Initial Environmental Examination (Draft)

June 2018

Sri Lanka: Science and Technology Human Resource Development Project —Proposed Faculty of Computing and Technology Building Complex, University of Kelaniya, Sri Lanka

Prepared by University of Kelaniya, Sri Lanka for the Asian Development Bank.

CURRENCY EQUIVALENTS

(as of 31 May 2018)

Currency unit	–	Sri Lanka rupee/s (SLRe/SLRs)
SLRe1.00	=	$0.00633
$1.00	=	SLRs158.03

NOTE

In this report, "$" refers to US dollars unless otherwise stated.

SRI LANKA- PROPOSED FACULTY OF COMPUTING AND TECHNOLOGY BUILDING COMPLEX IN KELANIYA

Project Number:

May 2018

Vocational Training Authority, Sri Lanka

Prepared by TMS for UOK

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ABBREVIATIONS

ADB	Asian Development Bank
AP	Affected Person
AQ	Air Quality
BIQ	Basic information Questioner
BOQ	Bill of Quantities
BD	Building Department
CAP	Corrective Action Plan
CEA	Central Environmental Authority
COC	Certificate of Conformity
DMC	Developing Member Country
DoF	Forest Department
DSD	Divisional Secretariat Division
DM	Disaster Management
EHS	Environmental, Health and Safety
EIA	Environmental Impact Assessment
EPL	Environmental Protection Licenses
ESIA	Environmental and Social Impact Assessment
EMP	Environmental Management Plan
EMP	Environmental Monitoring Plan
ESMP	Environmental Social Monitoring Plan
FCTP	Faculty of Computing and Technology Project
FCT	Faculty of Computing and Technology
GRM	Grievance Redress Mechanism
GND	Grama Niladari Division
HSE	Health, Safety and Environment
IEE	Initial Environmental Examination
IP	Indigenous Peoples
IR	Involuntary Resettlement

ILO	International Labor Organization
LFS	Labour force survey
M&E	Monitoring & Evaluation
MOERE	Ministry of Environment and Renewable Energy
MOFP	Ministry of Finance and Planning
MOHEH	Ministry of Higher Education and Highway
MSL	Mean sea level
NEA	National Environmental Act
NWRB	National Water Resources Board
NIRP	National Involuntary Resettlement Project
PP	Project Proponent
PA	Project Approving Authority
REA	Rapid Environmental Assessment
SPS	Safeguard Policy Statement
SLLRDC	Sri Lanka Land Reclamation and Development Cooperation
STHRDP	Technology and Human Resource Development Project
TA	Technical Assistance
TMS	Total Management Solutions
WRB	Water Resource Board
UDA	Urban Development Authority
UGC	University Grant Commission
UOK	University of Kelaniya

EXECUTIVE SUMMARY

A. Introduction

1. Government of Sri Lanka with loan funding from Asian Development Bank (ADB) has proposed to implement Science and Technology and Human Resource Development Project (STHRDP). The Ministry of Higher Education and Highway (MOHEH) shall be the Implementing Agency and the University Grant Commission shall be the executing agency for the Project. This project aims to increase the technology oriented work force to transform Sri Lanka's growing economy. Under this Project, the University of Kelaniaya (UOK) will build a new Faculty of Computing and Technology (FCT) in Kelaniya. This will be referred to as the 'project' in this report.

2. The safeguards screening for UOK has been completed by the consultants mobilized under TA8235 with recommendations for a flood risk assessment and a rapid biodiversity assessment.

3. In pursuance of the above, Total Management Solutions Company (Pvt) Ltd (TMS) was appointed as Consultants by ADB to carry out the environmental safeguards services.

B. Objectives of the IEE

4. The objectives of the Environmental Study are to:

- Determine the category of the project depending on improvement proposal, environmental sensitivity and magnitude of impacts, i.e. screening as per Government of Sri Lanka's regulations and ADB's Safeguard Policy Statement 2009;
- Determine the appropriate extent and type of EA required (IEE or EIA), i.e scoping;
- Determine the requirement of statutory clearances;
- Baseline environmental monitoring and survey;

- Prediction of impacts on relevant environmental attributes and mitigation measures to minimize the impacts; and
- Preparation of IEE Report including ESMP

C. Description of the Project

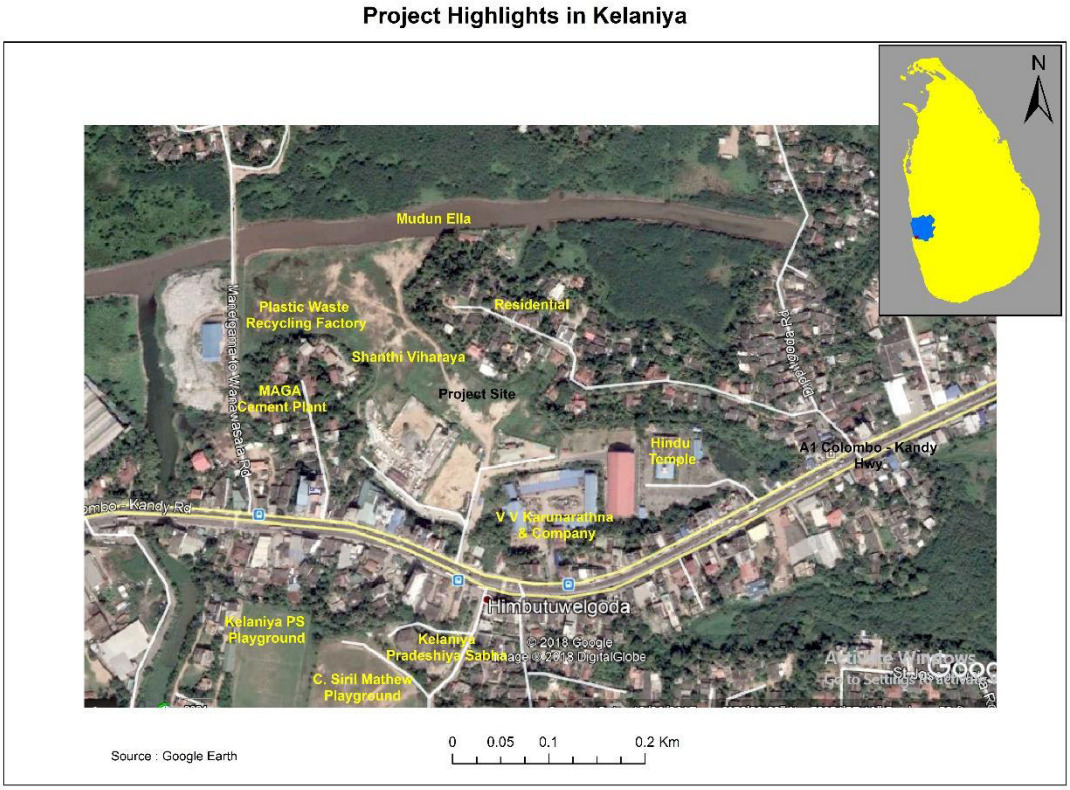
5. The proposed construction of the new Faculty of Computing and Technology (FCT) is located in Kelaniya in the Gampha District, Western Province, Sri Lanka. The project site (i.e. Land) is located alongside the Colombo - Kandy Road and is within 1km of the Kiribathgoda town. The land location points are $8^0 21' 38.74'' N \quad 80^0 30' 12.18'' E$. The government granted the university with a 3 acre 2 route 49.45 perch land located in Wedamulla, Hubutuwellgoda, Badalgoda villages within the Kalaniya Pradeshiya Saba. Adjoining properties are privately owned for residential and industrial purposes. The proposed project site is located 1 km from the existing premises of University of Kelaniya.

6. Establishment of FCT with training on subjects such as nanotechnology, robotics and industrial automation, bio-systems technology, ICT, e-learning, etc. will improve the job security for these graduates in the local as well as global job market. Graduates from University of Kelaniya FCT will have a competitive edge to secure jobs in the future.

7. The proposed FCT is composed of 10 stored academic building (1600sqm^2), 10 storied apartment building (600 sqm^2), 5 storied administration building (500sqm^2) during the Phase 1 of the project. It will include laboratory facilities electronics, bio chemistry, bio technology, engineering technology, industry technology lab and a product design lab. The apartments will provide temporary lodging for foreign exchange students and other post graduate students only. It will also include two computer labs that will train 150 students at a time with other technology labs such as etc.

D. Project Highlights

Figure 1 : Project highlights in kelaniya



Source: Prepared by TMS

1. Project Information

Table 1: E.1 Salient Existing Features of the Project

Funding	USD 24,310,000 (Rs: 3,856,781,500)
Approximate student capacity	800
Auditorium	43,800sq ft
Cafeteria	900 sq ft 200 students seating capacity
Land Use	Mainly abandoned paddy field that was reclaimed by the SLLRDC. The land is bounded on the northern side by the Mudun Ella.
New FCT Courses	Computing/ICT Engineering technology Bio system technology
Office (administrative buildings)	9000 sq ft
Labs 10 story academic building (1600sqm^2	Extent 16000sq ft Biochemistry Research Bio technology Computing multi media lab network and security lab language lab software development lab
Total extent of the building	(DATA NOT RECEIVED TO DATE)

2. Annual Students Enrollment to the Faculty

8. Three undergraduate courses in Bachelor of Engineering Technology, ICT and Computer Science is introduced at FCT in UOK. This involves admission to the university in two intakes 86 and 88 students respectively for the Bachelor of Engineering Technology. B.Sc. on ICT will enroll 75 students in each of its two academic intakes for the university. The BSc in Computer Science will enroll 50 students. Another 50 students are expected to be enrolled for the Master of ICT for Education programme commencing from 2018. For the current academic year there will be about 424 students enrolled.

3. FTC Graduate Employment Prospects

9. The FTC at the University of Kelaniya with the establishment of the Industry Advisory Board (IAB) has developed strong industrial linkages that will assist the graduates to secure employment in the emerging job market.

10. Willingness to implement cutting-edge technologies in education and research at FCT with staff who are experienced in technology and research would ensure the training of graduates to be highly skilled. FCT's main areas of focus includes nanotechnology, robotics and industrial automation, bio-systems technology, ICT, e-learning, etc. These fields have growing demand in the international, local job market and hence ensure job security for the future graduate.

E. Policy, Legal and Administrative Framework.

11. As per the ADB's Safeguards Policy Statement of 2009 and based on the REA Checklist of ADB classification, the FCTP is categorized under environment category B. According to the BIQ and IEE/EIA environmental guidelines of Central Environmental Authority of Sri Lanka (CEA), the proposed project falls in to the non-prescribed category. Therefore environmental clearance (EIA or IEE) will not be required from the government of Sri Lanka to proceed. The IEE was carried out as a requirement of ADB under its safeguards policy to be eligible for their financing.

