level planning by various institutions. Most of these maps are available for downloading free of cost in the NBRO website (www.nbro.gov.lk).







Hazard Zonation Map 1: 50,000 Scale

Landslide Risk Assessment Reporting Process (LRAR)

NBRO issues Landslide Risk Assessment Reports to local governmental authorities recommending whether to grant or not approval to a building permit or approval of a development project when sites are in landslide-prone areas. By 31st December 2018 the NBRO has received 73,304 applications since the issuance first started in March 2011. The number of applications received in 2018 was 9325, the number of approvals issued was 9200 and the number of applications rejected was 125. The NBRO charges a nominal fee to process an application, carry out necessary investigations and issue a report. The General Treasury provided Rs. 27.5 Mn in the year 2018 to cover the recurrent expenditure of this process and balance expenditure was borne by NBRO revenue as CSR.

Table : LRAR details since the process inception in March 2011

	(district) දිස්ත්‍රික්කය	1	2			=1-(2a+2b+2	Pending Application Details (අතිරික්ත		
		Total Applications Received (ලැබූ ඉල්ලුම්පත් සංඛ්‍යාව)	Total Applications work			Total applications pending (අතිරික්ත ඉල්ලුම්පත් සංඛ්‍යාව)	Pending For initial Investigation (මූලික පරීක්ෂණ සඳහා)	Referred to revisit/detailed investigation විස්තරාත්මක අධ්‍යයනයට යොමු කිරීම	Documents Pending from Client (ඉල්ලුම්කරුගෙන් අදාල ලියකියවිලි ලැබෙන තෙක්)
			2a Permission granted (අනුමැතිය ලබා දුන් ඉල්ලුම්පත්)	2b Permission not granted (අනුමැතිය ලබා නොදුන්	2c Applications rejected due to other reasions (වෙනත් හේතූන් මත				
1	Kandy - මහනුවර	17467	15693	216	1384	174	21	8	145
2	Matale- මාතලේ	7231	7142	16	33	40	26	0	14
3	Nuwaraeliya - නුවරඑළිය	6276	6042	43	50	141	58	40	43
4	Badulla - බදුල්ල	9339	8844	142	236	117	56	30	31
5	Kagalle - කෑගල්ල	9849	9393	29	360	67	1	1	65
6	Rathnapura - රත්නපුර	8455	7189	31	1171	64	46	0	18
7	Kaluthara - කළුතර	834	797	5	26	6	4	0	2
8	Galle - ගාල්ල	11857	11792	5	23	37	35	2	0
9	Matara - මාතර	1953	1935	5	7	6	0	0	6
10	Hambanthota - හම්බන්තොට	36	36	0	0	0	0	0	0
11	Kurunagala - කුරුණෑගල	7	7	0	0	0	0	0	0
	Total	**73304**	68870	492	3290	652	247	81	324

Landslide Special Investigations (SPI)

District and Divisional Secretaries, and officials of governmental institutions often request NBRO to conduct landslide special investigations for the purpose of identifying risks in particular sites in relation to the safety of neighbouring human settlements, infrastructure and plantations and to provide immediate recommendations. A total of 2820 landslide special investigations were performed in 2018. The General Treasury has provided Rs. 36.81 Mn. for this work.

Landslide Mitigation Program (GOSL Funded)

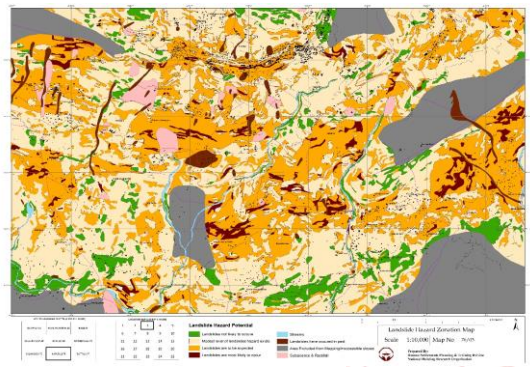
The landslide and slope instabilities needing mitigation have been identified by LHMP and SPI, and six prioritised sites were mitigated during 2018 as indicated by the following.

- Stablilzation of unstable slopes near Lankagama Maha Widyalaya (Rs. 42.40 million)
- Stablilzation of unstable slopes near Kadugannawa Tamil School (Rs.34.30 million)
- Stablilzation of unstable slopes and landslides near Ayagama hospital (Rs. 31.50 million)
- Landslide mitigation near Kandy Nursing school (Rs. 23.30 million)
- Stablilzation of unstable slopes near Atale Maha Vidyalaya (Rs. 43.0 million)
- Stablilzation of unstable slopes on either-side of Maha Oya , Kochchikade river bank (Rs. 10.5 million)

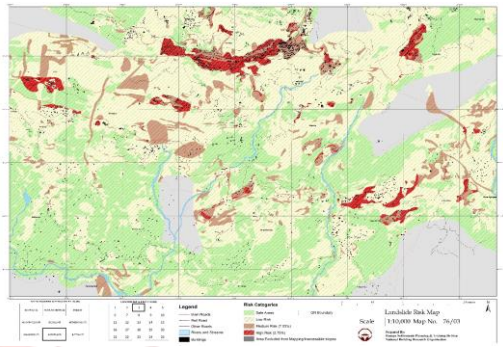
Development of Risk Profile for landslide prone areas

This project was initiated to meet the outcome -1: National and sub-national level agencies are capable of assessing disaster risk and making decisions for short-, medium- and long-term disaster management of the Sri Lanka Comprehensive Disaster Management Programme (SLCDMP) 2014-2018. Adhering to this outcome, risk profiles have been developed to enhance the capacity of national and sub-national level agencies in assessing the disaster risk and formulate short, medium- and long-term disaster risk reduction decisions. Tasks achieved under the Landslide Risk Profile Development Project in the year 2018 are;

I. Formulation of landslide exposure map in 1:10,000 scale
II. Data collection on buildings expose to landslide hazard
III. Training and awareness
IV. Establish community-based disaster management committees
V. Identification of potential safer lands for development
VI. Development of a spatial database on buildings expose to landslide hazard



Landslide Hazard Map (76/03)



Landslide Risk Map (76/03)

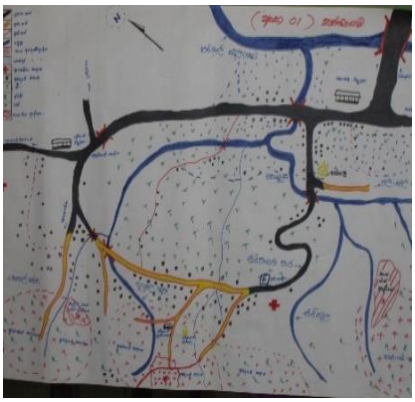
Installation of community-based landslide early warning systems – Phase I (cont'd from 2017)

Landslides occur due to heavy rainfall and hence, NBRO issues landslide early warning to areas indicating heavy rainfall. But some communities living in isolation do not readily receive such warnings sent. This project addresses the requirements of communities living in isolation and empowers them by making them aware of how to monitor rainfall and evacuate if necessary. This is important because such communities can be prepared and take precautionary actions on time, even before receiving early warnings sent by authorities.

So far, the project is in effect at 96 selected sites belonging to Nuwara Eliya, Badulla and Kegalle districts. As per the objectives of the project, site-wise community awareness creation, community vigilance group creation, manual rain gauges distribution, manual sirens distribution, introduction of simple extensometer instrumentation to monitor ground movement and community involved risk map and preparedness plan formulation have been already completed in each of these sites. Additionally, a "landslide early warning preparedness plan map" i.e. a printed map showing verified landslide susceptible areas and safe areas in the village, locations of houses, locations of rain gauges, safe evacuation routes and evacuation centres, has been set up at a suitable public and open location in selected sites so that it will be displayed to the community at all times.

Exchange of contact information between the NBRO and community vigilance group leaders and rain gauge data recorders within these communities has enabled NBRO to alert the communities in advance about adverse weather forecasts issued from Meteorological Department. Monthly rainfall records of all the manual rain gauges are sent to NBRO by the community rainfall data

recorders at the end of each month which helps to maintain an active link between these communities and the NBRO. Furthermore, before the onset of the last monsoon, special workshops were conducted in all three districts gathering the community vigilance group leaders and manual rain gauge data recorders from all the sites in order to enhance attentiveness of the communities. Moreover, it is planned to conduct such community leader workshops on a quarterly basis in the years ahead with the aim of sustaining a dynamic relation between the communities and NBRO. Currently under the project, manual rain gauges are being set up adjoining automated rain gauges in the NBRO's automated rain gauge system. This allows communities to get better observations of rainfall and allows NBRO to verify the records of automated rain gauges as well.

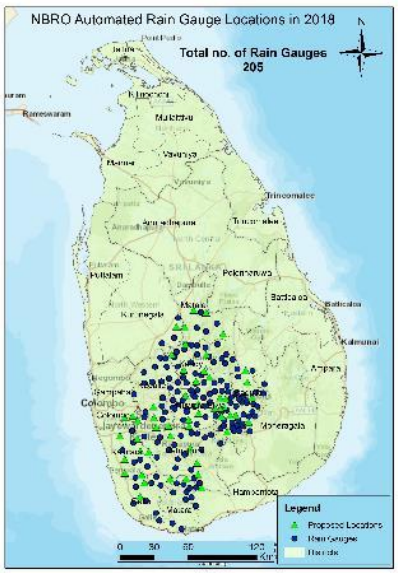


Enhance real time landslide forecasting & early warning capacity by expanding automated rain gauge network.

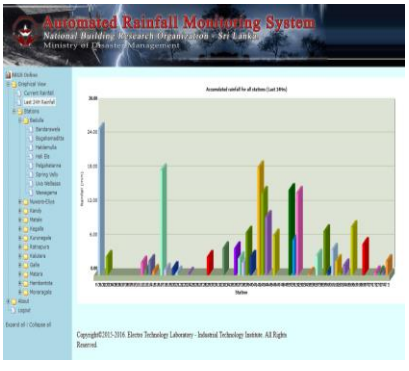
This project covers installation of 130 Nos automated rain gauges into the existing rainfall monitoring system to issue landslide early warning to the locations identified as high risk. NBRO established a Landslide Early Warning Centre at NBRO Head Office for issuing timely early warning and evacuation orders to Disaster Management Centre (DMC) and this Early Warning Centre is now working around the clock during rainy weather.

