

**NATIONAL
BUILDING
RESEARCH
ORGANISATION**



PUBLIC INVESTMENT PROGRAM – 2021

**CAPITAL EXPENDITURE
(DEVELOPMENT PROGRAMS)**



State Ministry of National Security and Disaster Management

National Building Research Organisation [NBRO]

State Ministry of National Security and Disaster Management

NBRO carry out following development projects and programs under 2021 Budget in view of implementing through Treasury funds & foreign aid. Proposals have been categorized under two major categories and each project is listed below against the category. Project summary and detailed proposals are given in the annexure.

(a) Continuation Programs (Ongoing)-2021

Recurrent Expenditure (Rs. 35.0 Mn.) – VOTE 130/02/09/1/1508

- 1) Issuance of Landslide Risk Assessment Report /clearance certificate priorNBRO-OG -1
to building construction and development work in the landslide prone areas

Capital Expenditure - VOTE 130/02/09/(4-14) /2509

(i) Landslide Investigations, Research & Development (Rs. 100.0 Mn.)NBRO-OG -2

- a) Landslide Hazard Zonation Mapping [LHMP]- Filling the gaps of Landslide
Hazard Zonation Mapping - (extended program) (Rs. 25 Mn) NBRO-OG -2a
- b) Research & development for creating disaster resilience (Rs. 15 Mn) NBRO-OG -2b
- c) Landslide special investigations. (Rs. 45 Mn)..... NBRO-OG -2c
- d) Procurement of Research (Lab & Field) Equipment. (Rs. 15 Mn)..... NBRO-OG -2d

(ii) Integrated Landslide Mitigation Program (Rs. 150.0 Mn.)

Landslide Mitigation Program- Stabilization identified landslide & unstable

Slopes on priority basis.....NBRO-OG - 3

(iii) Development of a Landslide Risk Profile (Rs. 35.0 Mn.)NBRO-OG - 4

(iv) Enhance Landslide forecasting capacity (EW) by automated rain gauge

System (Maintenance cost of rain gauge network.) (Rs. 15.0 Mn).....NBRO-OG - 5

(v) Developing a system for building assessment and condition reporting (Rs.50.0 Mn).....NBRO-OG - 7

(vi) Establishment of permanent of District Offices for enhancing capacity for landslide

disaster risk reduction activities (Badulla and Kandy) Phase I... (Rs. 60.0 Mn)NBRO-OG - 8

(vii) Resettlement of High Risk Communities in Landslide Prone Districts (Rs. 500.0 Mn.)

Construction of Precast Disaster Resilient HousesNBRO-OG -9

(b) Ongoing Projects under foreign Aid – 2021 VOTE 130/02/09/(9,11,12) /2509

(viii) Development and deployment of structural and non-structural measures for effective mitigation of

landslides and associated hazards and related capacity strengthening (JICA) [TCLMP Phase II]NBRO-OG- 10

(ix) Reduction of landslide vulnerability by mitigation measures

Mitigation under Asian Infrastructure Investment Bank (AIIB).....NBRO-OG-11

(x) Development of early warning technology of rain-induced rapid and long-travelling landslides

in Sri Lanka (Under SATREPS/JICA & JST)NBRO-NP- 12

(c) New Proposal for – 2021 onwards

- 1) Creating disaster resilience by the assessment of building deterioration and prolongation of service life.....NBRO-NP- 13
- 2) Establishment of Community Managed Landslide Early Warning System (CMLEW) with Self Evacuation Plan – Phase IINBRO-NP-14
- 3) The project for gap filling and updating of Landslide Hazard Maps (LHM)NBRO-NP- 15
- 4) Creating disaster resilience in construction by ensuring the quality of imported construction materials and introducing an inspection scheme to monitor quality complianceNBRO-NP- 16
- 5) Compilation of a compendium of construction materials used in Sri Lanka for the benefit ofNBRO-NP- 17 construction industry professionals
- 6) Development of soil bio engineering techniques in landslide disaster risk reduction and trialNBRO-NP- 18 applications in selected sites
- 7) Promotion of sustainable building materials technologies for disaster resilient constructions.....NBRO-NP-19
- 8) Development of information & monitoring based drought risk reduction strategy for dry zone.....NBRO-NP-20
- 9) Maintenance of Automated Rain-gauge System and Operation of Landslide Early Warning Activities..NBRO-NP-21