12. Main objective of this IEE report is to prepare a comprehensive account of the current environment condition of the selected site for the construction of the FCT in Kelaniya Divisional Secretariat, Gampha District. It also aims to identify any potential negative environmental or social impacts in the immediate vicinity or surrounding areas that maybe short term or long term. Accordingly, a single consolidated IEE report is submitted for ADB to facilitate their decision making.

13. Field observation of the project site within Kelaniya Divisional Secretariat was carried out on 16th of February 2017. During the site visit, the REA, IP and IR checklists were filled and the findings incorporated in the IEE. The site was again visited on 10th October 2017 with the Flood Risk Assessment team, on 24th of January 2018 with the biodiversity assessment team, and on 3rd May t2018 for the stakeholder consultation.

During the inspection, activities such as assessment of the existing location and the surrounding environment identification of sensitive areas, consultation with the local officers, key informant interviews were carried out. Other reliable information was collected from villagers and respective authorities during public consultation meetings. Secondary information for the report was gathered from printed materials and other sources of the relevant Government Departments, Authorities, Divisional Secretariat and relevant websites.

14. The CEA's consent for the projects under non-prescribed category has not yet been obtained, however, the process has been initiated. A summary of the statuary clearances required for the FCTP is presented in Table- E.2.

15. Apart from the clearances for the overall project work, the contractor, before starting the construction work, has to obtain required Clearances listed in Table- E.3. for operating his equipment and carrying out construction work

Table E. 2: Statutory Clearances required for the Project

Type of Clearance	Activity	Authority	When required
Environment Clearance Environmental Protection Licensing) Regulation No. 1533/16of 2008	Implementation of the project and waste water treatment recommendations to be adopted in the design.	CEA	Before construction
Permission for storm water drainage and infilling	Implementation of the project. On regulations pertaining to the reservation and reclamation and land filling	SLLRDC	Before construction
Clearance for development activities to obtain the green building certificate (refer Annex 01)	Implementation of the project and construction of the building.	UDA	Before construction for green building approval
Local Government Authorities building approval	The Municipal Councils, Urban Councils and Pradeshiya Sabhas share the powers regarding the approval of buildings plans, control of solid waste disposal, sewerage and other public utilities. Under these laws the new construction requires approval. Adhere to building regulation	Local Authority (Kelaniya Pradeshiya Saba)	Before construction for green building approval
Approval for removal of trees on site	Site clearance to have space for the building and to provide aces and material storage	District Secretariat	Before construction
Consent from relevant government agencies	Construction of building and culverts and other drainage systems etc	Urban Development Authority, SLLRDC, CEA	Before construction
Consent from Ceylon Electricity board	Obtaining the electricity supply for the FCT complex	Ceylon Electricity Board	After completion of the building
Water Supply	Supply of potable water for the facility and supply the certification of pumping drainage	NWSDB	Before construction

: *Compiled by TMS*

Table E.3: ***Clearance required to be obtained by the Contractor***

No	Construction Activity & Type of Clearance Required	Statutory Authority	Statute Under which Clearance is Required
1	Consent for Establishment of Stone Crushers and Cement Mixing Batching Plant	CEA	National Environmental Act No. 47 of 1980
3	Permission for extraction of sand, metal from soil	Geological Survey and Mines Burea (GSMB)	Geological Survey and Mines Bureau (GSMB) Act No. 33 of 1992
4	Location and layout of workers camp, & equipment and storage yards	Kelaniya Pradeshiya Saba	Local Government Ordinances and Acts – Urban Council Ordinance 61 of 1939, Act 29of 1947, Act 18 of 1979, and Act 13 of 1979
5	Discharges from labour camp	Central Environmental Authority (CEA)	National Environmental Act Act No. 47 of 1980 National Environmental (Protection & Quality) Regulations, No. 01 of 1990
6	Disposal of solid and liquid waste	Central Environmental Authority (CEA)	National Environmental Act No. 47 of 1980
7	Noise and dust pollution during construction activities	CEA	Air (Prevention and Control of Pollution) Act, 1981 National Environmental (Noise Control)Regulations No. 01 of 1996
8	Disposal of spoil material garneted during building and construction	Kelaniya Pradeshiya Saba	National Environmental Act Act No. 47 of 1980
9	Revenue license for the heavy machinery and other vehicles at the work site	Office of provincial Commissioner for Motor Traffic the vehicle is being registered	Motor traffic Statute of Western Province No 7 of 1991.

10	Engagement of Labour - Labour License	Labour Commissioner	Shop and office Employees Act 1934 Employees' Trust Fund Act No 15 of 1980 established the Employees' Trust Fund (ETF). Employees' Provident Fund Act of 1958 Municipal Council Ordinances and Acts – Urban Council Ordinance 61 of 1939, Act 29 of 1947, Act 18 of 1979,
11	Engagement of Labour- • Social Security- • Labour Welfare- • Wages	Labour Commissioner (Ministry of Labour and Employment	The Employees' Provident Fund Act, 1958 & Miscellaneous Provisions 1975 Workmen's Compensation Ordinance of 1935 and subsequent Amendments hop and Office Employees (Regulation of Employment and Remuneration) Act, 1954 Factories Ordinance, 1942 2010 on fair treatment

Source: Compiled by TMS

16. In addition to the above, Contractor has to obtain

- Insurance relating to 3rd party, workmen compensation
- Permission from the LA to set up labour camps
- Change of land use certificate from the Divisional Secretariat of Kelaniya

F. Description Of the Environment

17. The existing environmental conditions of the study area covering the Kalaniya Divisional Secretariat. FCT development project is located in the Bulugaha junction, extent of 2185.25 hectares with 37 GND. There are several crucial environmental challenges facing the Kelaniya DSD including improper land use planning, flood management, operations of unauthorized quarries, unauthorized construction, industries and pollution of water ways, (i.e. Kelani River) leading to water pollution and improper solid waste disposal etc.

- **Seismicity**

18. The project is located in the western province of Sri Lanka which is not an active seismic region. The area does not have any potential risk of damage due to earth quake

- **Land Use**

19. The land use pattern in the project site is an urban area with predominately mixed development. Project surrounding land can be categorized into residential and commercial area (70%), protected mash area (25%) and steams (5%). Proposed site is a filled wetland (mainly abandoned paddy land). Land use of the project area consists of private land, state land, residential land, industrial land, and several natural habitats, (wetland and stream).

- **Geology, Soil and Topography**

20. The topography of the selected land is relatively flat terrain. The soil found in Kelaniya DSD exhibit laterite, gravel, alluvial and clay. The project site consists of soil composed of yellow brown and reddish brown fine to medium sand with lateritic clayey gravel.

- **Climate and Meteorology**

21. Kelaniya division lies within the wet zone in the country with flat train. It experiences a uniform rainfall pattern. The maximum rainfall is experienced April to June during the southwest monsoon and again from September to November during the northwest monsoon. Annual rainfall within the area is 2216.7mm. The average temperature is 27ºC -29 ºC in this area. Meteorological data at the site is summarized in Table E.4

Table E.4: summarizes the metrological data for the site

Parameters	**Amount Jan –Dec 2017**
Maximum Temperature(^{0}C)	32.22 ^{0}C
Minimum Temperature (^{0}C)	23.88 ^{0}C
Maximum Relative Humidity (%)	96%
Minimum Relative Humidity (%)	4%
Total Rainfall (mm)	3450 mm
Average Wind Speed [CK1]	10 mph
Predominant wind direction	West
Dry hours (%)	More than 95%

Source: weatherspark.com/y/109716/Average-Weather-in-Kelaniya-Sri-Lanka-Year-Round#Sections-Wind

- **Ambient Air Quality**

22. To draw up a baseline status of the ambient air quality the UOK will take the measurements prior to the commencement of the development project.

- **Ambient Noise Level**

22. To assess the baseline value for the background noise level, ambient noise monitoring will be conducted by the UOK prior to the construction activities at the site.

- **Surface and Groundwater Quality**

23. The baseline data on water quality will be collected for two locations within the project area by the UOK and will be monitored, analyzed and assessed during the construction and operational period. The water quality results will indicate quality of the adjoining surface water. An assessment of water quality will be done to check coliform count, BOD, COD to obtain the baseline value. Before the construction it is recommended that the above test be carried out.

24. The project site runs a possible risk of flooding during the rainy season. The main cause for flooding can be attributed to;

- Discharge from catchment area itself

- Floods in the lower basin due to heavy rain in the upper catchment
- Insufficient discharge from the Kelani river outfall due to the high tidal effect
- Insufficient canal capacity to carry high runoff

G. Ecology and Biodiversity

25. The rapid biodiversity assessment for the site was carried on the January and February in 2018. Total of eight samples of 10 mx 10 m were laid for the purpose of the biodiversity assessment. The GPS coordinates and the altitudes were recorded for each of the plots. Refer table E.5 & E.6:

Table E.5: summarizes the GPS coordinates for the terrestrrail sample plots

Plot	Latitude (N)	Longitude (E)	Alt (m)	Vegetation type
1	6.9711	79.9029	5.47	Sedges
2	6.9705	79.9021	4.27	Sedges and semi aquatic herbs
3	6.9729	79.9025	5.79	Annona woodland
4	6.9716	79.9034	5.79	Annona woodland
5	6.9712	79.9040	3.66	Annona and semi aquatic herbs
6	6.9715	79.9053	6.71	Annona woodland
7	6.9725	79.9047	6.40	Disturbed vegetation
8	6.9727	79.9042	6.71	Home garden
9	6.9724	79.9059	8.53	Annona woodland
10	6.9718	79.9082	6.40	Annona woodland
11	6.9717	79.9091	4.27	Sedges
12	6.9705	79.9085	5.18	Annona woodland
13	6.9720	79.9045	3.35	Panicum & herbs
14	6.9693	79.9060	7.01	Panicum & herbs

Note: When the sample is a line transect, values of the center point is given

Table 6: E6 summarizes the GPS coordinates for the aquatic sample plots

Plot	Latitude (N)	Longitude (E)	Alt (ft)	Vegetation type
1	6.9718	79.9017	15	*Eichhornia crassipes*
2	6.9705	79.9016	12	*Eichhornia crassipes*
3	6.9710	79.9039	11	No vegetation
4	6.9705	79.9041	9	No vegetation
5	6.9705	79.9058	21	*Hydrilla verticillata*
6	6.9713	79.9060	22	No vegetation
7	6.9714	79.9074	19	No vegetation

26. None of the species found in the project area fall under the threatened category as per IUCN red list.

27. Four trees were found at the project site and these all wetland associates species. These were invasive species found in an urban wetland

28. In Kelaniya, improper disposal of solid and liquid waste is one of the main causes for environmental pollution is a major issue. Other issues are sand mining, and unregulated disposal of solid waste, industrial pollution and land filling.