The project will also Identify gaps and introduce additional automated rain gauges and cutting-edge technologies to improve methods and accuracy of landslide early warning issued. In the year 2018, 66 numbers automated rain gauges have been added to the system, that now

provides data from 216 rain gauges. Total number of rain gauges in the system would be 292 by the end of 2019.



Automated rain gauges locations



Data retrieval in Early Warning Center

Stabilising Meethotamulla Wastefill for Development

After the garbage mound located at Meethotamulla, Kolonnawa collapsed on 14th April 2017, National Building Research Organisation (NBRO) staff together with a team of experts from Japan investigated and reported on the situation existed, probable causes of failure, demarcation of evacuation zones and remedial actions to prevent further failures. Later, Japanese experts helped NBRO staff to assess relevant geotechnical parameters applicable to this waste fill.

NBRO later assisted in the designing of long-term countermeasures for stabilization of the waste fill. A trial embankment with 50 m in length, 30 m in width and 5 m in height was compacted with the Army extending assistance in construction works. At present, the settlement of this trail section, shear failures and compaction are being monitored.

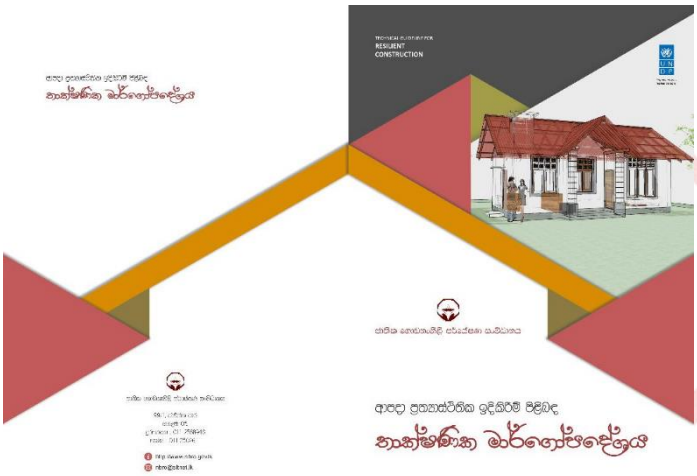
Research & Development Program

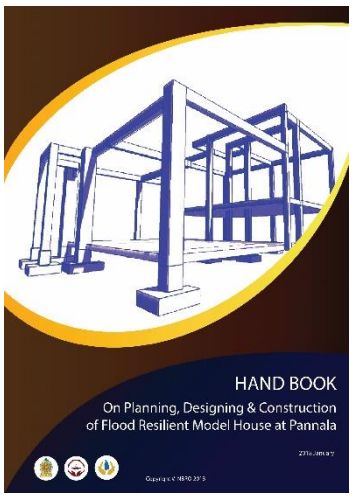
NBRO received Rs. 15.0 Mn as the annual government grant for research and development in 2018. The primary focus of the R & D programme was set on creating disaster resilience. Outcomes of this work were presented and published at the 9th Annual Research Symposium of NBRO 'Innovation for Build Back Better' held on 18thand 19th of December 2018 in Colombo. Altogether 38 technical papers were published in the Symposium Proceedings.

R & D projects in 2018

Continuation of developing resilient construction manuals:

NBRO revised the previous document (නායයෑම් ආපදා ප්‍රත්‍යාස්ථිතික ඉදිකිරීම් පිළිබඳ තාක්ෂණික මාර්ගෝපදේශය) by adding more information related to utilities etc. in 2018 and published for distribution among resettled families, technical officers in local government authorities, home builders and construction professionals. This document provides guidance to the resettlement project presently in progress to resettle over 14000 families over the next 2 years.





Constructing disaster resilient model houses:

NBRO designed and constructed a model house with flood-resilient features for public display at the 202 Milepost in Tangalle. In addition this model house exhibits special features such as low thermal transmittance in walls. Alternative building materials such as Bottom Ash Blocks, Expanded Poly Styrene and rammed earth panels that were developed as NBRO R & D work were used in construction work. Thermal performance was tested and found to be superior and the results were published at the Symposium.

Determination of regional and local rainfall thresholds for landslides in Sri Lanka

This study was carried out to investigate the relationship between occurred date/time of landslides and antecedent rainfall characteristics. Landslides in some districts logically are connected with a shorter time period of rainfall, whereas some others are not. To determine the effective antecedent rainfall threshold values, 1-day, 2-day, 3-day, 5-day, 10-day,15-day and 20-day cumulative rainfall were considered. In certain circumstances, the crucial soil moisture to trigger a landslide in central highland districts is related to more than 15-20 days antecedent rainfall (lower intensities over long time period) and in South-Western districts the crucial soil moisture to trigger a landslide is related to less than 3-5 days antecedent rainfall (high intensities over long time period). Studies proved that not only the daily rainfall affects for the initiation of a landslide but also, the antecedent rainfalls are a necessity. As a result of these different features in different scale, more research is needed to investigate the relation between rainfall and other physical characteristics to trigger a landslide event.

Development of geotechnical guidelines for high-rise buildings

Recent increase in the construction of high-rise buildings and large building complexes in urban areas are often found to be affecting stability of adjacent buildings and sometimes, damaging them. As poor designs and construction practices during excavation and subsurface construction contribute vastly, it is necessary to develop mechanisms to guide design and construction personnel to follow proper and systematic work procedures. This research will probe into pros and cons in present design and construction work and prescribe correct procedures to follow and it has been proposed that using such developed procedures and guidelines be made mandatory in future.

Designing a transitional shelter for disaster-affected communities

The frequency of landslide and flood occurrence has increased significantly in the recent past as a result of which the need for transitional shelters to shelter disaster affected persons has also risen. Tents are used for this purpose at present but contemporarily, improved transitional shelters are a necessity. This research will lead to the development of transitional shelters that can be transported to selected sites quickly and erected and at the same time, stored in compact stores when not in use. Benefit of such development is that prefabricated shelters can be made and kept in store beforehand and deployed quickly after emergencies and further, this can prevent using schools as transitional shelters.

Analysing the effect of meteorological, environmental and anthropogenic factors attributed to drought severity and sector-based water stress in Anuradhapura District

Drought and water stress occur as a consequence of rainfall deficiency and projections for Si Lanka are severe. The study focused onto the effect of rainfall variability on drought related water stress in a particular area in the dry zone for a period of 9 years from 2008 onwards. The results show a strong rainfall variability seasonally. There is no variability in the annual rainfall, but a large fraction of annual rainfall has been delivered by extreme rainfalls. An increasing trend of extreme rainfall events was apparent during this period.

Preparation of Technical Guidelines for Building Demolition work in Sri Lanka

Increasing number of buildings are being demolished especially in urban areas for various reasons like creating land space for gardens or constructing newer and larger buildings, or because of being unfit for occupancy or lack of structural integrity. In the absence of controlling mechanisms or procedures such demolitions take place in an ad-hoc and unsafe manner. With the need for preparing and introducing a suitable guideline being felt, this project was launched as a research first to study the current demolition procedures and identify strengths and weaknesses, and then to compile and introduce a suitable guideline for demolition work.

Development of cost-effective green masonry products using textile waste

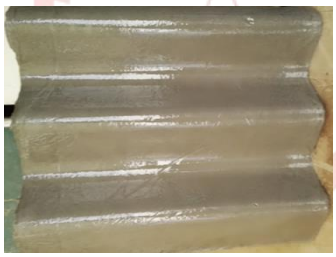
The apparel industry generates vast quantities of fabric offcuts as waste resulting in a waste disposal problem and of these, disposal of offcuts of rubber-mixed fabrics like polyester spandex is found to be a difficult issue. This research is expected to develop polyester spandex embedded masonry products that can be produced with desired strength and other properties and used in construction work. Accordingly, paving blocks were developed incorporating shredded form of polyester spandex, which shows superior energy absorption capability.

Development of guideline for selection of materials and products for construction industry

Presently a large number of different construction materials and products are available in the market and construction persons are often unaware of their properties, how to design with such materials and how to correctly use them in construction work. This research will develop a guideline giving such information, as a valuable future reference.

Development of alternative fibres to asbestos fibres for roofing materials

This research project is expected to develop roofing materials using natural fibres as viable alternative to asbestos fibres. Many different natural fibres have been tested and roofing sheets samples have been fabricated and tested.



Systematic diagnostic assessment of select chemical disasters in Sri Lanka

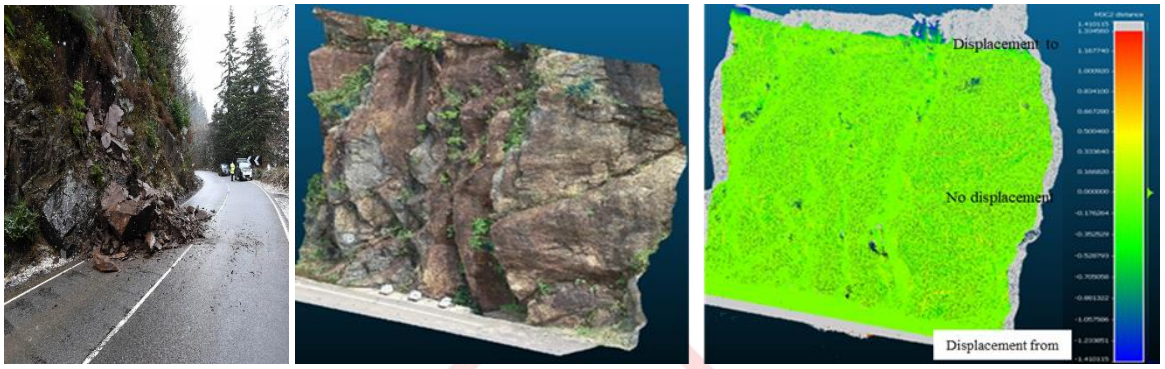
Occurrence of accidents in chemical industries is showing an increasing tendency and exposure of vulnerable elements in the neighbourhood to this hazard could lead to man-made disasters. A systematic procedure for risk assessment is absent, and poor transparency on information to the public on overall situation makes the situation worse. Past incidents highlighted gaps in current DM process and while understanding the potential for chemical disaster, the need has been strongly felt for introducing a chemical hazard mitigation frame work and a sound legal framework on management of disasters associated with chemical accidents. Preparatory work of this research study has been already started and a literature review has been conducted. Professional engineer from Norway who is an expert in this field was invited to NBRO as a guest lecturer to deliver an extended lecture on the subject to NBRO staff.