Submitted by

Forwarding Ministry / Recommended by



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Secretary
State Ministry of Internal Security,
Home Affairs and Disaster Management

National Building Research Organisation [NBRO]

State Ministry of National Security and Disaster Management

Our Vision

Creating a safer built environment

Our Mission

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

Introduction

National Building Research Organisation (NBRO) which was established in 1984 has now grown and diversified into a successful technical service provider and research and development institution where experts from multiple disciplines have teamed up and dedicated to create a safer built environment for the nation. One of the NBRO's goals is to assist the government in its national development and enrich the quality of lives through Disaster Risk Reduction (DRR). The tasks of NBRO are diversified and expertise extends into a wide range of disciplines in;

- Building Disaster Resilience in the country,
- Hazard/risk mapping and landslide identification, monitoring, issue landslide early warning and stabilization/mitigation.
- Promotion of disaster resilient village concept,
- Systematic diagnostic assessment of chemical disaster risks
- Building assessment and condition reporting
- Issuance of Landslide Risk Assessment Report prior to any building construction or development activity in landslide prone areas as a pre-requisite of building permits issued by the local authority and project implementing agencies since March 2011
- Research and Development work
- Development of disaster resilient housing for disaster victims
- Provision of technical consultancy services in the fields of landslide studies and services, disaster impact assessment studies, geotechnical exploration for development projects, building materials technology, risk assessment and defect rectification of damaged buildings, and project management services

Summary of Budget for 2021
National Building Research Organisation,
State Ministry of National Security and Disaster Management

ONGOING PROGRAMS (2021)						
Recurrent Expenditure						
Category, Vote/details	Se. No	Project/Program	TEC (Mn.)	Project Period	Budget 2021	Approval/ Authority
Recurrent Expenditure 02/09/1/1508	1	Issuance of Landslide Risk Assessment Report /clearance certificate prior to building construction and development work in the landslide prone areas	50.0	Annual	35.0	Cabinet
Capital Expenditure						
02/09/4/2509	4	Landslide Investigations, Research & Development	100.0	Annual	100.0	NPD/ Cabinet
		<i>I. Landslide Hazard Zonation Mapping [LHMP]-(35.0)</i>		<i>Annual</i>	<i>25.0</i>	
		<i>II. Research & development for creating disaster resilience (20.0)</i>		<i>Annual</i>	<i>15.0</i>	
		<i>III. Landslide special investigation (40.0)</i>		<i>Annual</i>	<i>45.0</i>	
		<i>IV. Procurement of Research (Lab & Field) Equipment (25.0)</i>		<i>Annual</i>	<i>15.0</i>	
02/09/5/2509	5	Integrated Landslide Mitigation Project – Landslide Mitigation Program (stabilization identified landslide & unstable slopes on priority basis)	4,300.0	Annual	150.0	NPD/ Cabinet
02/09/6/2509	6	Development of a Landslide Risk Profile	246.0	2016-2022	35.0	NPD/ Cabinet Total allocation up to end 2020 Rs. 169.0 Mn.)
02/09/8/2509	8	Enhance real time landslide forecasting and early warning capacity by expanding Automated Rain Gauge network in Sri Lanka – maintenance component (2019-2021)	30.0	Annual	15.0	NPD/ Cabinet
02/09/12/2509	12	Construction of precast Disaster Resilient Houses by NBRO & Technical Work Component	1500.0	2021-2022	500.0	NPD /Cabinet Revised Proposal

02/09/13/2509	13	Establishment of permanent of District Offices for enhancing capacity for landslide disaster risk reduction activities (Ratnapura, Kegalle, Badulla and Kandy) Phase I	300.0	2019-2021	60.0	NPD/Cabinet Total allocation up to end 2020 Rs. 71.2 Mn.
02/09/14/2509	14	Developing a system for building assessment and condition reporting	115.0	2019-2023	50.0	NPD/ Cabinet Total allocation up to end 2020 Rs. 43.12