H. Educational, Medical and Religious Properties

29. Generally the education level is good with literacy rate being around 95.4% (department of cense and statistics, 2015). Educational facilities in the area include 55 schools. Health facilities in this area include base hospital, peripheral units, central dispensaries, maternity homes and dispensaries.

30. Cultural, archaeological and historically significant sites in Kelaniya DSD include the Kelaniya Temple and Vidyalankara Pirivena. These are located in close proximity to the site (2.31Km).

I. Demographic details of Affected Population

31. The population and community in this area are predominantly Sinhala. The population composition all ethnicities such as Sinhala, Tamil, Lanka Yonaka, Burgher and others. When considering the ethnicity within the DSD, 75% of the population is Buddhist, 5% are Hindu, 9% are Islam, 9% are Roman Catholic, and 2% are Christian.

32. The agriculture sector provides employment for 0.95%, 4.5% in industrial sector and 6.4% in service sector in total labor force in the Kalaniya DSD. Population in Kelaniya engages in agricultural, industrial and fishing with some employed in the government sector. The predominant work force in Kelaniya engages in the service and industry sectors.

J. Analysis of Alternatives

33. Although the proposed Technology Faculty Development project is located in close proximity to wetland, impacts associated with construction stage are temporary and short term. Any long term impacts can be managed by adhering to ESMP. Also, there

is no existing facility in the vicinity that can be developed as an alternative to the proposed project. Therefore, examination of alternatives to the project‘s location, design, technology, and components show that it is compliant.

34. The selected site is strategically located in the Western Province and within close proximity to the 2 main Export Processing Zones (EPZ) in Sri Lanka: Biyagama and Katunayake. It is easily accessible to the student community. Thus, the development of the land into a training facility will be the better option under the existing condition. It is also within 1.13km to the main UOK Campus in Kelaniya.

K. Anticipated Impacts and Mitigation Measures

35. An environmental and social management plan (ESMP) has been developed to provide mitigation measures to reduce all negative impacts to acceptable levels. Locations and siting of the proposed infrastructures were considered to further reduce impacts. These include (i) locating FCTP on government-owned land to avoid the need for land acquisition and relocation of people; and (ii) Flood risk assessment was carried out for the flooding scenarios for a 50 year cycle and design alternatives were propose.

36. The ESMP includes design measures such as (i) selection of construction methodology on alluvial soil that is prone to flooding; (ii) quick leak detection and rectification to save the resources, etc. during construction. The EMP includes mitigation measures such as (i) implementation of noise and air quality management (ii) awareness campaigns and consultations to inform residents and businesses of potential disturbances; (iii) use of dust-suppression methods such as watering and/or covering of stockpiles; and (iv) finding beneficial use of excavated materials and spoil material. As for the O&M phase, facilities will need to be repaired from time to time, but environmental impacts will be much less than those of the construction period as the work will be infrequent. The ESMP includes mitigation measures and monitoring plan to ensure compliance to environmental standards during O&M phase.

37. A summary of the potential environmental impacts during construction and operation phase along with recommended mitigation measures is summarized in a Table-E7

Table E.7: Summary of Anticipated Impacts and Recommended Mitigation Measures

Issues of concern	Anticipated Impacts	Proposed mitigation Measures
Pre-Construction and Construction Stage		
Clearance for the project	In the absence of relevant approval from the and CEA for the new development may lead to environmental and social consequences	Obtain CEA, recommendation letter and approval letters from, SLLRDC, UDA(refer Annex 02)
	Lack of sufficient planning to assure long-term sustainability of the improvements and ensure protection of the FCT	Design has to include provisions for ensuring effective maintenance and protection of the FCT in the long-term. The long-term sustainability has been ensured by consideration of relevant authorities for Standards The initial designs of FCT academic building should consider that net allowable carrying capacity of 3.0MN/m^2. The carrying capacity in skin friction within the basement rock or the ultimate skin friction coefficient is 140 kN/m^2, which is less than ICTAD recommended guidelines and propose the design. Refer the geotechnical soil assessment recommendation.
Risk of temporary floods	Lack of drainage within the project site will submerge the land during heavy rains. In the absence of a proper storm water drainage system, there will be a risk of water logging around the site. Currently the canal that boarders the western part of the land with the 12m access road is poorly drained which will result in flooding. The site is located close to main canal that discharges rain water from surrounding areas which will also increase the risk of flooding of the FTC and its sewage system.	Consult SLLRDC and local authority and the resident population and develop road side drains. May require construction of drains to manage the flood waters in the area. Develop a proper drainage mechanism for the project site after careful evaluation. Coordinate with the Ministry of Megapolis and Western Development and Department of Railway to remove blocked canal systems to improve the water flow in the canal system Establish storm water management system for the site during detail design process Maintain design features such as drainage structures

		Select the foundation design that will least impact the surrounding community such as the cast in situ RC pile foundation Erosion control measures should be taken.
Integration of energy efficiency and energy conservation programs in design of project components. Non compliance of green building guidelines	Unsustainable, energy inefficient, and un-economical unviable building that will negatively impact the environment In the absence of water conservation and energy efficiency of the building structure, it may lead to resource constrains and increase the running cost.	The detailed designs for the project should ensure environmental sustainability principles, including energy efficiency, resource recycling, waste minimization, etc.: - Usage of recyclable materials like wood substitutes. - Installation of sustainable energy efficiency certified equipment - Usage of energy efficient lighting fixtures (LED) - Provision of photovoltaic cells on roofs for solar power - Rain water harvesting structures planned for ground water recharge and rain water collection Will have to carry out baseline study of the existing condition of the surrounding buildings. -Provide a fund for compensation if it becomes necessary. - Conduct stakeholder meeting during piling activities
Establishment of baseline environmental conditions prior to start of civil works	Non availability of a method to audit the impact. Obtaining a suitable and representative baseline data set will be critical to the whole monitoring and audit process because it forms the standard against which environmental impacts are assessed. Impact of vibration noise, ground water pollution due to solid and waste water disposal etc.	Conduct documentation of areas for construction zone (camp, staging, storage stockpiling, etc.) and surroundings (within direct impact zones). Include photos and GPS coordinates Conduct base line monitoring in respect of ambient air quality, water quality, and noise levels as per monitoring plan. Thus, baseline monitoring for water quality, noise, vibration will be audited prior to the start of construction and in site supervision.

Utilities	Establishment of utilities for the FCT such as water, telecommunication and electricity will disrupt the services to the project associated establishments and communities.	-The location of utilizes and operators of utilities to be impacted should be identified and documented in detailed project design documents to prevent unnecessary disruption of services during the construction phase. -Contractor should prepare a contingency plan to include actions to be done in case of unintentional interruption of services. -Obtain from the PIU the list of affected utilities that need to be shifted.
Resources mobilization and allocation of space	Allocation of space for storage yard for construction material, labour camp, project office require addition amount of space. Use of additional land for resource mobilization during construction may lead to conflicts.	Adequate provision should be made on site to mobilize the construction equipment. Selection of land for construction material storage should be done carefully avoiding conflict with Kelaniya Pradeshiya Saba approval. Selection of lands such purposes should be undertaken by the contractors carefully Sitting of the construction camp shall be as per the guidelines below and details of layout to be approved by PMU. Potential sites, within the FCT plot, for the labor camp will be lined up to be visited by the environmental expert of PMU Construction camp sanitation facilities shall be adequately planned. Selection of local un-skilled and skilled workers for the proposed construction activities can reduce the requirement of land for labour camps. Use local materials as much as possible to reduce the need for storage space
Disaster management	Extreme climate events such as intense rainfall (flooding), cyclone etc. and fire may cause damages to lives and property.	An appropriate adaptation and disaster risk reduction strategy should be developed.

		Identify an emergency evacuation point in the building. An emergency alarm system has to be in place in all the buildings. Schedule the maintenance and cleaning of the canal system associated with the project. Develop a flood risk management plan for FCT
Safety of students and academic staff	Lack of safety measures within the design will lead to fire and increase occupational safety hazards	Plan for fire extinguishers fire alarms and a stair case for emergency evacuations. Fire safety management and mock drill
Occupational Health and Safety	Unless worker safety is complied with, it can lead to injury and other health risks	Contactor to comply with ADB Environmental, Health, and Safety Guidelines, Labour Organization (ILO) convention No. 62, and Factory Ordinance to the extent that are applicable Develop and implement comprehensive site-specific health and safety plan on Occupational Health and Safety Include in the health and safety plan measures as per the detailed ESMP volume 3 Provide medical insurance coverage and immediately for workers.. Properly barricaded through Mild Steel sheets of adequate height to avoid noise impacts
Public consultation	Inability to resolve environmental impact on surrounding community due to project based activities may trigger social unrest	Continue information dissemination, consultations, and involvement or participation of stakeholders during project implementation
Site Clearnce and cut and fill operations	Construction activities such as cut and fill operation etc. may lead soil erosion, sedimentation and siltation. Decrease of infiltration of rain water, acceleration of surface runoff, are the main impacts	Only ground cover or shrubs and trees that directly affect the permanent works or necessary temporary works shall be removed with prior approval from the environmental expert of the PIU. Detailed presentation of mitigaory measures to be adopted are viable on vol 3 ESMP
Land preparation	Activities such as site preparation of site will	Awareness programs should be organized for the workforce.