Application of ecosystem resilience approach to analyse water resource health of Pinga Oya watershed

Pinga Oya watershed is a sub-watershed in the Polgolla watershed and its water quality is subject to heavy degradation due to numerous anthropogenic influences. Using Watershed Metaphor Model developed based on Metaphorical analysis was used to assess the system resilience with respect to flux of constituents in various phases of ecosystem under diverse anthropogenic influence and the response of water resource healthiness in terms of water quality and biological integrity was also studied. This research project now continues into the third successive year and samples were extracted and analysed adding data into a comprehensive database.

Application of UAVs & fast image processing techniques in rockfall monitoring

Rockfall is a hazard in hilly areas. When such site is close to a main road, monitoring becomes a sheer necessity. It is usually required to continuously monitor fractured rock surface to identify rockfall events and traditional approach of monitoring rocky surfaces is time consuming and costly. Hence, advancement in the UAV based photogrammetry technology along with structure-from-motion in combination with multi-view-stereo (SFM – MVS) technology-based 3D model was used as a precise technology. NBRO researched into rockfall monitoring by using image processing techniques where camera drones and super computers at NBRO were used to create three dimensional images. A vertical rock cliff located at 18th bend of Kandy – Mahiyanganya Road (7.343754°, 80.913108°) was taken as a case-study and height of the rock surface ranged from 680m to 740m and the length was about 100 m. Senior staff at the Norwegian Geotechnical Institute advised NBRO scientists in this research work.



Short-Term Research Projects

Establishment of heat index values for the identification of hotspots (A case study in Colombo urban area)

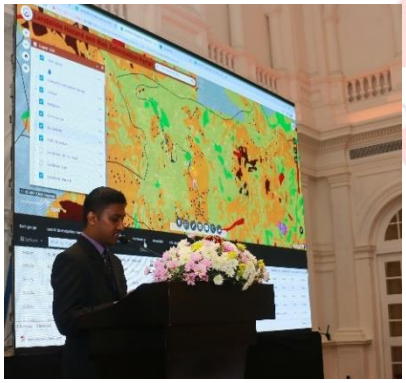
This research was for establishing heat index values in the hot humid city of Colombo, Sri Lanka and conducting a questionnaire survey to assess the subjective thermal comfort. Calculation of thermal comfort is based on field measurements of air temperature and relative humidity. Main objective of this research was to compare the heat index in different urban designs in Colombo. Other specific objectives were to assess the public perception about outdoor thermal comfort in Colombo urban area based on questionnaire and to develop heat index distribution map for Colombo by using ArcGIS software.

Short-Term Research Project: Comparative assessment of particulate matter concentration and air quality index in selected urban areas (A case study in Colombo)

A research study was conducted to identify the ambient air quality level in different urban areas that represent commercial and construction areas by using air quality index values. Survey was conducted to evaluate the public perception and awareness about the particulate matter related ambient air pollution and air quality index concept. Appropriate statistical approaches (one sample t-test and tukey pairwise comparison) and statistical software (Minitab18.0 version and SPSS16.3 version) were used for the data analysis of this research. The research outcomes (8 articles) were published in ‘’Air that we breathe’’ conference, Sri Lanka and ‘’Better Air Quality’’ conference at Kuching, Malaysia.

Symposia - 2018

NBRO Annual Research Symposium



NBRO held its 9th Annual Research Symposium under the theme “Innovation for Build Back Better” in Colombo on 18th and 19th December 2018 where outcomes of research by NBRO and collaborative work with local and international stakeholders were presented and published as the Symposium Proceedings. The symposium recorded a high level of attendance of participants coming from a wide-spectrum of stakeholders.

Dr. Farrokh Nadim, Technical Director of Norwegian Geotechnical Institute delivered the key note address on “Managing landslide and other natural hazard risks: Lessons from the European Safe Land Project”. Afterwards the symposium proceeded, holding six structured technical sessions chaired respectively by Dr. U. P. Nawagamuwa, Dr. J. S. M. Fowze, Prof. S. U. Adikary, Dr. Prasanna Ratnaweera, Dr. (Mrs.) B. C. Liyanage Athapattu, and Prof. Tilak Hewawasam, on the following themes.

- Emerging technologies for safer built environment
- Preparedness for effective response
- Innovations for sustainable building materials
- Engineering approaches for resilience
- Environmental adaptation for sustainable development
- Recovery, rehabilitation & reconstruction

There were two panel discussions and the first panel discussion on “Nature Based Solutions for Landslide Risk Management” was held on 18thchaired by Mr. N.M.S.I. Arambepola as the Moderator and with Dr. U.P. Nawagamuwa, Mr. H.M.U. Chularathne, Dr. Pathmakumara Jayasinghe and Ms. Priyanka Dissanayake as panellists. The second panel discussion was held on 19th on “Sri Lanka’s approach towards resilient built environment: Are we on the right path towards Building Back Better?”, chaired by Ms. Florita Gunasekara as the Moderator, and with Eng. (Dr). Asiri Karunawardena, Dr.William Cheang. Dr. Farrokh Nadim, Prof. C. Jayasinghe, Col. Sudath Madugalle, and Dr. Athula Senaratne as panellists. Prof. of University of Melbourne visiting the event made a brief and very attractive address on high rise structures.

The symposium attracted researchers, disaster management practitioners, policy makers and eminent experts from local and international institutions and it provided an excellent platform to have discussions, exchange ideas and share experience. The symposium was very successful. All the presentations were interesting and informative, the published papers were of high standard and the attendance on both the days was fairly

high. Symposium Proceedings containing 38 technical papers was published.

Seminars and Workshops - 2018

1. Workshop on ''Introduction of real time air quality monitoring sensor system for ambient air quality in Sri Lanka''

A workshop was organised by Environmental Studies and Services Division on "Introduction of real time air quality monitoring sensor system for ambient air quality in Sri Lanka" on 19th July 2018 at the auditorium of Meteorology Department, Sri Lanka. Dr. Ajith Kaduwela presented the keynote speech on "Importance of air quality monitoring and use of real-time air quality sensors" and other presentations were made by Mr. S. Premalal, Director General of Meteorology Department and Mr. H.D.S. Premasiri, Senior Scientist in-charge of air quality studies at NBRO. After, a panel discussion was held on the theme "The way forward to future of air quality monitoring and management in Sri Lanka". Many participants invited from governmental organizations, industries, universities & various parties relevant to air quality monitoring participated in the workshop, and actively discussed and shared their views.

2. Nature-Based Landslide Risk Management Project in Sri Lanka

(a) This project implemented by NBRO is facilitated by Asian Disaster Preparedness Center (ADPC) of Thailand and funded by the World Bank and has participation of experts from the University of Peradeniya. It aims at raising the awareness on the subject and deepen the knowledge within country on the role of nature-based solutions for landslide risk management. A national workshop was organized by NBRO and Asian Disaster Preparedness Center to validate the findings and recommendations of this project on 28th September 2018 at Colombo.


(b) As a part of this project, a training programme was conducted from 1st to 4th October 2018 on Application of Google Earth Engine (GEE) Platform for Land Cover Monitoring and Satellite-Based Rainfall Estimation.


(c) Nature-Based Landslide Disaster Risk Management project – Training Part 1 was held on 12th & 13th November 2018.

Major Consultancy Projects

Clearing geotechnical issues in construction projects

When requested, NBRO conducts investigations and issues reports to authorities such as UDA and Tourist Board prior to granting permits for construction projects involving high-rise buildings and large building complexes where extensive excavation and foundation works are carried out and have a potential to impact on neighbouring buildings. This process has been carried out since 2017.

Year	2017	2018
No. Reports	32	38

Issuing condition reports on buildings

As per a client request or a court order, NBRO conducts investigations including crack surveys and carry out associated computations to decide on the condition of a building and its structural integrity and then issues relevant reports as a fee-based service. Often such services are required to assess condition of buildings in export-oriented industries and sometimes, to decide damage to buildings caused by construction activities in adjacent properties. This process has been carried out for considerably long period by NBRO and the following table gives the details.

Year	2011	2012	2013	2014	2015	2016	2017	2018
No. Reports	47	29	28	47	42	60	148	116

Laboratory Testing Demonstration Sessions for Construction Professionals

Building Materials Research and Testing Division of NBRO conducted Laboratory Testing Demonstration Sessions for professionals from construction industry, planned to impart them exposure to laboratory work. The four-week weekend course titled “Testing of cement and concrete for the professionals in the construction industry” was conducted twice in 2018. Participants mainly from PRDA and other construction industries attended these programmes. The sessions covered theoretical and practical aspects of testing of cement and concrete and related quality control and each session was attended by over 20 professionals.



Project on ambient air quality in main urban cities in Sri Lanka

The Ministry of Environment and Mahaweli Development awarded a grant to extend the current study of Ambient Air Quality in Main Urban Cities in Sri Lanka by using passive air quality monitoring technique funded by VETT program. The monitoring network was extended to Puttalam city and new strategic sampling locations were introduced to the Kandy city. The project was started in late 2017 and NO2 and SO2 data have been collected since then.

Study of Ambient Air Quality in Main Urban Cities in Sri Lanka by Using Passive Air Quality Monitoring Technique

Study of Ambient Air Quality in main urban cities in Sri Lanka by using passive air quality monitoring technique was continued. The project was started in Colombo, Gampaha, Horana, Rathnapura, Galle and Kalutara in 2012 and SO2 and NO2 data have been collected since then.

The monitoring network will be extended to Kandy, Kurunegala, Anuradhapura and Puttalam cities. A PM 2.5 sampling program was introduced to the project additionally in late 2017 to enhance the Air Quality database.