Foreign Aided Projects						
		Project/Program	TEC (Rs. Mn.)	Project Period	Budget 2021	Approval/ Authority
/02/09/11/2509	11	Development and deployment of structural and non-structural measures for effective mitigation of landslides and associated hazards and related capacity strengthening (JICA) [TCLMP Phase II]	450.0	2019-2021	10.0 130.0	NPD
/02/09/09/2509	9	Reduction of Landslide Vulnerability by Mitigation Measures – Asian Infrastructure Investment Bank (AIIB) (Foreign loan) -GOSL Component	19,116.0 13,431.0 5,685.0	2019-2023	1,160.00 700.00 460.00	NPD/ Cabinet AIIB GOSL
/02/09/15/2509	15	Development of early warning technology of rain-induced rapid and long-travelling landslides in Sri Lanka (Under SATREPS/JICA & JST) FA FADF	819.0	2020-2024	160.0 150.0 10.0	NPD/ Cabinet

New Project Proposals -2021 onwards					(Rs. Mn.)			
VOTE Details	Se. No	Project/Program	TEC (Rs. Mn.)	Project Period	Proposed Budget 2021	Projection 2022	Projection 2023	Approval/ Authority
130/02/09/17/2509	17	Establishment of Community Managed Landslide Early Warning System (CMLEW) with Self Evacuation Plan – Phase II	184.5	(2021-2023)	60.8	67.9	55.4	NPD pending
130/02/09/18/2509	18	The project for gap filling and updating of Landslide Hazard Maps (LHM)	90.0	(2021-2023)	30.0	30.0	30.0	NPD pending
130/02/09/19/2509	19	Creating disaster resilience in construction by ensuring the quality of imported construction materials and introducing an inspection scheme to monitor quality compliance	45.0	2021	45.0	-	-	NPD pending
130/02/09/20/2509	20	Compilation of a compendium of construction materials used in Sri Lanka for the benefit of construction industry professionals	25.0	(2021 – 2022)	10.0	15.0		NPD pending
130/02/09/21/2509	21	Development of soil bio engineering techniques in landslide disaster risk reduction and trial applications in selected sites	73.0	(2021 – 2023)	30.0	24.0	19.0	NPD pending
130/02/09/22/2509	22	Promotion of sustainable building materials technologies for disaster resilient constructions	35.0	(2021 – 2023)	20.0	8.0	7.0	NPD pending
130/02/09/23/2509	23	Development of information & monitoring based drought risk reduction strategy for dry zone	50.0	(2021 – 2023)	15.0	20.0	15.0	NPD pending
130/02/09/24/2509	24	Maintenance of Automated Rain-gauge System and Operation of Landslide Early Warning Activities	93.4	(2021 – 2025)	15.3	16.8	18.5	NPD pending
		Total			708.8	881.9	359.4	

State Ministry of National Security and Disaster Management

2021 Budget

Agency- National Building Research Organisation

(a) Continuation Programs (Ongoing)

No	Vote	Project Title/ Activity	Description of the project/program	Proposed Budget for 2021	Remarks
NBRO-OG 1	130/02/09/1/15 08 Recurrent Expenditure)	Issuance of Landslide Risk Assessment Reports /clearance certificates prior to building construction and development work in landslide prone areas	It has become a pre-requisite to obtain Landslide Risk Assessment Report (LRAR) from NBRO before a building permit is issued by a local authority or a project is approved by a project approving agency involving construction or development activities in landslide prone areas, in order to minimize lives & property loss due to landslide disaster. 10 District offices are functioning since March 2011. (Continuation Program)	35.00	The annual expenditure for the program is Rs 50.0 Mn. Rs. 10.0 Mn is expected from the nominal payment charged from the applicants /clients. The extra cost is expected by the treasury considering this as a public service.
NBRO-OG 3	130/02/09/5/25 09	Integrated Landslide Mitigation Program (ILMP) TEC Rs 4,300 Mn. (Period – 2014-2020)	Landslide Mitigation Program Funds have been sought for (a) Stabilization of unstable slopes in and around schools, hospitals and other governmental organizations in the hill country on priority basis identified by the hazard mapping & special investigations as highlighted in the ILMP (b) Application of immediate mitigation measures of critically unstable landslides in other areas (Continuation Program)	150.0	Many schools, hospitals, settlements, institutions and many roads in the central highland are under landslide threat. NBRO involves in risk reduction in these sites by applying appropriate mitigations measures on priority basis except the sites identified under AIIB Loan