	potentially impact the ecological resources. Noise generated from construction vehicles, equipment, and vehicle traffic has the potential to disturb fauna	Contractor shall adhere to the guidelines and recommendation made by CEA and DS regarding removal of trees Contractor should especially be careful not to introduce any alien species during the activities
Soil erosion and water ponding on account of excavation	Incidence of vector born disease	Slope protection measures will be undertaken as per design to control soil erosion especially on side slopes of access and internal roads The excavation works will be avoided during monsoon months to avoid soil erosion, stagnation of water, and vector – borne diseases
Drinking water availability at construction camp and construction site	Non availability of drinking water for labours will result in dehydration and health risk Lack of usable Ground water may lead to water constraints at the construction site.	Sufficient supply of potable water to be provided and maintained at the site for the workers. The drinking water will be obtained from the market or any alternative source. The drinking water will be stored in a suitable size storage tank to ensure uninterrupted availability Detailed presentation of mitigation measures are given in Part III ESMP.
Arrangement for construction water in the event water requirement is large for construction and cannot be supported by the pipe water supply	Delayed and interruption water supply leads to economic cost	The contractor shall provide a list of locations and type of sources from where water for construction shall be acquired To avoid disruption or disturbance to other water users, the contractor shall arrange water from the market through authorized tanker suppliers etc
Use and transport of natural resources	Impact on the natural ecosystem by means of exploitation.	Extraction of construction materials should be undertaken only from mines and quarries approved by GS&MB Extraction of material from CEA,LA approved sites and conforms to regulation imposed by the DS. Transportation of material should be carried out in accordance to the regulations imposed by the relevant

		authorities. (details refer Part III ESMP)
On Site housekeeping	Lack of solid waste and sanitation management on site can lead to lack of general cleanliness and impact on ecology, public health and scenic beauty.	Pre identified waste disposal site by the contractor should exclude areas which are close to public and sensitive environment. This is part of the comprehensive waste disposal plan. A solid waste management plan will be prepared by the contractor in consultation with local civic authorities Details refer ESMP part III.
Stockpiling of construction materials	Pollution of water ways	-Stockpiling of construction materials will be done in such a way that it does not impact and obstruct the drainage. -Stockpiles will be covered to protect from duct and erosion
Air pollution	Impact from dust generation leads to Poor air quality release of Volatile Organic Compound (VOC) from storage sites and transfer of vehicle/equipment fuels, emission of small amounts of Carbon monoxide, Nitrogen dioxide and particulates from construction activities and vehicles may compromise health of the workers and surrounding community.	Wet down and spray water at construction site, quarries if required. Take steps to avoid dust emissions during loading and unloading of construction material. Tarpaulin covering is mandatory on trucks/lorries All filling works are to be protected or covered in a manner to minimize dust generation The air quality monitoring will be conducted as per the plan All vehicles, equipment, and machinery used for construction shall conform to the Sri Lankan government vehicle emission test. For equipment emission norms as specified in air emission gazetted under NEA The Contractor shall maintain a record of pollution under control for all vehicles and machinery used during the contract period
Impact from noise and vibration	Construction noise can disturb surroundings	Maintenance of machinery and equipment in a good condition, Limit working time for activities that create noise etc.
Onsite emergency plan for minor accidents and mishaps	Accidental risk to the worker.	Onsite emergency management plan will be prepared by the

		contactor with the consultation of the PIU .
Clearing of construction of camp and restoration	It will not be visually pleasing and would lead to health risk	Contractor to prepare site restoration plans for approval by the engineer (PIU). The plan is to be implemented by the contractor prior to demobilization. On completion of the works, all temporary structures will be cleared away, all rubbish removed, excreta or other disposal pits or trenches filled in and effectively sealed off, and the site left clean and tidy, at the contractor's expense, to the entire satisfaction of PIU.
Landscaping	In the absence of proper landscape will not be aesthetically pleasing. Landscaping should blend in with the wetland ecosystem. Recommendations of the Rapid Bio Diversity Assessment should be considered.	Project landscape activities have to be done as per either detailed design or typical design guidelines. The landscaping works will be taken up in XXXXm2 area ear marked in the drawing. Plant floral species that are recommended in the IEE
Operational Period		
Environmental conditions and parameters	Unless regular monitoring is conducted, it may lead to environmental pollution issues during the operation of the Campus.	Periodic monitoring of the ambient air quality, noise level, surface water quality, soil quality in the subproject area as suggested in the monitoring ng plan through an approved monitoring authority.
Drainage Congestions	Flooding due to lack of maintenance on the canal system around the project site	SLLRDC – Mudun Ela Surrounding canal system in Kelaniya Pradeshiya Saba
Solid waste management	At the moment solid waste collection is done twice a week , there is risk of solid waste piling up on site and obscuring the environment.	Adopt an agreement with the LA and put into operation the waste management plan in place.
Water supply	This should be properly calculated for the purpose of available toilets, 20 student dormitories and other facilities.	Ensure that water supply is in place before operation to the training center.
Sanitary facilities	Poor maintenance of sanitary facilities and improper disposal of domestic waste water will result in environmental	Ensure that the facilities are properly maintained and with adequate supply of water

	pollution and spread of diseases	
Health and safety of the trainees	Activities such as laboratory work may result in accidents injury among students. Social conflict with the surrounding residents and worker in other establishment due to unacceptable behavior of students	Train the students and teachers on managing risk and emergencies. Provide emergency switches to prevent fire hazards Place rules and regulations and code of social conduct that is required to be maintained by the student.
Waste generated on account of operation and maintenance	Collection of waste will obscure the environment.	The solar thermal panels and water will be operated by the supplier. Any waste that is generated will be taken by the supplier for possible reuse and recycle. For this necessary agreement will be made
Onsite emergency plan for minor accidents mishaps and disaster management plan. For natural disaster such as flooding		The dean of the FCT of UOK should prepare an onsite emergency plan for possible minor accidents. During the operation phase. For natural disaster the disaster management plan prepared by UOK will be followed.
Maintenance of plantation and landscaped area in the FCT project site	In the absence of maintained landscape FCT grounds will not be pleasing to the eye	The faculty head with the appropriate support staff allocated for the purpose will be responsible for the maintenance of shrubs, tree and land scape of the area.
Adoption of Food safety guidelines	Unhygienic food preparation conditions may lead to health issues in the cafeteria	Adopt rules on personal hygiene. Adopt food safety regulation for the cafeteria which is imposed by the Ministry of Health.

Source: Compiled by TMS

38. The budgetary provision for the implementation of the ESMP of the FCTP can be categorized in to two types and is presented below;

- ESMP works to be implemented by the contractor under civil works contracts.

- ESMP works to be implemented by the FCTP project management unit.

39. A capital cost provision of about Rs. XXX has been allocated for the implementation of the ESMP. Summary of the budget is presented in Table-E.8

Table E. 8: Summary of the budget

Component	Description	To be implemented by	Amount (Rs)
A	Mitigation / Enhancement	Contractor	
B	Environmental Monitoring		
Subtotal			
C	Training and mobilization	FCTP project management unit	
D	Meeting		

L. Public Consultation (PCM)

40. The following are the major points of concern of the participants of PCM

- Main concerns that came out included the filling of the land. Local community is worried that further filling and development will increase the flooding risk locally.
- The activity will further degrade the surrounding natural habitat.
- The area is an unstable area with subsidence, so proper foundations will have to be laid will ensuring that the water flows in the canals are not impeded.
- Need to discuss with the relevant authorities, the need to increase rhe efficiency of water flow in the surrounding canals.

M. Conclusion and Recommendations

41. Conclusion: The IEE study did not find any major incompatibilities with the surrounding physical, biological, socio-economic or cultural environment. However careful planning and design of the new development is necessary to ensure that it does pose any significant long term environmental threat (flood risk). The most impacts are likely

during the construction phase and are expected to be temporary in nature and could be mitigated with proper management and good practices. The GRM and ESMP provide appropriate guidance for suitable environmental and social safeguards. Accordingly, the proposed project can be recommended for implementation with strict adherence to ESMP and GRM provided in this IEE.

42. Most of the adverse impacts of FCTP during construction period are short term and temporary in nature. These impacts can be minimized through specific engineering and management solutions. Environment friendly construction methodology has been incorporated into the project design and the ESMP has been prepared to minimize the overall impacts on the environment during the proposed project civil works. Since the proposed project is unlikely to cause any significant adverse environmental impacts, no further study is required.

43. Recommendations: The ESMP has been prepared incorporating various modern technologies and guidelines to reduce the environmental impacts of project constructions to make it a Green building Therefore, it is recommended to follow the ESMP and associated guidelines during construction and operation phases of the project. UOK need to engage with SLLRD to develop a flood water management plan, to clean and maintain the project associated canal system and to develop the access road. The detailed engineering design of the building should consider the geotechnical report and propose migratory measures that ensures strong foundation and flood resilience. FCT of UOK with consultation of the Kelaniya Pradesha Saba should ensure that the open dumpsite be relocated and maintained appropriately. Continued consultations with the Ministry of Megapolis and Western Development should be carried out on the proposed measures to mitigate the odor and effluent discharged by the proposed metro Colombo waste dump.

1 INTRODUCTION

1.1 Project Background

44. In Sri Lanka, the service sector, financial activities, transportation and real estate activities have shown a significant year to year (YOY) growth together with activities such as Information Technology (IT), IT enabled Services (ITeS) / Business Process Outsourcing (BPO) and telecommunications. In the ICT services sector, IT programming consultancy and related activities has grown significantly by 21.1% YOY in 20151. Successive governments in Sri Lanka have promoted the concept of a 'knowledge based economy', particularly during the past two decades[1,2]

45. The International Labour Organisation publication titled 'The Skills gap in four industrial sectors in Sri Lanka' has identified major skills mismatches especially in the high-skill job categories in the ICT, tourism & hospitality, construction and light engineering industries3.The Faculty of Computing and Technology of the University of Kelaniya was established in 2016 to make a significant contribution to meet the human resource needs of Sri Lanka. The FCT has introduced latest teaching and learning methodologies to its undergraduate students. Currently FCT lacks infrastructure to arrange the lectures and the practical laboratory sessions within the available limited space. They have secured a temporary facility in Dalugam which does not have proper laboratory facilities or air conditioned space to conduct the academic activities. As a result the faculty runs academic constrains in conducting practices and lectures as they need to train a large number of students in limited space without adequate facilities

46. Government of Sri Lanka with loan funding from Asian Development Bank (ADB) has proposed to implement the Science and Technology and Human Resource Development Project (STHRDP). The Ministry of Higher Education and Highway (MOHEH) shall be the Implementing Agency and the University Grant Commission shall be the executing agency for the Project. This project aims to increase the technology oriented work force which will contribute to transform Sri Lankans growing economy. Under

[1] Mahinda Chinthana, 2005, Government of Sri Lanka
[2] An Empowered Sri Lanka, 2016, Government of Sri Lanka
[3] The skills gap in four industrial sectors in Sri Lanka, 2015, International Labour Organisation

this Project the University of Kelaniaya (UOK) will build a new Faculty of Computing and Technology (FCT) in Kelaniya. This will be referred to as the project in this report.

47. The safeguards screening for UOK has been completed by the consultants mobilized under TA8235 with recommendation for a flood risk assessment and a rapid biodiversity assessment. In pursuance of the above, Total Management Solutions Company (Pvt.) Ltd (TMS) was appointed as Consultants by ADB to carry out the IEEs and provide environmental safeguards services for Human Resource Development Project. Therefore, TMS will carry out the IEE for FCTP project which will implemented by the UOK.