Major geotechnical consultancy projects

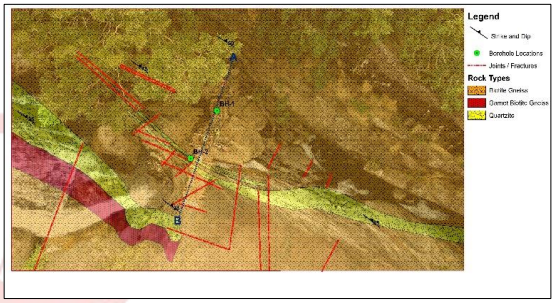
1. Restoration Transport Continuity of Hatton – Maskeliya – Delhouse (B-149) Road damaged due to the Norwood Landslide at Culvert 10/2 (30/25793)

Norwood Landslide

2. Geotechnical Investigation for Design Review to Evaluation Undue Settlement of Gabion Wall, Moragoda Ela, Galle (30/26211)

3. Preliminary Geotechnical Investigation Work Of Both the Banks of the Kelani River from Kaduwela to Hanwella (30/26168)

4. Geotechnical Investigation for Proposed Greater Matale Water Supply Scheme 30/26177



5. Reduction of Landslide Vulnerability by Mitigation Measures Project – Phase I-30/26215

Other Income Generating Activities

NBRO continued the provision of technical testing and consultancy services in the fields of landslide studies and services, geotechnical engineering, project management services, building materials, human settlements planning and environmental management and this work continued to strengthen the financial viability of the institution. Testing and consultancy services provided by NBRO are summarized below:

Activity/ Division	No. of consultancy jobs	No. of testing jobs	Total Income Generated (Rs. Mn.)
Landslide Research & Risk Management Division	2820	-	115.9
Geotechnical Engineering & Testing Division	217	160	154.9
Environment Studies & Services Division	2	630	69.4
Building Materials Research & Testing Division	-	3819	44.6
Project Management Division	214	-	45.2
Human Settlements Planning & Training Division	10	-	45.5
Road Project (CRIP)	-	-	41.3
Landslide Mitigation Project – (AIIB Financed)			54.2
Other Revenue	-	-	63.1
Total			**634.1**

Projects with Foreign / Donor Collaboration

NBRO-JICA technical collaboration projects (Foreign Aid and Technical Cooperation)

- **Technical Cooperation for Landslide mitigation Project (TCLMP-Phase I)**
  The mitigation works of three landslide locations (Alagumale, Udamadura and Badulusirigama) prioritized by Integrated Landslide Mitigation Project under the TCLMP Phase I were officially completed in 2017. Japan International Cooperation Agency provided technical and financial assistance for project implementation. Post-mitigation monitoring work of the three sites continued in 2018. (TCLMP-Phase II is expected to commence from February 2019).

- **Landslide mitigation at Nurses Training School in Kandy District**
  Mitigation work of landslide / unstable slopes in and around the premises of Nurses Training School in Kandy was carried out with the assistance of JICA as a joint venture by Koiwa Corporation and Earth System Science Limited with Nippon Koei working as the consultant. Design work of this mitigation work was done by the TCLMP Phase I. NBRO completed certain project components of this project and it is presently near completion.


Alagumale rock falling site


Badulusirigama site


Udamadura site


Kandy training School site

- **Ground Movement Detection Instrumentation**
  There are isolated communities living in landslide-prone areas whom cannot be contacted easily for landslide early warning dissemination from Colombo. With the assistance from the Government of Japan and JICA, a project was launched by Earth System Science & Osasi Limited to install monitoring instrumentation in such areas for the benefit of respective communities. An instrumentation system was installed first in Diyanilla to demonstrate capabilities, and later as a pilot project, instrumentation systems including dip meters, rain gauges and inclinometers were installed in Galaboda. Presently these two systems are in operation and signals from instruments are received by NBRO Early Warning Center and by mobile phones of the officers concerned with early warning.




Instruments at Diyanilla in Nuwara Eliya Instruments at Galaboda in Ratnapura

- **Landslide research with NILIM**

  NBRO and National Institute for Land and Infrastructure Management (NILIM) of Ministry of Land, Infrastructure, Transport and Tourism (MLIT), Tsukuba City, Ibaraki, Japan joined in hands by signing a memorandum of understanding at the last NBRO Research Symposium held on 24th January 2018. Teams from NILIM visited NBRO & sites, and held discussions on conducting research on landslides. A team of three scientists from NBRO went to NILIM for training on sediment disaster.

Training NBRO staff in Japan

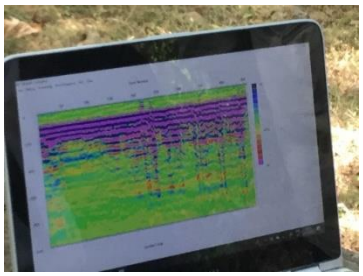
Field work in Sri Lanka

UNDP assistance on resilience building in flood and landslide recovery

NBRO implemented “Resilience Building Program in Flood and Landslide Recovery” in collaboration with the UNDP to ensure safer built environment in landside disaster-prone districts in Sri Lanka. This programme was formulated to enhance relevant awareness of main 4 stakeholder groups namely Awareness for District Senior Government Officers (District Secretary & Divisional Secretaries) (4 programmes), Training Workshop for Technical officers & National Disaster Relief and Service Centre (NDRSC) officers (9 programmes), Awareness for the Beneficiaries of the National Resettlement Programme - 2017 (12 programmes) and Training Workshop for the Masons (11 programmes) in this effort. NBRO presently has a memorandum of understanding with the UNDP to this effect.

Deliverables achieved can be listed as related knowledge sharing for District level administrative decision makers in creating an arena to bring forward the problems and challenges faced in the resettlement framework; keeping everything on track, towards the ultimate target of disaster resilient and sustainable human settlements; a benchmark particularly on changing mindset of the stakeholders about the importance of NBRO recommendations for a safer built environment, in contrary with their traditional ways of land selection, housing construction, land development; in distributing required technical knowledge on land use management significantly in disaster-prone areas, able to make the masons aware on disaster resilient housing construction methods as recommended by NBRO and their importance as a sustainable measure in achieving the future goals of disaster resilient and sustainable human settlements; in distributing this knowledge to who has no professional training on construction was quite beneficial in order to change their mindset significantly on housing construction in disaster-prone areas to deviate from traditional practices in Sri Lanka.

NBRO –NGI Technical Cooperation Project



NBRO and Norwegian Geotechnical Institute (NGI) have conducted various studies since 20xx and an agreement on cooperation was signed to continue the project "Institutional Cooperation on Mitigation of Natural Disasters due to Climate Change" for the five years from 2018 to 2022.

In 2018, NGI experts together with NBRO staff, conducted a GPR survey in Anuradhapura to map the subsurface to located the inner citadel for the Sacred Cities Development Project.

Dr. Farrok Nadim the Technical Director of Norwegian Geotechnical Institute visited NBRO in December 2018 and expressed interest to conduct nature-based landslide mitigation projects, venturing into more diversified areas in association with Asian Disaster Preparedness Centre.

Royal Norwegian Embassy (RNE) in Colombo provided financial assistance to this project.

Nature Based Landslide Risk Management Project with Asian Disaster Preparedness Centre in Sri Lanka

In the past Sri Lanka has largely relied on engineering solutions on landslide risk management. The application of nature-based and hybrid (engineering and nature based) approaches for landslide risk management is still limited. It has been demonstrated in many countries in Asia that the risk-informed nature-based solutions can be effective in reducing the occurrence and impact of landslides.

Recognizing the importance of application of nature-based solutions for landslide risk management in mitigating the landslide risk in Sri Lanka, National Building Research Organisation (NBRO) has taken an initiative to implement the project on “Nature Based Landslide Risk Management”, with the technical assistance from Asian Disaster Preparedness Center (ADPC), Thailand. This Analytics and Advisory Services project is funded by the World Bank and aims at raising the awareness on the subject and deepen the knowledge within country on the role of nature-based solutions for landslide risk management. It is also expected to apply this knowledge in a number of pilot demonstration sites under the ongoing Climate Resilience Improvement Project (CRIP) funded by the World Bank.

Reduction of Landslide Vulnerability by Mitigation Measures Project

NBRO devised the Reduction of Landslide Vulnerability by Mitigation Measures Project (referred now shortly as the RLVMMP) following the Cabinet approval for implementation of Integrated Landslide Mitigation Programme. In this project, prioritized mitigation sites requiring immediate attention have been listed for mitigation and these include roadside unstable slopes as well as unstable slopes along the railway lines in the hill country for mitigation jointly with Road Development Authority and Sri Lanka Railway.

The project components of the proposed project are:

- Civil work and associated design and construction supervision / management activities
- Policy and Regulation Enhancement
- Institutional Capacity Building
- Technical Support and Project Management

In 2018, NBRO conducted ground investigation and social & environmental studies related to 27 sites selected for urgent mitigation and later, carried out design of the mitigation measures.

Selection of contractors will be done in early 2019. Further, works related other 120 sites in altogether 8 districts have been started by NBRO.

Developing of Real-time Air Quality Monitoring Sensors

The staff of Environmental Studies and Services Division, AQ section with the guidance of Dr. Ajith Kaduwela, an expert from California Air Quality Research Board developed a real-time Particulate Matter Monitoring sampler to measure ambient air quality. Dr. Kaduwela with his aides for two weeks conducted a series of lectures and practical sessions for NBRO staff on this subject. The division initiated the development of this air quality monitoring sensor with the intention of achieving real-time online air quality data. The Division is currently engaged in monitoring ambient air quality in major urban cities of the country and to assess the ambient air pollution levels. Due to recent concerns on air pollution in cities and associated impacts, the division has decided to install air quality monitoring equipment in suitable locations in the city of Colombo.

With that intent, the premises of Meteorology Department in Colombo with the permission of the higher management was selected to install the Real-time Air Quality monitoring sensor. The on-line air quality data (SO2, NO2, PM10) are being recorded in monitoring sensors and displayed in all three languages (via digital display) in front of the said premises and data are also disseminated to the public through NBRO web site, so that, the public can be aware of levels of the real time ambient Particulate Matter in air that they breathe. This data is made available to the research community in coordination with the Air Quality Studies Unit. NBRO expects signing a memorandum to continue this research in collaboration with the University of California, Davies.

Air Quality measurement unit installed in Dept. of Meteorology premises

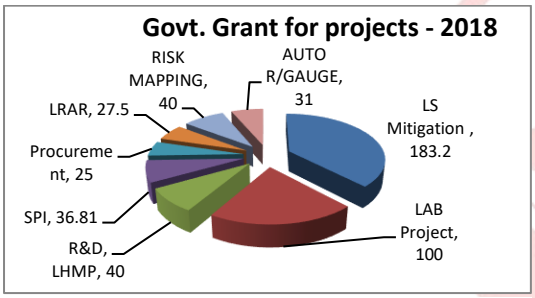
Safer Communities with Hydro-Meteorological Disaster Resilient Houses

Initial workshop on the collaborative research between Bath University, UK; University of Moratuwa, Sri Lanka and National Building Research Organisation was held in May 2018. The overall aim of this project is to build resilience of vulnerable communities in Sri Lanka by developing strategies that will improve the resilience of low-rise masonry structures to withstand flood events. The project will employ inter-disciplinary approaches to address the questions posed by post-disaster reconstruction, while working with social scientists and economists in Sri Lanka.