	Vote	Project Title/ Activity	Description of the project/program	Proposed Budget for 2021 (Rs. Mn.)	Remarks
NBRO- OG 2	130/02/0 9/4/2509	Landslide Investigation, Research & Development	Landslide Hazard Zonation Mapping [LHMP] Research & Development Program, Landslide Special Investigations, Procurement of Research (Lab & Field) Equipment	100.0	To continue the program as planned (Annually Rs. 100.0 Mn)
		2509-2 a	<i>Landslide Hazard Zonation Mapping [LHMP]- Filling the gaps of Landslide Hazard Zonation Mapping and updating past maps.</i> <i>480 sq. km in Kandy, Nuwara Eliya districts covering grids 6104, -6109, 6110, 6114, 6115, 6120, 6125, 6815,6818-20, 6823-25 have been planned.</i>	25.0	<i>These maps are used as a tool in landslide early warning, and in the planning and implementation of construction and development projects by local government institutions, RDA, CEA, UDA & NPPD</i>
		2509-2b	Research & Development Program for creating disaster resilience. To conduct research studies in disaster management and related areas with the strengths available in the NBRO's Technical Divisions in view of creating safe built environment and disaster resilient capacity of community	15.0	<i>Annual Program. Rs. 15.0 Mn is expected considering that the need for Carrying out important research aiming to achieve disaster resilience</i>
		2509-2c	Landslide Special Investigations Detailed landslide vulnerability reports are requested by the relevant Government Institutions, District Secretaries, and Divisional Secretaries etc. in disaster situations. Reports are also called during high rain seasons to reach firm decisions on landslide vulnerability, evacuation and resettlement planning. About 2500 requests are received for a year but this will increase in emergency situations.	40.0	<i>Annual Program. Rs. 40.0 Mn is expected considering that the number of investigation requisitions is increasing. Funds are sought to carry out this work as a public service.</i>
		2509-2d	Procurement of Research (Lab & Field) Equipment - Procurement of Lab & Field and office Equipment are required to perform laboratory and the field investigations and this grant is expected to enhance the capacity of NBRO Head Office and its 12 District offices	15.0	<i>Proposed list of specialized equipment is given as Annexure</i>

	Vote	Project Title/ Activity	Description of the project/program	Proposed Budget for 2020 (Rs. Mn.)	Remarks
NBRO-OG-4	130/02/0 9/6/2509	Development of a Landslide Risk Profile TEC Rs. 246.0 Mn. (Period 2016-2022)	<ul style="list-style-type: none"> • Simulation of Landslide flow paths in Kandy, Kegalle, Rathnapura, Matale, Kaluthara, Galle, Matara & Hambantota districts. (123 map sheets) • Preparation of Risk maps for Kandy, Kegalle, Rathnapura, Matale, Kaluthara, Galle, Matara & Hambantota districts. (123 map sheets) • Survey of balance buildings, according to the Risk Map (Estimated No. of Buildings 50,00) • Community based DRR Phase III in 50 GN divisions (N'Eliya, Kandy, Kegalle, Rathnapura, Matale, Kaluthara, Galle, Matara & Hambantota districts) 	35.0	(Period 2016-2022) Total Estimated Cost Rs. 246.0 Program extended to year 2022 as limited funds received during 2019/2020
NBRO-OG-5	130/02/0 9/8/2509	Enhance Real Time Landslide Forecasting and Early Warning Capacity by Expanding Automated Rain Gauge Network in Sri Lanka Maintenance cost for next 3 years (TEC Rs. 45.0 Mn.)	Installation of a rain gauge system to issue landslide early warning to the locations identified as at high risk; identify gaps and introduction of additional automated rain gauges and cutting-edge technologies were completed under this project. About 300 rain gauges are functioning at present and in order to continue the system uninterruptedly and to improve methodologies and accuracy of landslide early warning issued, replacement of spares and batteries, periodical maintenance and calibration are required.	15.0	Total Estimated Cost of Maintenance Rs. 45.0 Mn. (2021-2023)