48. The project proponent (PP) of this project is FCTP project implementation unit in University of Kelaniya. The proposed feasibility study and the detailed designs of the FCT at UOK includes the following:

49. Phase I of the project will involve the construction of the 10 story academic building (1600sqm^2) , 5 storied administration building (500sqm^2), apartment building (600 sqm^2) building for student centers, location for service building, transformers, waste water treatment, solar panel system, rain water treatment plant, garbage collection / recycling plant

50. Phase II include 5 storied academic building (1000sqm^2), 10 storied center units (1000 sqm^2).

51. Three undergraduate courses in Bachelor of Engineering Technology, ICT and Computer Science is introduced at FCT in UOK. This involves admission to the university in two intakes 86 and 88 students respectively for the Bachelor of Engineering Technology. B.Sc. on ICT will enroll 75 students in each of its two academic intakes for the university. The BSc in Computer Science will enroll 50 students. Another 50 students are expected to be enrolled for the Master of ICT for Education programme commencing from 2018. For the current academic year there will be about 424 students enrolled.

52. Currently at FCT 13 academic staff is engaged in education program. This includes 1 Professor, 09 Senior Lecturers and 03 Probationary lecturers. There are 10 more cadre positions identified for future recruitment in the faculty.

53. The FCT will train graduates who are ready for industries such as ICT, manufacturing, logistics and services. This will ensure that these graduates will have a competitive edge to secure jobs both locally and internationally.

1.2 Objectives of the IEE

54. The objectives of the Environmental Study are to:

I. Determine the category of the project depending proposal, environmental sensitivity and magnitude of impacts, i.e. screening as per Government of Sri Lanka's regulations and ADB's Safeguard Policy Statement 2009;

II. Determine the appropriate extent and type of EA required (IEE or EIA), i.e. scoping;

III. Determine the requirement of statutory clearances;

IV. Provide a baseline environmental monitoring and survey; on biodiversity, biophysical resources

V. Predict impacts on relevant environmental attributes and mitigation measures to minimize the impacts; and

VI. Prepare IEE Report including ESMP

55. Recommendations will be provided for mitigating any negative impacts wherever possible through the ESMP. The ESMP will include the recommended institutional arrangements for monitoring activities for identified environmental issues. The IEE will address current physical, ecological, economic and social background of the project anticipated environmental impacts that will arise due to project activities, necessary measures that have to be adopted to mitigate them and public views and suggestions regarding the project.

56. Accordingly, a single consolidated IEE report will be submitted to ADB and also be made available to the PP to facilitate their decision making.

1.3 Approach and Methodology

57. The IEE has been carried out within the existing policy, legal and administrative framework considering the applicable environmental legislation, regulations & guidelines of ADB and MOEF.

58. **Reconnaissance Survey:** A reconnaissance survey was carried out identify the value environmental components surrounding the project. Location of environmentally protected areas; surface water bodies; environmentally sensitive receptors (educational institutions, religious structures, medical facilities etc.) at the project site has been identified during the survey. The Consultant conducted preliminary analysis of the nature, scale and magnitude of the impacts that the project is likely to cause on the environment, especially on the identified Valued Environment Component (VECs). REA, IP and IR checklists were filled out and the findings incorporated in the preparation of the IEE. Site inspection of proposed project was carried out on 16th February 2017 (refer Annex 03 (a) for details).

59. Another study will be carried out to analyze and identify the demand for technology graduates in the labor market to justify the public investment in the technology education and on proposed FCT project. This will be carried out by ADB with the data obtained by 1st of May 2018 from the Department of Census and Statistics.

60. **Data Collection & Review:** Secondary data such as Survey of Sri Lanka Topo Sheets, District Planning Maps, SLLRDC Working Plans, etc. have been collected from various secondary sources. Further, secondary data, which are relevant to understand the baseline as pertaining to physical and biological environments has been collected and reviewed. Applicable environmental legislation, regulations & guidelines of ADB and MOERE.

61. **Environmental Screening & Scoping:** Screening has been conducted with specific consideration such as location of the projects with respect to flood risk and critical issues to be studied in detail as well as provide important feedback to the design / technical team. It will help to modify the designs at locations where impacts can be avoided and

incorporate mitigation measures wherever the impacts were unavoidable due to other constraints.

62. **Baseline Environmental Monitoring:** To establish the baseline environmental status, monitoring was carried out for various environmental parameters such as meteorology, ambient air quality, ambient noise level, ground & surface water quality and soil quality[4] at the project site secondary data was referred from numerous reports. Rapid biodiversity assessment was carried out to assess the importance of the biodiversity surrounding the project site and to obtain baseline data of the biodiversity surrounding the project site. A flood risk assessment was done to ascertain the risk of flooding in the area and also carried out analysis to determine future scenarios of flooding.

63. **Stakeholder Consultation:** Consultations on environmental issues have been carried out with relevant stakeholders identified through stakeholder analysis. Such consultations were done with the officials and staff of University of Kelaniya, Additional General Manager Sri Lanka Land Reclamation & Development Corporation, and immediate neighbors from the adjoining properties. A stakeholder consultation was held with representatives from government sector such as University of Kelaniya staff and students, Kelaniya Pradeshya Saba , Industrial sector, the community surrounding the project site, on the 3rd of May 2018 at Kelaniya (refer Annex 04, for details).

64. Analysis **of Alternatives:** The environmental analysis of alternatives mainly focuses on location, building design if any, sources of designs from an environmental management perspective to reduce flooding.

65. **Prediction of Impacts & Mitigation Measures:** Based on the above study potential positive and negative impacts on land environment, air environment, noise environment, water environment and biological environment has been assessed for both construction and operation phase. For each impact predicted, feasible and cost effective mitigation measures has been suggested to reduce potentially significant adverse environmental impacts to acceptable levels.

66. **Environment Management Plan:** The ESMP (Part III) has been prepared as per the requirements of ADB safeguard policy statement. The ESMP includes management of borrow areas, quarries, construction camp; rain water harvesting, storm water

[4] Soil report for the site

management practices; enhancement plan for water body; requirement of noise barrier, establishment of a waste water treatment plant & solid waste management plan, capacity building & training; environmental supervision, monitoring & auditing requirements; etc. At the same time, information was collected to prepare a Basic Information Questionnaire (BIQ) for environment clearance from CEA (refer Annex 04,).

1.4 Structure of IEE Report

67. In order to fully meet all requirements, the IEE report generally follows the ADB Safeguard Policy Statement 2009 and EA Guidelines 2003. Structure of the IEE report is organized as follows:

Part 1. IEE Report

Executive Summary

Chapter 1- Introduction

Chapter 2-Policy, Legal, and Administrative Framework

Chapter 3-Description of the Project

Chapter 4-Description of the Environment (Baseline Data)

Chapter 5-Analysis of Alternatives

Chapter 6-Anticipated Environmental Impacts and Mitigation Measures

Chapter 7-Public Consultation

Chapter 8-Environmental Management Plan

Chapter 9-Conclusion and Recommendation

Part II. Annexes

Part III. ESMP

2 DESCRIPTION OF THE PROJECT

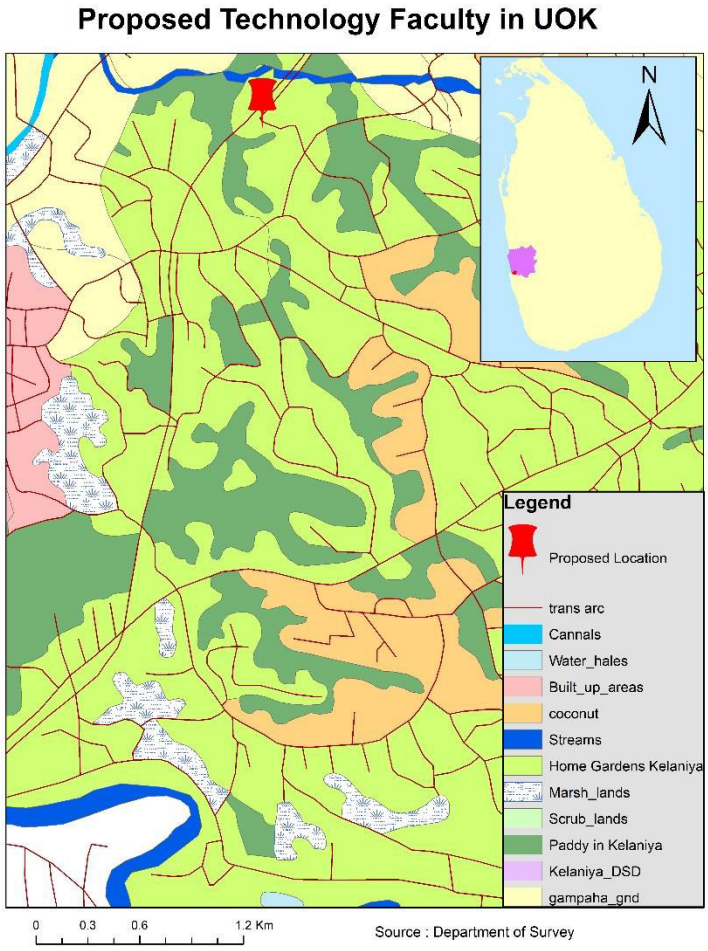
1.1. Project Location

68. The proposed construction of the new Faculty of FCT is located in Kelaniya, Gampha District, Western Province, Sri Lanka. The project site (i.e. land) is located alongside the Colombo - Kandy Road and is within 1km of Kiribathgoda town. The government granted the university with a 2 acre 1 route 35.46 perch land located in Bulugaha Junction, Wedamullla, Hubutuwellgoda, Badalgoda villages within the Kelaniya Pradeshiya Saba. Adjoining properties are privately owned for residential and industrial purposes. Figure 2.

69. The proposed project site is located 1 km from the existing campus pf the University of Kelaniya. The land location points are $8^0 21' 38.74''$ N $80^0 30' 12.18''$ E. The land is rectangular in shape. Adjoining properties are currently developed. There are no permanent or temporary structures on the site. Since the site has been lying vacant and unused, small shrubs have grown over time. Outside the project site, there is waste dump, temple and, residential houses and two storm water drainage channel. Some photos of the site are shown in Figures 2 & 3 On the eastern boundary lies Lots 1 & 4 and southern boundary Lots 4 and 11, while the western boundary adjoins the Lot 2. These details are shown in the attached site survey plan (Annex 05). The project site is 122.32m form a waste collection site and 100m from the Shanthi Viharaya Buddhist Temple.

70. The project land is government owned and was previously an abandoned paddy field. The UOK is in the process of obtaining approval from the SLLRDC/ CEA since the project area was a reclaimed land. Once the internal drainage plan is laid down to the project site, seek approval from the SLLRDC.