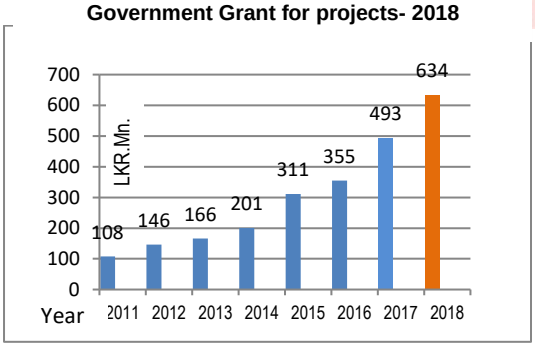
Financial Highlights

In 2018, NBRO recorded consolidated revenue of Rs. 1,048 Mn. that reflects a growth of 18% over the previous year. Revenue from customary NBRO services Rs. 634 Mn. shows a 45% growth in 2018. The institution depends mostly on this consultancy revenue generated to meet its recurrent expenditure.

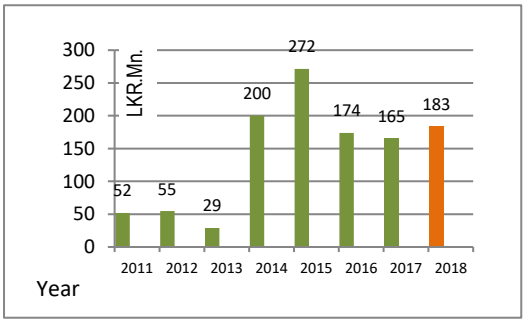
Rs. 183.2 Mn. has been received under government grant for mitigation of high-risk landslides in 2018. Nine district offices of NBRO have been functioning since March 2011 for issuance of Landslide Risk Assessment Reports for development work in landslide-prone districts. Rs. 27.5 Mn. was provided by the Treasury as recurrent expenditure and the balance requirement was met with nominal fee charged from applicants and rest by NBRO revenue.



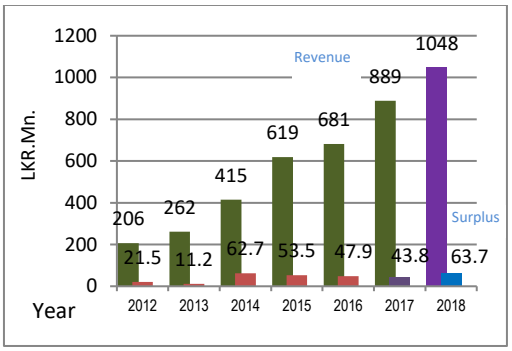
Government Grant for projects- 2018



Income by Testing and Consultancy



Landslide mitigation budget 2018



Total Operating Revenue

In addition, Research Grant for Landslide Hazard Mapping of Rs. 25 Mn. together with Rs. 15.0 Mn for the Research & Development was received. Grant for Landslide Special Investigations of Rs. 36.81 was received including Rs. 16.81 Mn. for the additional investigation due to extreme climatic events happened in 2018. Procurement Grant for lab & field, office equipment of Rs. 25.0 Mn. was received from the Treasury.

The consolidated revenue for year 2018 was Rs. 1,048 Mn. while total consolidated expenditure for the corresponding period was Rs. 984.6 Mn. A net profit of Rs. 63.7 Mn. was recorded.

The expenses on personal emoluments for the staff strength of 483 plus daily paid employees was Rs. 465.9 Mn. in 2018 as against the staff strength of 462.0 plus daily paid employees was Rs. 405.2 Mn. In year 2017.

The institution growth and enhanced performance have been mainly due to the courageous effort of the management and the staff of NBRO.

Statement of Financial Position

STATEMENT OF FINANCIAL POSITION AS AT 31ST DECEMBER 2018

Rs.

		Annex No	As at 31.12.2018		As at 31.12.2017
Current Assets					
Cash and cash equivalents		**1**		40,116,143	577,229,851
Receivables	Project Debtors	**2**	477,982		630,082
	Sundry Receivables	**3**	48,690,522	49,168,504	49,727,417
				89,284,647	
Inventories		**4**		3,743,181	3,363,822
Pre-payments		**5**		220,743,686	
					169,516,361
Other Current Assets					
	Project work in progress	**6**	441,668,072		435,708,060
	Others	**7**	587,593,088	1,029,261,160	130,094,193
Non - Current Assets					
Infrastructure, Plant & Equipment		**8**	597,301,323		522,543,297
New Lab Building WIP			206,249,677	803,551,000	121,449,776
Total Assets				**2,146,583,674**	**2,010,262,859**
LIABILITIES					
Current Liabilities					
Payables	Money Received from Clients	**9**	573,905,412		713,441,299
	Sundry payables	**10**	142,911,001	716,816,413	126,446,534
Non – Current Liabilities					
Long term provisions					
	Provision for Depreciation	**11**	424,538,506		369,020,247
	Provision for Gratuity & Bad debtors	**12**	75,823,532	500,362,038	70,183,590
Total Liabilities				**1,217,178,451**	**1,279,091,671**
Net Assets				**929,405,223**	**731,171,189**
NET ASSETS / EQUITY					
Capital contributed by Government & Other entities		**13**	581,140,713		446,592,083
Reserves – Revaluation Surplus			27,875,989		27,875,989
Assets acquired			2,264,498	611,281,200	2,264,498
Accumulated Surplus/ (Deficit)					
	Surplus brought forward	**14**		254,438,619	210,607,780
Surplus for the year				63,685,404	43,830,839
Net Assets / Equity				**929,405,223**	**731,171,189**

Statement of Financial Performance

STATEMENT OF FINANCIAL PERFORMANCE FOR THE YEAR ENDED 31.12.2018

Rs.

Revenue	Annexure	Year 2018	Year 2017
Revenue			
Environmental Studies & Services Division	**15**	69,417,949	51,901,731
Geo Technical Engineering & Testing Division	**16**	180,401,699	103,186,185
Landslide Research & Risk Management Division	**17**	356,250,234	446,374,812
Human Settlement Planning & Testing Division	**18**	112,791,634	140,767,215
Building Material Division	**19**	44,577,204	39,709,939
Project Management Division	**20**	126,212,223	33,153,417
CRIP	**21**	41,337,703	42,186,613
RLVMM Project (AIIB)	**22**	54,200,000	
Total Operating Revenue		**985,188,645**	**857,279,912**
Other Income	**23**	63,070,505	31,765,511
Total Revenue		**1,048,259,150**	**889,045,423**
LESS - Expenses			
Salaries, Wages and Employee Benefits	**24**	465,874,891	405,210,823
Supplies and consumables used	**25**	479,832,590	400,716,738
Depreciation	**26**	11,192,661	9,503,939
Impairment of Property, plant and Equipment	**27**	15,747,918	16,236,039
Other Expenses	**28**	9,299,474	11,330,903
Finance Cost	**29**	126,213	216,142
Total Expenses		**982,073,747**	**843,214,584**
Net Profit before Tax		66,185,404	45,830,839
Income Tax		2,500,000	2,000,000
Net Profit after tax		**63,685,404**	**43,830,839**

Cash Flow Statement

CASH FLOW STATEMENT FOR THE YEAR ENDED 31.12.2018

Rs.

	2018	2017
Surplus / (Deficit) before Taxation	**63,685,404**	**43,830,839**
Adjustments		
Depreciation	11,192,661	9,503,939
Provision for Gratuity	8,329,841	9,931,470
Gratuity Payment	-2,689,899	-4,719,403
Disposal of vehicles	-	-1,500,000
unrealized Interest Income	-58,586,910	-30,531,613
Correction for year 2016	-	-5,264,603
Operating Surplus(Deficit)before working capital changes	**21,931,097**	**21,250,630**
Changes in working capital		
Increase in Debtors	1,188,995	-8,480,642
Increase in Pre payments	-51,227,325	-83,427,567
Increase in Inventories	-379,359	-1,000,815
Increase in Working In Progress	-5,960,012	-112,991,817
Increase in Deposits	-457,498,895	-79,162,178
Money Received from Client	-114,535,887	135,483,451
Increase in Sundry Creditors	16,464,467	49,820,417
Net Cash flows from Operating Activities	**-590,016,919**	**-78,508,521**
Cash flows from Investing Activities		
Interest Income	58,586,910	30,531,613
Purchase of Fixed Assets	-159,557,927	-113,438,728
Net cash flow from Investment activities	**-100,971,017**	**-82,907,116**
Cash flows from Financing Activities		
Government Grant (Procurement)	25,000,000	25,000,000
Other Grants	128,874,229	164,712,078
Cash flows from Financing Activities	**153,874,229**	**189,712,078**
Net change in Cash and Cash equivalents	-537,113,707	271,681,959
Cash and cash equivalents beginning of the period	577,229,851	548,933,410
Cash and cash equivalents as at 31.12.2017	**40,116,143**	**820,615,369**
Note- Cash and Cash equivalents		
Cash at Bank and hand	40,116,143	577,229,851
	40,116,143	**577,229,851**

Notes to Accounts

1. Accounting Policies.

Financial Statements have been prepared by Complying with generally accepted Accounting Principles, Fundamental assumptions, Public Sector Accounting Standards and Accounting Standards introduced by the Institute of Chartered Accountants from time to time and also by considering the followings.

(a) Going Concern

(b) Consistently Application of Accounting Policies.

(c) Revenue and expenses recognition on accrual basis.

(d) Disclosure to deviations to Standards

2. General Accounting Policies.

2.1 Depreciation Policies.

(a) Depreciation is provided based on number of days used

(b) Fixed assets are depreciated on Straight Line basis using the following rates.

Fixed asset type	%
Buildings	2.5
Machinery and Lab Equipment	20
Furniture & Fitting	10
Vehicles	20
General Office Equipment	20
Drawing Office Equipment	10
Tools	50
Library Books	5
Fire Extinguishers	10

(c) Amortization for granted assets has been deducted from the carrying value of grants as stipulated in Sri Lanka Accounting Standards.

2.2 Valuation of Closing Stock

Unutilized materials stocks have been valued at cost.

2.3 Provision for Gratuity

Provision for gratuity is calculated in accordance with the Gratuity Act.

2.4 Provision for doubtful Debtors

A provision has been made for doubtful debts on the basis of;

(a) 1 % Provision for debts outstanding over 2-10 years.

(b) 25 % Provision for debts outstanding over 10 years.

Statement of Responsibility for Financial Statements in terms of Sec. 7A.

The Accounting policies & Notes to Accounts on page 06 form an integral part of these Financial Statements. The Board of Directors is responsible for the preparation and presentation of these Financial Statements. These Financial Statements were approved by the Board of Directors and signed on their behalf.