Ongoing Projects cont'd. 2021

No	Project Title/ Activity	Description of the project/program	Proposed Budget for 2020 (Rs. Mn.)	Remarks
NBRO-NP-7	Developing a system for building assessment and condition reporting 130/02/09/14/2509	Assessment of building condition is of utmost importance to decide whether a building can be repaired or to be demolished. Currently, NBRO is conducting such investigations as a consultancy work. But due to fund limitation this service is not extended to parties free. This project is to enhance NBRO capacity, improve and standardize investigation methodologies and establish a mechanism to provide building assessment and condition reports for a nominal fee to the general community and free in difficult situations to local authorities.	50.0	(Period 2019-2023 onwards) Total Estimated Cost Rs. 145.0 Mn. (First year Rs. 35.0 Mn & 20.0 Mn. each for continuation of 4 years)
NBRO-NP-8	Establishment of permanent of District Offices for enhancing capacity for landslide disaster risk reduction activities (Badulla and Kandy) Phase I 130/02/09/13/2509	Due to the recent upheaval of disastrous landslides, it has become necessary for NBRO to work directly from offices close to high risk areas. It has been planned to upgrade the physical capacity of all district offices with laboratory facilities with required lab and field equipment in 2019. Ratnapura & Kalutara work commenced & Kandy & Badulla will be completed in 2022.	60.0	Period 2019 -2022
NBRO-NP-6	Systematic Diagnostic Assessment of Chemical Disaster Risks in Sri Lanka 130/02/09/10/2509	Chemical disaster risk has not been adequately addressed in the present context of Disaster Management. Records indicate that incidence of chemical related accidents taking place in the country is increasing. This project was formulated to develop a systematic diagnostic assessment method for chemical disaster risks, an inventory of industries with potential hazards, and guidelines for the purpose of usage in making policy framework when strengthening the legislations up to an adequate level.	8.0	33.0 (2019-2021)

Ongoing Projects– 2021 Foreign Aid/Grant/Loan

No	Project Title/ Activity	Description of the project/program	Proposed Budget for 2021 (Rs. Mn)	Remarks
NBRO-LP-10	Development and deployment of structural and non-structural measures for effective mitigation of landslides and associated hazards and related capacity strengthening (Technical Cooperation – JICA) 130/02/09/11/2509	This project is an extension to the project of Technical Cooperation for landslide Mitigation (TCLMP) carried out during 2016-2017 for mitigation of four high risk landslides in Kandy, Matale, Nuwara Eliya & Badulla with capacity building of NBRO and Japanese technology transfer. This new project mainly focuses on soft mitigation measures.	JICA – Rs. 130.0 Mn GOSL Rs. 10.0 Mn	Period 2019-2021 TEC Rs. 450.0Mn. JICA – Rs. 380.0 Mn GOSL Rs. 70.0 Mn
NBRO-LP-11	Reduction of Landslide Vulnerability by Mitigation Measures 130/02/09/09/2509	<p>The main objective of the Project is to reduce risk and damage from landslides in Sri Lanka through implementation of physical mitigation measures based on investigation and risk assessment and improvement in planning, regulation and instruments associated with landslide management.</p> <p>The tentative estimated value of the activities under the Project is around 110 million USD, of which AIIB will finance approximately 70% of total estimated value. Pre-construction activities carried out by National Building Research Organisation (NBRO), tax and duties will be solely financed by GoSL.</p> <p>Mitigation work under this project – total cost 19,116.0 -Asian Infrastructure Investment Bank (AIIB) (Foreign loan) 13,431.0 GOSL Component -5,685.0</p>	Total – 1,160.0 Mn GOSL (CF) - 460.0, AIIB- 700.0	Period 2019-2023 TEC – Rs. 19,116.0 Mn AIIB – Rs. 13,431.0 Mn CF – Rs. 5685.0 Mn.