Figure 2: Location of project site



Source: Prepared by TMS

Figure 3: Pictures of project associate site

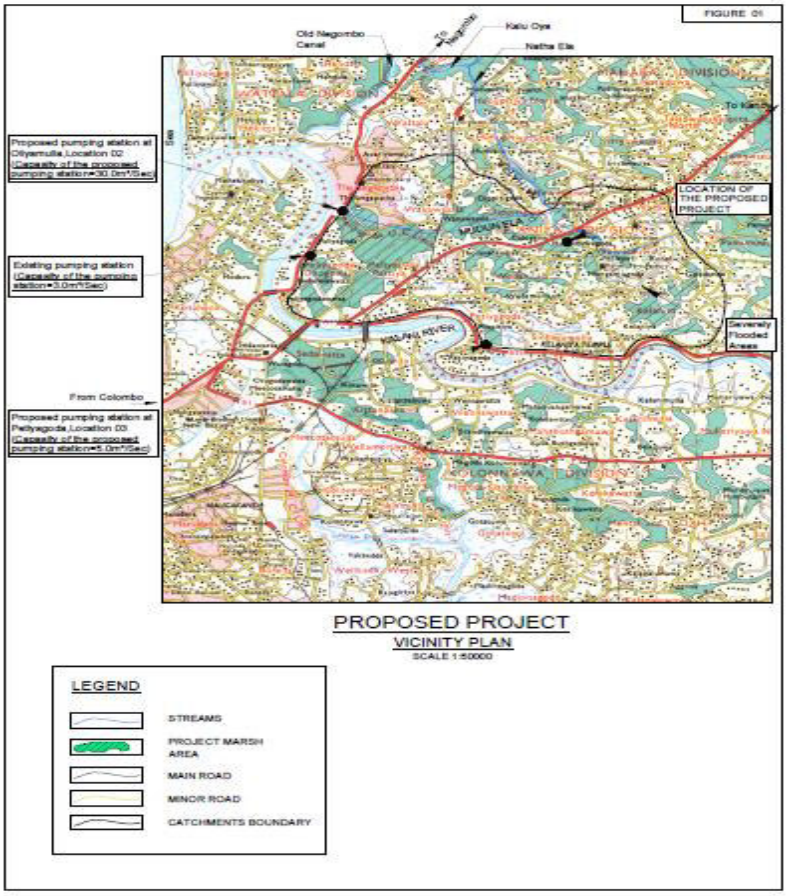

Figure 1 Marga Concreate batching pant


Figure 2: Shanthi viharaya

Figure 4: Partly build access road to project site and stagnant canal

Captured by TMS

Figure 5: Proposed project vicinity plan:



1.2. Description of the Project

71. The proposed Technology Faculty Development project will involve construction of a new faculty with facilities to conduct lectures for technology students. The FCT will be with several storied buildings and will be constructed in two phases. It will include laboratory facilities for chemistry, physics, electronics, two labs for bio chemistry, research lab, bio technology, engineering technology, industry technology lab and a product design lab. It will also include two computer labs that will train 150 students at a time. The details design and the lay out plan for the FCTP (Refer Master plan and preliminary design plan for FCT Map Annex 06). The project will be implanted in two stages.

72. Phase I of the project will involve the construction of the 10 story academic building (1600sqm^2) , 5 storied administration building (500sqm^2), apartment building (600 sqm^2) building for student centers, location for service building, transformers, waste

water treatment, solar panel system, rain water treatment plant, garbage collection / recycling plant.

73. This academic building will be with a ground story, seven storied building having a floor area of 13,333m^2 (Approx) consisting of pile foundation with RCC columns, beams, slabs , stair case with stainless steel hand rails, plastered and pained. Zn/Al roof covered on a metal frame, gypsum board celling for toilets, powerdre coadted dorrs and windows, porcelain floor tiling, wall tiling, 4 number of lift and fire protection system installed. CCTV system, data and telephone system, lighting protection system, audio visual equipment and stage lights for auditorium, air condition systems and drainage systems will be installed[5]

74. Phase II include 5 storied academic building (1000sqm^2) for staff accommodation and provide lodging for exchange students , 10 storied center units (1000 sqm^2)this will include center units such as industry interaction center and business center (3000 sqm^2). e- learning center (5000 sqm^2), nano technology center (16200 sqm^2), cyber security and computer forensic center (2000 sqm^2), center for data and science (2000 sqm^2), business incubator(1000 sqm^2).

75. The details of the building structure is as follows

- Lecture Halls with student capacity of 400, 200, 100, 50, 30 (33800 sqm^2),
- Auditorium with a occupancy rate of 1000 (1000 sqm^2),
- Laboratories – chemistry (2000 sqm^2), physics (2500 sqm^2), electronic and robotics (2000 sqm^2), biochemistry 1 and 2nd year student lab (1500 sqm^2), biochemistry 3rd and 4th year students lab (1000 sqm^2), two research labs with student capacity of 30 (2000 sqm^2), biotechnology lab (1000 sqm^2), engineering technology lab (1000 sqm^2), industrial technology lab (500 sq ft), product design lab (500 sqm^2), engineering workshop (2000 sqm^2). This is based on information provided at time of IEE and may change during the final stages of design.
- Computer labs with a capacity of 100 students (42000 sq ft) and 50 students (4000 sq ft), multi media lab with 40 computers (1000 sq ft), network security lab (1000 sq ft), embedded system lab (1000 sq ft), game and animation lab (1000 sq ft), high

[5] Cost estimates from the state engineering coperation

performance computing (1000 sq ft), Software designing lab (1500 sq ft), language lab (1000 sq ft), data center (750 sq ft), IT store room (1500 sq ft), IT staff room (750 sq ft).

- Student group work areas (2600 sq ft).
- 6 areas for students reading with a capacity of 50 (6000 sq ft)
- Staff rooms and faculty office rooms
- Faculty library (2000 sq ft)
- Admiration building : Board Room capacity 150 (1500 sq ft). Three board rooms for department to share (1500 sq ft). 120 staff areas (14 400 sq ft). 100 temporary staff areas (8000 sq ft). faculty office area (2000 sq ft). Office areas for the department (7500 sq ft). office area for the technical and allied staff (1500 sq ft). student center and the gymnasium (2500 sq ft). staff lunch area (500 sq ft), faculty common area (1500 sq ft).Three cafeteria with each having a student capacity of 200 (6000 sq ft). sanitary facilities, carrier guidance center (250 sq ft). office for research students (2000 sq ft). store room (1500 sq ft). ground floor parking (9000 sq ft). security and maintenance (250 sq ft).
- Waste water treatment plants,
- Rain water harvesting system

76. The layout plan of FCT of UOK is shown below in Figure 6. The site plans and 3D views have been shown in Figure 7.

Figure 6: Site Plan of the FCT of UOK and

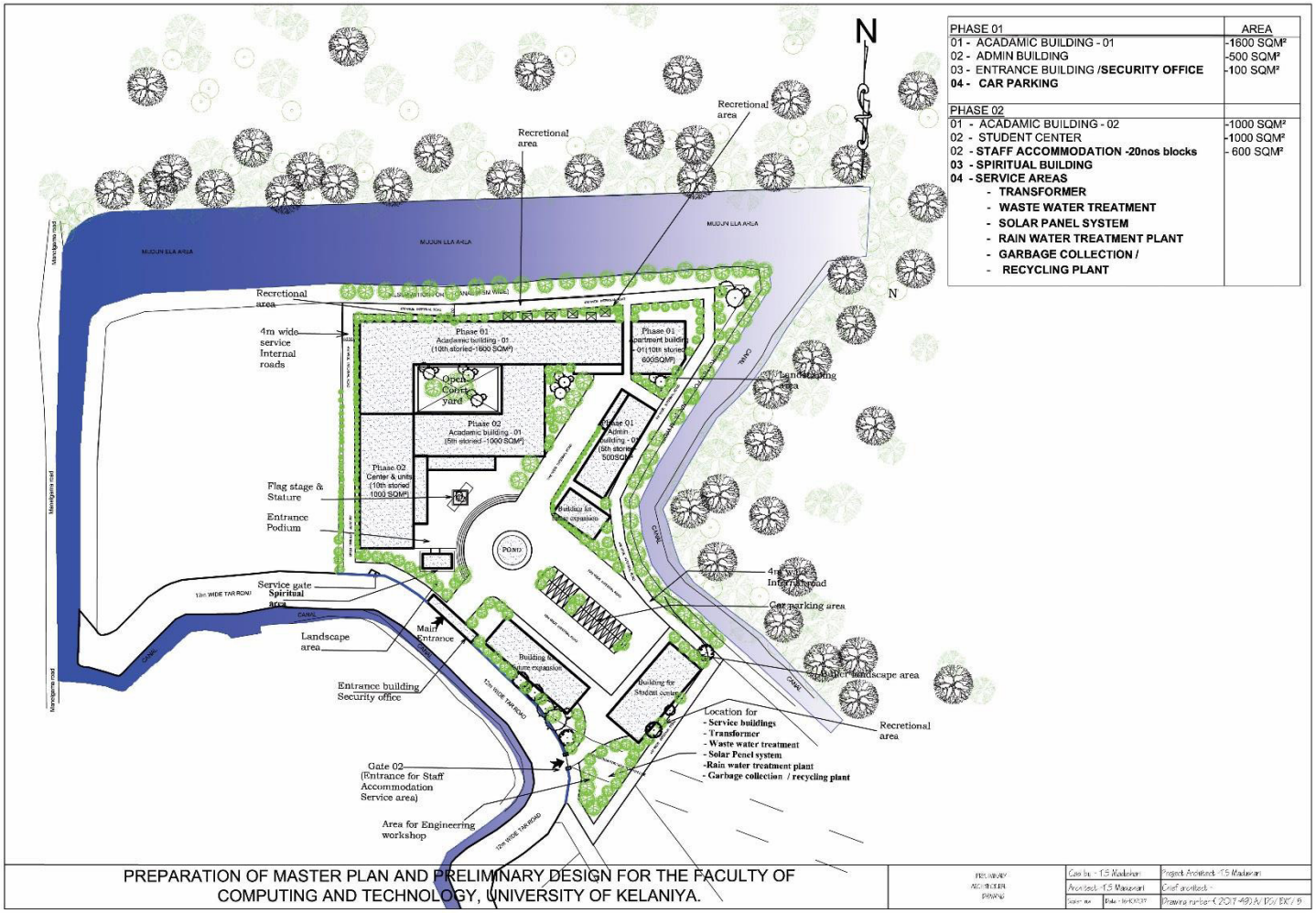


Figure 7: 3D view of the FCT building UOK

77. The floor plans for the respective buildings are provided in Annex 07.

78. The FTCP is designed based on the green building concept that includes energy saving systems such as inverter type air conditioning, LED Lighting and rain water harvesting. The wastewater that is generated from the facility will be directed to a treatment plant and then released for irrigation within premises. The building structure will be designed on a slab and beam with Alume Zinc roofing (marine quality) all doors and windows will be powder coated aluminum. Other design considerations include fire safety, air conditioning, septic tank for collection of waste water and sewage, and landscaping.