Member of the Interim Management Committee of NBRO

J.J.Ratnasiri
Secretary
Ministry of Public Administration & Disaster Management
Chairman of the IMC

J. J. Rathnasiri
Secretary
Ministry of Public Administration & Disaster Management
Vidya Mawatha, Colombo 07.

H. U. R. Fonseka
Chief Accountant
Ministry of Public Administration & Disaster Management

H. U. R. Fonseka
Chief Accountant (Disaster Management)
Ministry of Public Administration &
Disaster Management
Vidya Mawatha, Colombo-07.

Chief Executive Officer of NBRO

Eng.(Dr.) Asiri Karunawardena
Director General
National Building Research Organisation

Director General
National Building Research Organisation
No. 99/1, Jawatta Road,
Colombo 05

Chief Financial Officer of NBRO

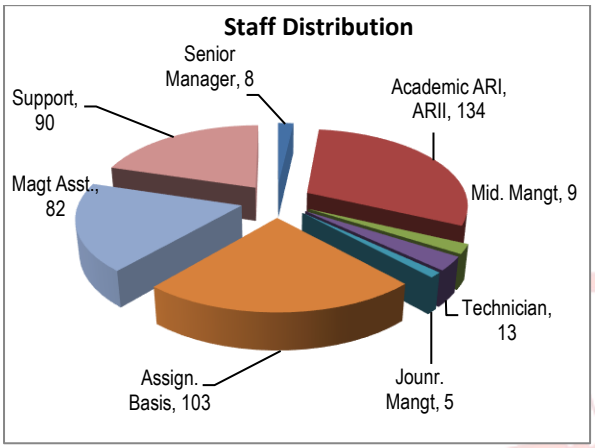
K.K.H.Randeny
Director (Finance)
National Building Research Organisation

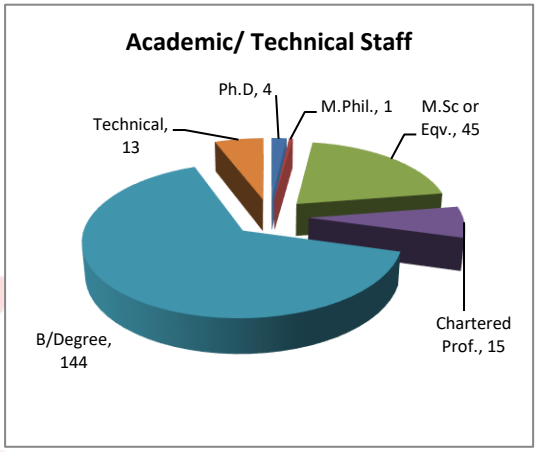
K.K.H. RANDENY
DIRECTOR FINANCE
NATIONAL BUILDING RESEARCH ORGANIZATION
FINANCE DIVISION
99/1, JAWATTA ROAD,
COLOMBO - 05.

Human Resource /Capacity Development

NBRO's Vision and Mission were set to develop its capacity to cater the Ministry's DRR needs. With this in view NBRO is in the process of legalizing the institution mission by an act and developing staff capacities to deliver high standard outputs. Human resource and infrastructure needs of the institution are becoming a matter of serious concern with the increasing responsibilities the institution shoulder at present. Staff turnover is one of the inherent issues of NBRO during the recent past.

Recruitment of new employees for essential vacant positions was done. In 2018, 44 employees in 6 categories were recruited. A staff development program has been launched and opportunities for local and foreign training were increased for NBRO staff to learn and gain experience.





RECRUITMENT, RETIREMENTS & RESIGNATION of PERMENANT STAFF IN 2016

No	Sal/ Code	Staff Category	No of Recruitment	No of Resignations	No. of Retirement
1	HM 1- 3	Senior Manager (CEO)	1	1	-
2	HM 1-1	Senior Manager	1	1	-
3	MM 1-1/JM 1-1	Middle/ Junior Management	1	1	1
4	AR2	Senior Academic/ Scientist	1	1	-
5	AR 1	Academic/ Scientist	27	6	-
6	MA 2-2	Management Assistant (Tech)	5	1	-
7	MA 1-2	Management Assistant (Non Tech)	-	1	-
8	PL 1,2&3	Primary	8	1	2
	TOTAL		**44**	**13**	**3**

NBRO Training

NBRO carried out various training programmes for its staff. Many staff members were sent for short term training programmes abroad. Some scientists were selected for masters programmes abroad.

Foreign Training Opportunities in 2018

No	Participants	Designation	Division	Training Information	Period	Country
1	Mr. H.M.L. Indrathilaka	Senior Scientist	LRRMD	Mainstreaming Disaster Management in Infastructure Sector	08.01.2018 12.01.2018	Gujarat, India
2	Mr. H.D.S. Premasiri	Senior Scientist	ESSD	Asia Pacific Clean Air Partnership Joint Forum	19.03.2018 24.03.2018	Thailand, Bangkok
3	Mr. T. Rasaroopan	Scientist (Engineer)	LRRMD	Early Warning System for Natural Disasters	29.03.2018 18.04.2018	Korea
4	Mr. N.S.A.K. Cooray Ms.R.M.S.K.Rathnayake	Assistant Director (Admin & HRM) Management Assistant	Admin & Finance	International Training Programme and Modern Initiatives	09.05.2018 13.05.2018	Malaysia
5	Mrs. H.H. Hemasinghe, Mr.P.M.G.R. Bandara, Mr.M.D.S.S.Karunarathne	Scientist	LRRMD	Promoting Corporative Research Between NILIM and NBRO on Estimation Method of Run out Deposition of Debris Flow Caused by Landslide	17.06.2018 30.06.2018	Japan
7	Mr. B.V.P. Jayakody	Scientist	Program Unit	Workshop on Developing Capacities on Climate Change Adaption and Disaster Risk Reduction	31.07.2018 03.08.2018	South Korea
8	Mr. V.D.W.Sumanasekara	Scientist	ESSD	Master Degree Program in Water Resources Management	16.08.2018 14.01.2020	Korea Sung Kyun Kwan University
9	Ms. H.T.J.Senevirathne	Scientist	ESSD	Master Degree Program in Environmental Science	22.08.2018 31.08.2020	University of Tsukuba, Japan
10	Ms. C.N. Subasinghe	Scientist	LRRMD	Master Degree Program in Civil Engineering	22.08.2018 31.08.2020	University of Tokyo Japan
11	Mr. W.K.S. Ariyakumara, Mr. D.M.L.P. Dassanayake, Mr.E.P.S. Pathirana, Ms. B.P.D.W. Ranathunga, Mr. A.G,R.P.Weerasingha	Scientist	LRRMD	Educational Tour for Post Graduate Students in University of Peradeniya	17.11.2018 26.11.2018	Bangkok, Thailand
12	Mr. K.C. Sugathapala	Director (Technical)	HSPTD	Overseas visit to University of Bath	01.11.2018 10.11.2018	UK
13	Mr. H.D.S. Premasiri	Senior Scientist	ESSD	10th Better Air Quality (BAQ) Conference 2018	11.11.2018 17.11.2018	Kuching, Malaysia
14	Dr. K.P.G.W. Senadeera	Senior Scientist	LRRMD	Regional Workshop and Capacity Building Programme for Utilization of space based and Geospatial Information for achiving targets of the Sendai Framework	02.12.2018 09.12.2018	Gujarat, India

PROCUREMENT OF EQUIPMENT

The grant of LKR 25.0 Mn. given by the General Treasury in 2018 to procure laboratory and field equipment for research for capacity building in NBRO was effectively utilized. Several major equipment including field accessories and important IT related equipment were procured under this grant. The key items are listed in the following table.

Division	Item
BMRTD	Weighing scales (100-250g & 1 – 1500g), Flexural device for prism, Compression device for prism, Automatic mortar mixer for cement test, Blaine air permeability apparatus, Le-Chatelier's Moulds, Standard Calibration Weights, Concrete Pocket Penetrometer, Masonry Rebound Hammer, 4- channel Data Logger with printer
ESSD	Sample bottle cooler, portable pH meter, soil sensor, pH/ISE meter, hot plate, vacuum filtration unit, stack sampling kit
HSPTD	Super computer
GED	Automatic proctor compaction machine, Linear shrinkage mould, 30kg weighing balance, drilling accessories

ENGISH TRANSLATION OF THE AUDIT REPORT OF NBRO FOR 2018

The Director General
National Building Research Organisation

Report of the Auditor General on the Financial Statements of the National Building Research Organisation for the year ended on 31 December 2018 in terms of Section 12 of the National Audit Act, No. 19 of 2018.

---

1. Financial Statements

1.1 Qualified Opinion

This report states my opinion and observations that I consider as required to be published with the Annual Report of the National Building Research Organisation as per the regulations in Section 12 of the National Audit Act, No. 19 of 2018 read in conjunction with the Article 154 (1) of The Constitution of Democratic Socialist Republic of Sri Lanka on the Financial Statements of the National Building Research Organisation for the year ended on 31st December 2018 comprising of Statement of Financial Position as at 31 December 2018, Statement of Financial Performance, Statement of Changes of Equity, the Cash Flow Statement for year ended and a statement of concise important accounting policies. My report will be tabled at the Parliament as per the Section 154 (6) of the Constitution.

I am in the opinion that except for the effects of matters described in qualified opinion in my report, Financial Position of the National Building Research Organisation as at 31 December 2018, Financial and Cash Flow for the year ending on that date are in accordance with the Sri Lanka Public Sector Accounting Standards and reflect a true and fair situation.

1.2 Foundation for qualified opinion

(a) Rs. 11.01 Mn should have been allocated for retirement benefits of the current year but only Rs. 8.39 Mn had been allocated.

(b) Instead of accounting funds retained for construction of the new building separately, it had been shown as the balance of contractor payment. As a result, Working Progress has been shown Rs. 8.09 Mn less.

I conducted this audit in accordance with Sri Lanka Auditing Standards (SLAuS). My responsibility under these auditing standards has been further described under Auditors. I believe that audit evidence obtained is sufficient and appropriate to provide a basis for my audit opinion.

1,3 Responsibility of the management and administration on the Financial Statements

It is the responsibility of the management to prepare these financial statements in accordance with Sri Lanka Public Sector Accounting Standards and present in a fair manner and decide on such internal controls as the management determines is necessary to enable the preparation of financial statements that are free from material misstatements whether due to fraud or error.

It is the responsibility of management to decide on the sustainability of National Building Research Organisation when preparing financial statements, and It is the responsibility of management to keep accounts on the basis of uninterrupted sustainability and declare matters

pertaining to uninterrupted continuity of National Building Research Organisation except in the case if the management decides on termination of National Building Research Organisation or if there is no other alternative except for suspending its operations.