No	Project Title/ Activity	Description of the project/program	Proposed Budget for 2021 (Rs. Mn)	Remarks
NBRO-LP-9	Resettlement of High Risk Communities in Landslide Prone Districts 130/02/09/12/2509	In order to protect the identified 14,860 families prone to landslide and flood hazard by either mitigation or resettlement, a suitable program has to be implemented. Mitigation of most of the high-risk landslide areas is not cost effective due to technical constraints and hence, resettlement in safe locations remains as the most viable option. Reconstruction of affected houses with resilient features in the same location would be the most viable option for flood prone areas. This project was thus formulated to resettle families in the identified high-risk areas in safer locations and to reconstruct flood-affected houses in the same location with resilient features. Arrangements have been made to; <ul style="list-style-type: none"> - Construction of precast disaster resilient houses by local housing developers - GOSL Component NBRO Technical Work Component	- Rs. Mn.500.0 NBRO Local Technical component Rs. 31.0 Mn.	200-250 medium rise houses will be construct initially under local developer. (TEC- Rs. 1500.0 Mn)
NBRO-NP-10	Development of early warning technology of rain-induced rapid and long-travelling landslides in Sri Lanka (Under SATREPS/JICA & JST)	The Project aims to develop a technology to identify the locations of rain-induced rapid long-travelling landslides and their moving areas 24 hours in-advance prediction of heavy rainfalls and resulting ground water pressure build-up which can trigger rain-induced rapid long-travelling landslides. A technology of effective risk communication, early warning to community people living in mountains and local cities will also be developed ensuring the safety of the public and securing vulnerable communities from landslides and associated hazards	160.0 [FA (13) – 150.0 FARDF – 10.0]	TEC Rs. Mn. 819.0 2021-2025
		Total		

New Projects for 2021 proposed

No	Project Title/ Activity	Description of the project/program	Proposed Budget for 2021 (Rs. Mn)	Remarks
NBRO-NP-13	Creating disaster resilience by the assessment of building deterioration and prolongation of service life	The main objective of the proposed project is to enhance the capacity of NBRO to conduct the assessments of building deterioration in the country as a proactive preventive measure to arrest building collapses in the country and thereby ensuring safety of the people living at risk. M/s. JRC Services (Japan) will provide technical guidance and training for the local staff.	376.0	TEC Rs. 875.0 Mn. Period 2021-2022 NPD Approval
NBRO-NP-14	Establishment of Community Managed Landslide Early Warning System (CMLEW) with Self Evacuation Plan – Phase II	(This is an extension to the project carried out in Nuwara Eliya, Badulla and Kegalle under Establishment of Community Based Landslide Early Warning System - Phase I) This project will be implemented to educate and make aware the vulnerable communities, formulate community-based preparedness plans and self-evacuation plans, setup site specific automated landslide early warning systems (with rain gauges, extensometers, tiltmeters and moisture sensors coupled with siren and automatic communication systems) in identified potential landslide areas in Southern, Western and Sabaragamuwa Provinces with a view to enhance the confidence and safety of the people living in those areas.	60.8	Period 2021-2023 TEC – Rs. 184.5 Mn.
NBRO-NP-15	The project for gap filling and updating of Landslide Hazard Maps (LHM)	The project aims to prepare Landslide Hazard Maps with development guidelines for the mountainous region with a view of reducing landslide disaster risk. It will also update the existing Landslide Hazard Maps of Badulla and Nuwara Eliya Districts prepared in 1995 with a view of accommodating changes in terrain factors while updating the existing landslide inventory. So far LHMP covered zonation maps to the scale 1:50,000 covering 32,593.1 sq. km in 13 districts identified as having the landslide hazard risk while mapping to the scale 1:10,000 to cover prioritized areas covering 8800 sq. km.	30.0	Period 2021-2023 TEC – 90.0