79. **Culvert:** There is a culvert across the access road leading to the project site. Considering the hydrological requirement, some additional culverts and replacement of some culverts would have to be proposed for the project.

80. **Road side drain**: Roadside drains shall generally be provided on both sides of the Embankment to safely carry the discharge from the embankment without eroding the pavements.

81. **Utilities**: To facilitate utilities to the FCTP which may include electric lines and poles, fiber optics, waterlines, etc., sufficient space should be provided on both sides of the access road. The size of pipes to carry utilities will be based on FCT occupancy size and utilities needed.

82. **Land Acquisition**: UOK has secured adequate land to build the faculty. Project will be built on 2 acre 1 route 35.46 perches land which is owned by UOK. The land was given by the SLLRDC to the University. The strategic location of this faculty will enhance the opportunity for students to carry out their academic and practical assignments.

83. **Demand analysis study**: Detailed analysis on demand for graduate students will be carried out to justify the public investment for the FTCP. Two types of data will be collected (i) employment outcome of recent graduates from the university (ii) industry demand for graduates form the technology discipline A socio economic analysis will be carried out in 2018 to justify the banks investment. This will provide information on the quality of the degree that is awarded and the level of service offered. It will provide information on the demand field areas for undergraduate course material to be developed. It is anticipated that this study be completed by May 2018 and it will be carried out by a consultant appointed by the ADB in due course.

84. This will be carried out by ADB with the data obtained by 1st of May 2018 from the Department of Census and Statistics. It will analyze and identify the demand for technology graduates in the labor market to justify the public investment in the technology education and on proposed FCT project.

85. The FTC at the University of Kelaniya with the establishment of the Industry Advisory Board (IAB) has developed strong industrial linkages that will assist the graduates to secure employment in the emerging job market. IAB is composed of representatives from chambers such as Ceylon National Chamber of Industries, Sri Lanka Chamber of Small and Medium Enterprises, and trade associations such as Sri Lanka Association of Software and Service Companies (SLASSCOM), as well as senior managers from reputed companies in Computing and Engineering sector.

FCTP improvement proposal: There will be more reforms within the FCT university system such as

- Implementation of modern teaching practices; Learning Centered Education (LCE) rather than the conventional practices.
- Establishment of expedient collaborations with the industry : this will help the students to receive continuous mentoring from the industry that will provide them the competency to enter the job market.

- Incorporation of latest technology such as nanotechnology to undergraduate curriculum- Establishing the nanotechnology center and the e-learning center which will flood the students with latest technological skills. This improvement proposal is done by a consultant that is appointed by the ADB for the project.

86. **Development of infrastructure**: Under the FCTP teaching and research buildings will be established at the site. This will allow the research students and academic staff to carry out their research. The FCT has pioneered new teaching and learning approach with Learning Centered Education concepts. Therefore the laboratory and the academic building at the FCT will be developed with educational equipment that caters for these needs.

87. **Building safety design and devices**: The building must have built-in alternative emergency evacuation routes for speedy evacuation of occupants during an emergency. In case of a major fire, the building components should withstand the fire for a nominated time period without a catastrophic failure occurring until all occupants safely vacate the building. Fire Precautions for Buildings: During the building design the Code of Fire Precautions for Buildings would have to be applied i.e. ICTAD Publication No. ICTAD/DEV/14 that deals with the regulations on fire prevention in a building. There are many more periodic maintenance requirements to be fulfilled to ensure structural integrity, user safety and internal hygienic environment of the building. Apart from the above the manual on 'Energy Savings in Buildings' developed by Sri Lanka Sustainable Energy Authority and the Construction Material Specifications developed by the former Institute for Construction and Development should be referred.

88. The building should have fire safety mechanisms installed to ensure fire compartments, separation and fire suppression. The portable and built-in fire-fighting equipment and apparatus must be in place at correct locations and at optimal operational levels for the fire brigade to control the fire.

89. **Sources of Construction Materials**: Soil and material investigation for a FCTP is very essential to assess the availability of suitable construction material in the vicinity of the project. This includes investigation of suitable borrow area for borrowing earth and quarries for stone /aggregate material and also for the other construction materials like cement, steel, sand, soil etc. ICTAD/DEV/17R specification will provide the guidance on site investigation for building and civil engineering works.

a. **Borrow Areas:** Potential sources of earth for the construction of embankment and soil infilling needs to be identified by the consultant design engineers and the contractors for the project and the access road to FCT. The suitability of borrow materials can be checked by laboratory tests such as proctor compaction test, gradation test, liquid limit plastic limit etc.

b. **Fine Aggregate Material:** Local enquiry suggests that extraction / mining of natural sand is banned in Western province. It is therefore suggested to use sea sand which can be obtained from the SLLRDC sand depositary that is 50m from the site.

c. **Cement**: Local and imported cement in bag or bulk form is available for construction. Cement shall conform to SLS 107 for building.

d. **Cement block & clay bricks**: these should be tested according to SLS 847 and SLS 39 for compressive strength, dimensions and water absorption.

e. **Steel**: High strength deformed bars manufactured by various steel manufacturing companies conforming to SLS standards are available. Before incorporation into the work, steel should be approved by the Engineer.

90. **Quality Control of Earth Work**: This includes excavation, filling and leveling of the earth work. The failure of quality control of earth works in building construction sites would lead to ground subsidence, cracks and structural failure in a part of or whole building .To minimize the delay during progress of earth filling work, it is necessary to select borrow materials well in advance to the earth filling work because it will take a considerable time duration for selecting, testing, obtaining approval etc. of borrow materials..

91. According to the site condition, it is necessary to select suitable machines for spreading, leveling and compaction. The capacity of the machine and size of the blade are important factors for selection. After completion of each layer of compaction, dry density has to be checked as specified in the specifications. The failures of earth compaction compliance with the specifications may cause future settlements, erosions or subsidence.

92. **Cost of the Project** : The total cost estimated for major items associated with the proposed project (including earth work, pavement, drainage structures and construction of buildings) have been established by application of appropriate unit rates to the estimated work item quantities derived from the results of surveys, test results and design analysis for the project. The estimated civil work cost in phases I

and II is 3661 million. The total project cost during phase I will be 3270 million. Refer table 09.

Table 9: Project cost as per the submission to National Planning Department

Activity	Cost (Rs. Mn)
i) Civil works (Phases I & II)	**3661**
ii) Furniture & equipment (Phases I & II)	**967**
iii) Books & software (Phases I & II)	**64**
iv) Short term training (Phase I)	**44**
v) Long term training – PhDs (Phase I)	**122**
vi) Visiting professors (Phase I)	**132**
vii) Research studentships (Phases I & II)	**160**

3 POLICY, LEGAL, AND ADMINISTRATIVE FRAMEWORK

3.1 Applicable Measurable Environmental legislations

93. In Sri Lanka, there are over 70 laws that directly or indirectly relate to protecting and conserving the natural environment and human health. While most of these laws address specific issues pertaining to environment in the respective sector, it was the introduction and enactment of the National Environmental Act (NEA) that provided the overarching legal basis for regulation of pollution and protection of the environment in a comprehensive manner.

94. The following section outlines the broad legal and institutional framework in Sri Lanka for environmental management, relevant to the proposed project. The legislations relevant to the project are listed below. Further details are provided in Annex 08. This project comes under the purview of the following sector level Acts. The EPL procedure under the CEA is explained in Annex 08 along with the rest of the laws that are listed below

a) The Constitution of Sri Lanka (Articles 18, 27(14), Articles 154 (A), 9, 19 and (III) 17)

b) National Environmental Act No. 47 of 1980 (and its amendments of 1988) EIA is covered under this Act

c) Disaster Management Act No. 13 of 2005

d) Pradeshiya Sabha Act No. 15 of 1987

e) Flood Protection Ordinance, Act No. 22 of 1955

f) Sri Lanka Land Reclamation and Development Corporation Act No 15 of 1968

g) State Land Ordinance, Act No. 13 of 1949

h) Soil Conservation Act, No. 25 of 1951

i) Mines and Minerals Act No. 33 of 1992

j) Fauna and Flora Protection Ordinance, Act No. 49 of 1983

k) Forest Ordinance, No 17 of 1907 (and amendments)

l) National Water Supply and Drainage Board Law of No. 2 of 1974

m)National Policy for Rural Water Supply and Sanitation of 2001

n) Prevention of Mosquito Breeding, Act No. 11 of 2007

o) The Urban Development Authority, Law, No 41 of 1978

p) Municipal Council Ordinances and Acts – Urban Council Ordinance 61 of 1939, Act 29 of 1947, Act 18 of 1979, and Act 13 of 1979

q) Land Acquisition Act No. 09 in 1950 and subsequent amendments in 1983 1nd 1986 Land Acquisition Regulations of 2008

r) National Environmental (Amendment) Act 47 of 1980 and its amendments

95. This is the law that incorporates and covers all aspects of the environment in Sri Lanka. The National Environmental Act (NEA) No. 47 of 1980 is the basic national decree for protection and management of the environment. The NEA has gone through several amendments in the past in a bid to continually improve and to respond to the challenging conditions. There are two main regulatory provisions under the NEA which is implemented by the Central Environmental Authority (CEA).

96. The Environmental Impact Assessment (EIA) procedure for major development projects has been published in 1993 and is available with the CEA. The EIA process is implemented through designated Project Approving Agencies (PAAs). The screening, scoping, formulation of initial environmental examination (IEE), environmental management plan (EMP) and procedures for IEE and EMP disclosure and public comments will be governed by NEA of 1980 and its subsequent amendments of 1988 and 2000, and by environmental regulations. Under the national regulations, the current development project of the VTI Hotel School does not require an IEE because it is not within a designated protected area.

97. The Environmental Protection License (EPL) is a procedure for the control of pollution. Regulations pertaining to this process have been published in 1990 and are available with the CEA EPL is issued on the regulations are gazette under Gazette Extraordinary No. 1533/16 dated January 25,2008, for a variety of sectors involving in manufacturing, construction and services.

98. **Conclusion**: Under local legislation, an IEE is not required as the development is categorized in the “un - prescribed projects. However, CEAs consent for the projects under non-prescribed category has not been obtained The process would have to be initiated for a EPL

99. National laws and regulations that can be relevant to the project are briefly described in Table10. Details on these applicable laws are covered in Annex 08.