Parties administrating bear the responsibility of financial reporting activity of National Building Research Organisation. The books and records on own income revenue, expenditure, assets and liabilities should be properly maintained enabling the preparation of annual and periodical financial statements of the National Building Research Organisation according to Subsection 16(1) of the National Audit Act, No. 19 of 2018.

1.4 Auditor's Responsibility on auditing of financial statements

My responsibility is to give a fair judgement that financial statements are free of material misstatements whether due to fraud or error and issue audit report inclusive of qualified opinion. Fair certification is a higher certification but, when auditing according to Sri Lanka Auditing Standards it does not guarantee that material misstatements are always sufficiently disclosed. Effect of fraud and error singly or together can result in significant material misstatements and it is expected that economic decisions taken on the basis of these financial statements can be affected.

I have audited with professional judgement and professional scepticism according to auditing standards.

- When identifying and assessing, planning of audit actions timely and appropriately can alleviate the risk of quantitative material misstatements in financial statements due to fraud and error. And in order to do so, obtaining sufficient and suitable evidence is necessary to base my opinion. The effect of fraud is higher than the effect of significant / quantitative material misstatements and joint corruption, forging documents, intentional neglect, or disregarding internal controls results in a fraud.

- Internal controls of National Building Research Organisation were studied in to order to plan audit actions timely and appropriately but it is not expected to state an opinion on the effectiveness of these internal controls.

- Evaluation of the suitability of accounting policies and accounting estimates used, and the associated disclosures of the management

- Based on the audit evidence related to the significant doubt on the sustainability of National Building Research Organisation due to incidents and situations, the appropriateness of using sustainability of the organisation as a base in accounts was decided. If I decide that there is a significant doubt, my audit report should focus on associated disclosures in financial statements, and if such disclosures are insufficient, my opinion should be rejected. However, sustainability continuity may end based on future situations.

- Presentation of financial statements containing disclosures, structure and contents were assessed and assessment of appropriateness and fairness in the inclusion of related transactions and incidents in financial statements

Important audit findings, main weaknesses in internal control and other facts identified in my audit were apprised to management.

2. Report on other legal and Regulatory Requirements

Special provisions on the following requirements are given in the National Audit Act No.18 of 2018.

- As per the requirements in Section 12 (a) of the National Audit Act No.18 of 2018 except for the effects by reasons mentioned in the basis of my report, all information and explanations required for the audit were obtained by me, and according to my investigations, proper financial statements have been maintained at the National Building Research Organisation.

- As per the requirements in Section 6 (1) (d) (iii) of the National Audit Act No.18 of 2018, financial statements of National Building Research Organisation are in line with previous year

- As per the requirements in Section 6 (1) (d) (iv) of the National Audit Act No.18 of 2018, my recommendations given in the previous year have been included in the financial statements presented

Based on the methodologies followed and evidence obtained, and after limiting to significant facts, there were no reasons to state the following statements that drew my attention

- As per the requirements in Section 12 (d) of the National Audit Act No.18 of 2018, a member of the governing board is not having directly or otherwise any involvement outside common business norms regarding an OR any agreement of the National Building Research Organisation

- As per the requirements in Section 12 (f) of the National Audit Act No.18 of 2018, except for the following observation, not acted against any written law or other common or specific regulation issued by the governing board of the National Building Research Organisation

Reference to laws and regulations	**Description**
Financial regulation 835 (2) c	Rs. 9.39 Mn had been paid as the rent of 10 District Offices of the organisation in the year under consideration for which valuation reports have not been obtained from the Chief Valuer.

- As per the requirements in Section 12 (g) of the National Audit Act No.18 of 2018, except for the following observation, not acted beyond powers, functions and duties of the National Building Research Organisation

(a) Approval was given on 2nd June 2010 to the Cabinet Memorandum on drafting an act to give legal status to the research organisation and a draft prepared to this effect was sent to the Legal Draftsman's Department on 10th September 2012, but even by 31st December 2018, actions have not been taken to present this act to the parliament.

- As per the requirements in Section 12 (h) of the National Audit Act No.18 of 2018, except for the following observations, procured according to rules and regulations but unused the resources of the research organisation thriftily, efficiently, and productively within the set time limits

(a) In the period from 2015 to 2017, work had been completed in 22 construction contracts awarded by the research organisation related to landslide risk reduction but a sum of Rs. 75.43 Mn paid as advance to contractors had not been recovered

(b) Contractors who were awarded Landslide Mitigation Project contracts on Pussala Navodya Vidyalaya and Badulla - Wawegama Hospital premises had abandoned contracts on 4th March 2016 and 8th April 2016 respectively. Actions have not been taken to recover Rs. 1.66 Mn from the advance and recover the Performance Bond valued as Rs. 1.57 Mn from the contractors to minimize the loss to the organisation.

(c) In 2018, a contract to install 30 automated rain gauges had been awarded to an institution disregarding that work to install 50 automated rain gauges had not been completed in the contract awarded in 2017

(d) Space was more than enough in buildings where research organisation has district offices at Ratnapura, Kegalle and Kandy, but separate buildings had been rented at an expense of Rs. 1.16 Mn as project offices in the same districts.

(e) The following observations are made on the procurement activities of new office and laboratory building under construction during the year under consideration at an estimated cost of Rs. 600 Mn.

Research organisation had extended the duration of contract of the new office and laboratory building construction at 3 instances, according to which construction activities scheduled to be completed by 21st December 2017, had not been completed even by 31st December 2018. Action has not been taken to recover the penalty delay charges of Rs. 3.75 Mn.

As per the Paragraph 4.5 of the Contract Agreement, the minimum interim payment is Rs. 12.5 Mn but during the year under consideration, Rs. 95.74 Mn had been paid in 30 instances and these were below the value of a minimum interim payment. From the monies paid for civil works, a sum of Rs. 38.31 had been paid to external institutions behalf of the Contractor.

Due to the delay in building construction, Rs, 3.73 Mn had been paid in 2018 as rent for the building rented to house few divisions of the organisation. In addition, Rs. 8.88 Mn had been paid against the contribution of staff of the organisation.

A different contractor had been selected for electrical and plumbing works of the new office and laboratory building. As per this agreement, the works should have been completed by 29th May 2018, but it was not possible to complete these works due to the delay by the building construction contractor.

During the year under consideration, only an interim payment for Rs. 1.89 Mn had been forwarded whereas a sum of Rs. 2.69 Mn unrecovered from advances was remaining with the said contractor even by 31st December 2018.

A sum of Rs. 450 Mn had been released by the Treasury by the end of 2018, but only Rs. 206.24 Mn had been spent by 31st December 2018. It was observed that Rs. 243.75 Mn from the funds released had not been invested for the proposed activity and kept in bank accounts of the research organisation.

3. Other Audit Observations

(a) The following observations were made on the landslide risk reduction projects implemented by the research organisation

- Rs. 200 Mn had been provided by the Treasury for implementation of landslide risk reduction projects out of which, a sum of Rs. 16.81 Mn. had been invested for a special geological investigation unrelated to above purpose. Approval of the Treasury on this matter had not been presented to the audit.

- Implementation of landslide risk reduction project in Stanleyburg Estate at Doluwa in Kandy district has been cancelled due to difficulties in road access and instead, landslide risk reduction project in Tamil Maha Vidyalaya in Kadugannawa had been selected. Accordingly, it was observed that projects are selected not on a priority order and landslide risk reduction projects having road access had been selected for implementation.

- Engineers estimate of the landslide risk reduction project in Tamil Maha Vidyalaya premises in Kadugannawa is Rs. 25.23 but contract was awarded to a value of Rs. 29.5 Mn. Because of the shortcomings of the engineers estimate, the contract was awarded for a value about 17% higher.
- It had been planned to complete the landslide risk reduction project in Athale Maha Vidyalaya in Kaluthara district in 150 days, but after 82 days have passed by 31st December 2018 the physical progress was only 30%.
- Rs. 8.35 Mn had been spent on landslide mitigation projects at Kaandawa, Dharmaraja Pirivena and Deensite that were not included in the Annual Action Plan.
- Geotechnical Engineering Division of the research organisation had charged Rs. 10.96 Mn as engineering design charges of the River Bank Erosion Control project near Thoppuwa Bridge in Kochchikade, Negambo.The actual cost of this work was Rs. 6.85 Mn. Hence it was observed that a profit margin of Rs. 4.12 Mn on Treasury Funds was kept by the Geotechnical Engineering Division by showing higher costs.

(b) In 2018, treasury funds for Rs. 31 Mn were planned for installation of 30 automated rain gauges, but the engineers estimate was only Rs. 17.3 Mn. However, the value of contract for installation of rain gauges was Rs. 12.5 Mn. As a result of allocating funds and preparing estimates without a proper study, funds in excess of Rs. 18.15 Mn had been allocated and sites for installation of relevant rain gauges had not been identified by 31st December 2018.

(c) The research organisation received in 2015 a sum of Rs. 11.02 Mn from United Nations Development Programme for the implementation of community based landslide mitigation

programme and Rs. 6.00 Mn had been invested in the year 2016. The balance sum of Rs. 5.02 Mn had not been invested by 31st December 2018.

(d) A sum of Rs. 5.92 Mn had been shown as outstanding from Urban Development Authority in financial statements since 2009. But it was observed that such sum had not been shown as a balance payable in the financial statements of the Authority and hence recovery seemed to be uncertain.

(e) A sum of Rs. 1.01 Mn transferred by district offices to the research organisation had been shown as unidentified payments in financial statements.

(f) Actions have not been taken to clarify the balance of Rs. 1.43 Mn received by 31st December 2018 as excess payments from customers, and this sum includes a balance of Rs. 1.23 Mn unclarified for a period over a year.

W. P. C. Wickremaratne
Auditor General

අභ්‍යන්තර ආරක්ෂක, ස්වදේශ කටයුතු හා ආපදා කළමනාකරණ රාජ්‍ය ඇමාත්‍යාංශය
உள்ளகப் பாதுகாப்பு, உள்நாட்டலுவல்கள் மற்றும் அனர்த்த முகாமைத்துவ இராஜாங்க அமைச்சு
State Ministry of Internal Security, Home Affairs and Disaster Management

ජාතික ගොඩනැගිලි පර්යේෂණ සංවිධානය
தேசிய கட்டிட ஆராய்ச்சி நிறுவனம்
NATIONAL BUILDING RESEARCH ORGANISATION

99/1, ජාවත්ත පාර, කොළඹ 5. 99/1, ஜாவத்தை வீதி, கொழும்பு 5. 99/1, Jawatta Road, Colombo 5.