NBRO- NP-16	Creating disaster resilience in construction by ensuring the quality of imported construction materials and introducing an inspection scheme to monitor quality compliance	<p>The project aims at creating disaster resilience in construction by ensuring the quality of imported construction materials and introducing an inspection scheme by NBRO to monitor quality compliance.</p> <p>At present, Sri Lanka Standard Institution (SLSI) has an Import Inspection Scheme to assure that the quality of imported products is closely monitored and checked against the relevant Sri Lanka Standard Specification (SLS) and make recommendations to the Department of Sri Lanka Customs. But, scope of the SLSI in the inspection of imported construction materials is very limited. According to the Sri Lanka Customs National Tariff Guide 2019, there are many other construction materials imported in large quantities to Sri Lanka and these materials get cleared without any quality inspection. Using of the above uninspected and inferior materials significantly affects the structural performance of a building.</p> <p>Building Materials Research & Testing Division of NBRO is a long-established testing laboratory for the determination of the quality of construction materials in Sri Lanka, that has extensive experience and knowledge base on this subject. As non-compliance of imported construction materials has been frequently observed which is alarming and needing an urgent technical intervention, NBRO has taken a proactive role in formulating this project.</p>	45.0	Period 2021 TEC – Rs. 45.0 Mn.
NBRO- NP-17	Compilation of a compendium of construction materials used in Sri Lanka for the benefit of construction industry professionals	Proposed compendium is for the perusal of construction professionals and the general public enabling proper use of building materials and thereby, achieving desired quality of construction. It will enable construction industry professionals to be aware of available construction materials and products and this will assist them in the selection of appropriate materials for a specific requirement ensuring quality of construction and appropriate use of building materials.	10.0	2021-2022 TEC 25.0 Mn.
NBRO- NP-18	Development of soil bio engineering techniques in landslide disaster risk reduction and trial applications in selected sites	<p>Nature-based solutions (Nbs) are considered as interventions which involve natural processes and ecosystems to solve different types of societal challenges and are able to provide sustainable, cost effective & flexible approaches for disaster risk reduction. As a solution for high cost structural mitigations, many countries apply nature friendly or nature based solutions using suitable plants and this is called “Bioengineering”. As a tropical country with high diversity of plants, there is a huge potential of applying such nature based mitigatory measures for mitigating Sri Lankan landslides</p> <p>Nbs usually help enhancing the effect of other structural mitigation measures. Hence, it is suggested to have hybrid (combination of nature-based and engineering measures) approaches for landslide risk management as a trial application</p>	30.0	2021-2023 TEC 73.0 Mn.

NBRO- NP-19	Promotion of sustainable building materials technologies for disaster resilient constructions	Aim of this project is to develop alternative building materials for disaster resilient construction in Sri Lanka. Currently cement grout and shotcrete are the widely used materials in landslide mitigation works and difficult terrains cause significant pumping and workability problems contributing to additional labor hours and cost. Lightweight Cellular Concrete (LCC) has been a proven low-cost replacement for weak soils and its use is becoming widespread throughout the world. Hence, one aspect of this project is to develop LCC concrete using locally available raw materials and to develop specifications and guidelines in the use of landslide mitigation construction works. Other possible areas of such developments are the Coir fiber ropes and woven mats which can be used in many bio-engineering applications, for soil erosion control in stream banks, slopes, wetlands, and hillside soils and also in golf course development.	20.0	2021-2023 TEC 35.0 Mn.
NBRO- NP-20	Development of information & monitoring based drought risk reduction strategy for dry zone	The objectives of this project are to determine meteorological, environmental and anthropogenic factors attributing to present drought in Anuradhapura District, interpret the drought severity using most appropriate indices, estimate resultant water stress on various water use sectors, and thereby develop an information & monitoring based drought risk reduction strategy for dry zone to be utilized by the decision makers and stakeholders in drought risk management of Sri Lanka.	15.0	2021-2023 TEC 50.0 Mn.
NBRO- NP-21	Maintenance of Automated Rain-gauge System and Operation of Landslide Early Warning Activities	It is expected that the smooth function of the landslide early warning system by maintaining 300 Automated Rain gauge Units installed in the system in 14 landslide prone districts. Proper maintenance helps to improve the quality and the accuracy of the early warning messages and the people who live in vulnerable areas can take early action against a landslide disaster by self evacuation. The proper functioning of the system will help to reduce of life losses, casualties and damages.	15.3	2021-2025 TEC 93.4 Mn.