දුරකථන தொலைபேசி Telephone 011-2588946 011-2503431 011-2500354
අධ්‍යක්ෂ ජනරාල් பணிப்பாளர் நாயகம் Director General 011-2505149
ෆැක්ස් தொலைநகல் Fax 011-2502611
වෙබ් අඩවිය இணையத்தளம் Website www.nbro.gov.lk
ඊමේල් மின்னஞ்சல் E-mail info@nbro.gov.lk

මගේ අංකය எனது இல. Our Ref. NBRO/AD/2019/230

ඔබේ අංකය உமது இல. Your Ref.

දිනය திகதி Date 2019.06.20

Auditor General
National Audit Office
No. 306/72, Polduwa Road
Battaramulla

Report of the Auditor General on the Financial Statements of the National Building Research Organisation for the year ending 31st December 2018 under Section 12 of the National Audit Act No. 19 of 2018

Following are the explanations requested by Auditor General's Report Ref: DMG/A/NBRO/18/FS/07 dated 30th May 2019.

1. Financial Statements

1.1 Qualified opinion

1.2 Basis for qualified opinion

(a) An error occurred while applying the journal entries for the final accounts and action will be taken to correct the final accounts for the year 2019.

(b) Action will be taken to correct the final accounts for the year 2019.

1.3 Responsibility of the management and controlling parties in financial statements

1.4 Responsibility of the Auditor in relation to the auditing of financial statements

2. Report on other legal and regulatory requirements

Reference to rules, regulations or provisions issued by the management body
Financial regulations 835 (2) c

All buildings had been rented by calling quotations and evaluating in accordance with the Procurement Guideline and based on the decisions of the Procurement Committee.

Further, this had been done due to delays in obtaining the assessment of the Chief Valuer in accordance with financial regulation 835 (2) and also due to practical difficulties. However, actions will be taken to obtain the valuation of the Chief valuer in accordance with Financial Regulation 835 (2) c before renting buildings in future. Further, National Building Research Organisation plans to construct buildings for the district offices in the year 2019 and once they are completed, it will not be necessary to purchase the buildings on rent basis. Acting in violation of the powers and functions of the National Building

Research Organisation as required by Section 12 (g) of the National Audit Act No. 19 of 2018.

(a) The Department of Legal Draftsman has made the necessary amendments to the proposed Act regarding the establishment of the National Building Research Institute and has sent the final report draft. The final report of the proposed NBRI bill has been referred to the Attorney General's Department and the Ministry of Finance for their recommendations.

- Clarification that the resources of the National Building Research Organisation have been described, utilized and utilized in accordance with the relevant rules in a timely manner, efficiently and effectively, in accordance with the requirement of Section 12 (g) of the National Audit Act No. 19 of 2018, except for the following observations:

(a) Necessary steps will be taken to settle all the advances in the year 2019, since all the contracts awarded from 2015 to 2017 have been completed by now.

(b) The work had been completed to the extent of the advance by the time the two projects were halted stopped by the contractor. For this purpose, several written requests were made to the relevant insurance company, MBSL, to recover the performance guarantees. It was followed up but so far the company has not released the money. Following this incident, obtaining performance bonds from insurance companies have been stopped.

(c) Obtaining recommendations from the University of Moratuwa was required for the improvements (Rain-gauge and its Functionality) proposed to the Automated Rain Gauge Project in 2016 and a considerable time was taken to obtain such recommendations. Later, this year project was also submitted to the University of Moratuwa in order to obtain the recommendations and they verbally informed that it will take about 3 more months.

The project was delayed due to evaluation subject to the recommendations obtained from the above university.

However, by the time of the bid evaluation for the year 2018, the relevant institution had taken steps to properly install the automatic rain gauges for the year 2017.

d) Buildings were rented for the District Offices of the National Building Research Organisation so that the office activities could be carried out without any hindrance, giving priority to administrative requirements when renting buildings.

Also, the Human Settlements Planning and Training Division of the National Building Research Organisation implements two projects in the relevant districts, namely the Development of Landslide Disaster Risk Profile and the Resettlement of Landslide Disaster victims Program. Maintaining an office near the project site is more effective as it requires closer monitoring of projects implemented by the Human Settlements Division rather than administrative requirements. It is more

effective to provide accommodation for the project office staff in the office building because they often are coming from areas far away and have to stay longer during office hours when making field visits. Officers from Head Office and other Project Offices are involved in Accelerated Risk Profile Development Project Requirements. In such instances, the project office will be used to provide accommodation to them and it is a saving over the occasional high cost of providing accommodation elsewhere on a daily rental basis.
As explained above, these buildings were rented to complete the relevant projects on time and to maintain all the projects without any hindrance. It is reported further that the project offices have been relocated to the District Offices.

(e) The following factors also contributed to the delay in the construction of the building that were beyond the control of the contractor.

- The construction of this building is being carried out in a site with limited space and it is difficult to bring in concrete trucks due to traffic congestion during the day, inability to concrete at night in accordance with environmental laws and inability to concrete at night due to complaints from neighbors.
- Construction of the building was delayed by about three months due to the lack of approval from the Geological Surveys and Mines Bureau to transport the soil for backfilling. The contractor then used ABC fill to bear the loss at the same price as the soil filling.
- The Building construction contract was awarded in December 2016, when the piling contractor was in the final stages of work, but the Building contractor was able to begin work only in February 2017, as nine constructed piles were not up to standard and had to be re-constructed.
- There was a need to concrete all the beams and slabs when concreting the ground floor in order to improve the disaster resilience. This was an improvement over the requirements of the original plan, which took extra time.
- Also, due to the improvements mentioned above, there was a need to construct columns on Pile Cap without kicker. (To prevent the formation of cold joints) This took more time and work in addition to the planned time and work.
- The need to change the plan arose from time to time as modern laboratory equipment was purchased during the entire design and contract period.
- Due to the improvements mentioned above, the Stiffener Column had to be increased and this required extra time and work.
- There was a significant increase in the number of employees in the institution while the original plan and contract were being carried out. Furthermore, business opportunities increased accordingly. Accordingly, there was a need to increase the size of the auditorium. It took extra time to prepare its plans.
- In order to improve the quality of the building, there were instances where concrete could not be obtained on time due to the recommendation of only 03 institutions to obtain concrete for our institution.
- Work on the building was also delayed due to inclement weather.

Due to the above reasons the construction of the building has been delayed and the contractor has requested for an extension till 11.04.2019 and the request to extend that period is currently being considered.

- Building materials and workers should be supplied to the work site as required to increase the construction progress. For this, the cash flow of the contractor should be at a satisfactory level and with that objective, the bills have been settled even if they are less than the minimum value. Further, due to financial difficulties of the contractor, it was difficult to bring the main suppliers of steel reinforcement bars and bricks to the site. Therefore, the contractor, in consultation with those companies and with the consent of our institution, took action to deduct from the contractor's bills and pay directly to those suppliers at the request of the contractor.
  As mentioned above, these expenses had to be borne due to the delay in the construction work. Construction of the main structure is currently in the final stages and arrangements have been made to complete the building as soon as possible.
- Due to the delay in the construction of the main structure of the building due to the above factors, the work of electrical and plumbing work has also been delayed and the prices of the contractor performing the plumbing work will not be changed and only the price variation will be considered. Advance payments are made in accordance with the agreement. Accordingly, the money related to the work completed will be settled from the bills
- The total estimated cost of this building is around Rs. 600 Mn. of which, Rs. 450 million was received from the General Treasury and the balance amount will be borne by the organization. Also, contracts worth around Rs. 587 million have been awarded so far and in house money will be used to settle the bills according to their physical progress.

3. Other audit observations

(a) Explanation on the observations regarding the landslide risk mitigation projects implemented by the organisation.

- Relevant money transfers have been forwarded to the Treasury for approval and wish to inform that we will inquire from the Treasury and submit the relevant approval in the future.
- It is our experience that even if a bid is made despite road difficulties, successful bidders do not come forward and even if bids are submitted, the bids will be very high. In such cases, the lowest bidder may drop out of the project. Kadugannawa Tamil Maha Vidyalaya was selected to minimize the risk of landslides after considering the risks of the students studying in the buildings of Kadugannawa Tamil Maha Vidyalaya and considering the requests received in this regard.
- Due to the practical difficulties at the Kadugannawa Tamil College site, all the contractors had submitted higher prices for Mobilization Advance, Working Platform and Concrete work than the Engineering Estimate. After considering the relevant practicalities, the bids submitted by

bidders were evaluated in accordance with the Procurement Guidelines and the contract was awarded to the lowest bidder.

- About 90% work completed in the landslide mitigation project at Athale Maha Vidyalaya and arrangements have been made to complete it within the next two months and hand it over to the relevant parties.
- These sections were included in the preliminary plans, and since there were no technically competent and experienced parties at the time, it was decided to do Horizontal Drains later. Accordingly, the relevant work was carried out this year. This project was carried out at the request of the District Secretary regarding the landslide risk situation at the Dharmaraja Pirivena.
- The salary scales of the staff of professionals required to carry out the project have so far been used in the provision of other external projects and consulting services of the National Building Research Organisation. As informed during the audit, the fee for consulting services will be calculated and the relevant adjustments will be made in the year 2019.

(b) The lowest bidder for the manufacture and installation of automatic rain gauges was offered by ITI prior to 2016. However, with the expansion of the technology in Sri Lanka since 2016, the number of manufacturers of these devices has increased and competitive bidding has begun. That situation led to a quantitative change in the price of these devices, causing prices to fall and this situation led to a lower value of the relevant contract. Arrangements have been made to install 15 additional rain gauges using the remaining funds received for this project and by now all the rain gauges have been installed and completed.

(c) Arrangements will be made for spending this money for community-based disaster mitigation in the future.

(d) Several discussions were held in this regard and Letters were submitted by the Secretary to the Ministry of Sports to the Urban Development Authority and the General Treasury to recover this amount. NBRO is still working on this matter and had not the opportunity to succeed so far.

(e) The organization has instructed the bank to include the application number mentioned in the bank deposit in the bank records however this situation has arisen due to the failure to identify the depositors as the number was not mentioned in cases where they failed to do so. The Bank has been informed about this.

(f) Actions will be taken to include this money in the revenue for the year 2019

Eng. (Dr.) Asiri Karunawardena
Director General
National Building Research Organisation