100. **ADB Safeguard Policy Statement, 2009.** The Asian Development Bank has defined its Safeguard requirements under its ‘Safeguard Policy Statement 2009 (SPS 2009). The prime objectives of safeguard policy are to: (i) avoid adverse impacts of projects on the environment and affected people, where possible; and (ii) minimize, mitigate,

and/or compensate for adverse project impacts on the environment. And affected people when avoidance is not possible. This policy requires assessment, mitigation and commitment towards environmental protection. The extent of assessment depends on the category of the project. ADB's SPS 2009 classify a project depending on following three categories.

101. Category A: A proposed project is classified as category A if it is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An Environmental Impact Assessment is required.

102. Category B: A proposed project is classified as category B if its potential adverse environmental impacts are less adverse than those of category A projects. These impacts are site-specific, none or very few of them are irreversible, and in most cases mitigation measures can be designed more readily than for category A projects. An Initial Environmental Examination is required.

103. Category C: A proposed project is classified as category C if it is likely to have minimal or no adverse environmental impacts. No environmental assessment is required although environmental implications need to be reviewed.

104. **Conclusion**: The proposed project cause environmental impacts which are less adverse in nature and few of them are reversible and mitigation measures can be designed more readily for the identified impacts. To assess the impact the REA, IP and IR Checklist of ADB was followed As per the ADB's Safeguard Policy Statement the proposed FCT project of UOK has been classified as Category 'B' project requiring Initial Environmental Examination (IEE).

105. It also aims to identify any potential negative environmental or social impacts in the immediate vicinity or surrounding areas that maybe short term or long term. Accordingly a single consolidated IEE report is submitted for ADB to facilitate their decision making Clearances required for the Project.

106. A summary of the statuary clearances required for the FCTP is presented in Table-10.

Table 10: Statutory Clearances required for the Project

Type of Clearance	Activity	Name of the Authority	When required
Environment Clearance Environmental Protection Licensing) Regulation No. 1533/16of 2008	Implementation of the project and waste water treatment.	CEA	Before construction
Permission for storm water drainage and infilling	Implementation of the project. On regulations pertaining reservation and	SLLRDC	Before construction
Clearance for development activities	Implementation of the project and construction of the building. They will direct to obtain approval from the Kelaniya Pradeshiya Saba and CEA	UDA	Before construction
Local Government Authorities building approval	The Municipal Councils, Urban Councils and Pradeshiya Sabhas share the powers regarding the approval of buildings plans, control of solid waste disposal, sewerage and other public utilities. Under these laws the new construction requires approval. Adhere to building regulation	Local Authority (Kelaniya Pradeshiya Saba)	Before construction
Consent Department of Railway	Reconstruction of the culvert near the Wanawasala railway line is thought to improve the canal water circulation.	Sri Lanka Department of Railway	Before construction
Approval for removal of trees on site	Site clearance to have space for the building	DS	Before construction

	and to provide aces and material storage		
Consent from relevant government agencies	Construction of building and culverts and other drainage systems etc	Urban Development Authority, SLLRDC, CEA	Before construction
Consent to Ceylon Electricity board	Obtaining the electricity supply for the FCT complex	Ceylon Electricity Board	After completion of the building
Water Supply	Supply of Potable water for the facility and supply the certification of pumping drainage	NWSDB	After completion of the building

107. Apart from the clearances for the overall project work, the contractor, before starting the construction work, has to obtain required Clearances s listed in Table-11. for operating his equipment and carrying out construction work.

Table 11: Clearance required to be obtained by the Contractor

No	Construction Activity & Type of Clearance Required	Statutory Authority	Statute Under which Clearance is Required
1	Consent for Establishment of Stone Crushers and Cement Mixing Batching Plant	CEA	National Environmental Act No. 47 of 1980
3	Permission for extraction of sand, metal from soil	Geological Survey and Mines Burea (GSMB)	Geological Survey and Mines Bureau (GSMB) Act No. 33 of 1992
4	Location and layout of workers camp, & equipment and storage yards	Kelaniya Pradeshiya Saba	Local Government Ordinances and Acts –Urban Council Ordinance 61 of 1939, Act 29 of 1947, Act 18 of 1979, and Act 13 of 1979
5	Discharges from labour camp	Central Environmental Authority (CEA)	National Environmental Act Act No. 47 of 1980

			National Environmental (Protection & Quality) Regulations, No. 01 of 1990.
6	Disposal of solid and liquid waste	Central Environmental Authority (CEA)	National Environmental Act No. 47 of 1980
7	Noise and dust pollution during construction activities	CEA	Air (Prevention and Control of Pollution) Act, 1981 National Environmental (Noise Control)Regulations No. 01 of 1996
8	Disposal of spoil material garneted during building and construction	Kelaniya Pradeshiya Saba	National Environmental Act Act No. 47 of 1980
9	Revenue license for the heavy machinery and other vehicles at the work site	Office of provincial Commissioner for Motor Traffic the vehicle is being registered	Motor traffic Statute of Western Province No 7 of 1991.
10	Engagement of Labour - Labour License	Labour Commissioner	Shop and office Employees Act 1934 Employees' Trust Fund Act No 15 of 1980 established the Employees' Trust Fund (ETF). Employees' Provident Fund Act of 1958 Municipal Council Ordinances and Acts – Urban Council Ordinance 61 of 1939, Act 29 of 1947, Act 18 of 1979,
11	Engagement of Labour- • Social Security- • Labour Welfare- • Wages	Labour Commissioner (Ministry of Labour and Employment	The Employees' Provident Fund Act, 1958 & Miscellaneous Provisions 1975 Workmen's Compensation Ordinance of 1935 and subsequent Amendments Shop and Office Employees (Regulation of Employment and Remuneration) Act, 1954

			Factories Ordinance, 1942 2010 on fair treatment

108. **Construction and Demolition Waste**: When obtaining permission for building construction, a plan should be made available as to how to dispose the waste that is generated on site.

109. Every waste generator shall be responsible for collection, segregation of concrete, soil and others and storage of construction and demolition waste generated separately; deposit at collection centre so made by the local authority.

110. LA shall be responsible for proper management of construction and demolition waste within its jurisdiction including placing appropriate containers for collection of waste, removal at regular intervals, transportation to appropriate sites for processing and disposal **Table 12** Timeframe for Planning & Implementation.

Table 12: Timeframe for Planning & Implementation

Sl. No	Compliance Criteria	Duration
1	Identification of site for collection and processing facility	3 month
2	Commissioning and implementation	5 month
3	Monitoring by PIU	3 times a year

111. Present feasibility and cost for equipment and building of the FCTP at UOK were completed in December 2017. Bidding document was prepared for FCTP in Dec 2017 and technical bids will be evaluated by July 2018. The contracts for the civil works of this project are expected to be awarded by December 2018.

3.2 Administrative Framework

112. **Central Environmental Authority**: The CEA basically designs the scheme, procedures and standards to control the water, air & noise pollution, land degradation and hazardous substances and waste management.

113. CEA advise the MOERE on matters concerning prevention, control and abatement of water and air pollution; coordinate the activities of CEA & provide technical and research assistance; prepare manual, codes, guidelines & standards etc.

114. University of Kelaniya will be required to obtain an environmental recommendation letter or EPL from CEA. The NEA regulations stipulates that there will be three canteen facilities which provide seating capacity for 200 student at a time fall under EPL category B.

115. According to the BIQ, the proposed project falls in to the un-prescribed category. According to the BIQ and IEE/EIA Environmental Guidelines of CEA, the proposed project falls in to the non-prescribed category. Therefore environmental clearance for an IEE will not be required from government of Sri Lanka. CEA consent for the FCT development project under un-prescribed category has to be obtained through a letter. (Annex 09- BIQ has been filled out and ready to be submitted to CEA for environment clearance.)

116. The domestic waste water that will be generated during the operation of the facility will be collected to a septic tank and disposed at regular intervals. Before discharge treated water quality should conform to regulations No. 1534/18 dated 01.02.2008.

117. Sri Lanka Land Reclamation Development Authority (SLLRDC): Is empowered to take legal action against unauthorized reclamation activities and pollution of inland water bodies as well. As the site is located near Mudun Ella, UOK will be required to obtain approval for activities of earth work, site preparation and maintenance work on the canal reservation and proposed storm water drainage plan.

118. The internal drain network for the site should be included within the survey plan prepared by the SLLRDC on 20.11.2013. However, observations show that there is very little water flow in the canal system surrounding the project. Therefore UOK PIU needs to contact Kelaniya Pradeshiya Saba, Sri Lanka Railway Department and SLLRDC to reconstruct the culverts that are impeding the water circulation in the canal systems and avoid future risk of flood.

119. FCCTP is built in an area that is highly flood prone. In 2016 at Nagalagama Street which is close to the project site recorded 2.29 m MSL. MÄGA cement plant and Shanthis Viharaya which are other sites that are located close to the sites have recorded 1.5 feet of flood levels on previous flood occasions. The land is partly filled therefore the PIU of the UOK will need to obtain permission from SLLRDC to fill the land. Additionally PIU would be required to leave adequate reservation on the adjoining wetland for sake of the environment protection and disaster mitigation. The project management unit of the FCTP will need to reestablish the road drainage and

the storm water drainage system for the project site since proper mechanism is not available at the moment.

120. As the access road to the site is partially constructed at the time of this IEE report UOK will have to coordinate with SLLRDC to complete road and improvement of the canal system.

121. Popper management of the of the waste collection site that has been identified to be waste transit point located on the eastern boundary of the project site is important for the future development of the FCT of UOK. UOK should contact Ministry of Megapolis and Western Development and obtain the assurance that the identified metro Colombo waste transit site will become functional soon in 2020[6] and not be a permanent dump site.

122. Coordinate with the Kelaniya Pradeshiysa Saba on the open waste dumpsite on Manel Gama road. Obtain the assurance that it will be moved from the western boundary of the site to the new metro Colombo waste transfer site and properly managed.

.

[6] Metro Colombo Solid Waste Management Project : Ministry of Megapolis and Western Development August 2017

4 DESCRIPTION OF THE ENVIRONMENT

4.1 Methodology used for Baseline Study

123. Data collection and stakeholder consultations. Data for this study has been primarily collected through comprehensive literature survey, discussion with stakeholder agencies, and field visits to the proposed subproject site.

124. The literature survey broadly covered the following;

i. Project details, reports, maps, and other documents prepared by technical experts of the ADB PPTA team and discussions with technical experts of the PIU of UOK team, local authorities, relevant government agencies like SLLRDC, CEA, etc.

ii. Secondary data from previous project reports and published articles, and literature on land use, soil, geology, hydrology, climate, socioeconomic profiles, and other planning documents collected from government agencies (including the resource profile for the area) and websites.

iii. Several visits to the project sites were made during IEE preparation period between January 2017 to May 2018 to assess the existing environment (physical, biological) and gather information with regard to the proposed sites. Two separate studies were done to assess the risk of flooding and the importance of the biodiversity at the selected site

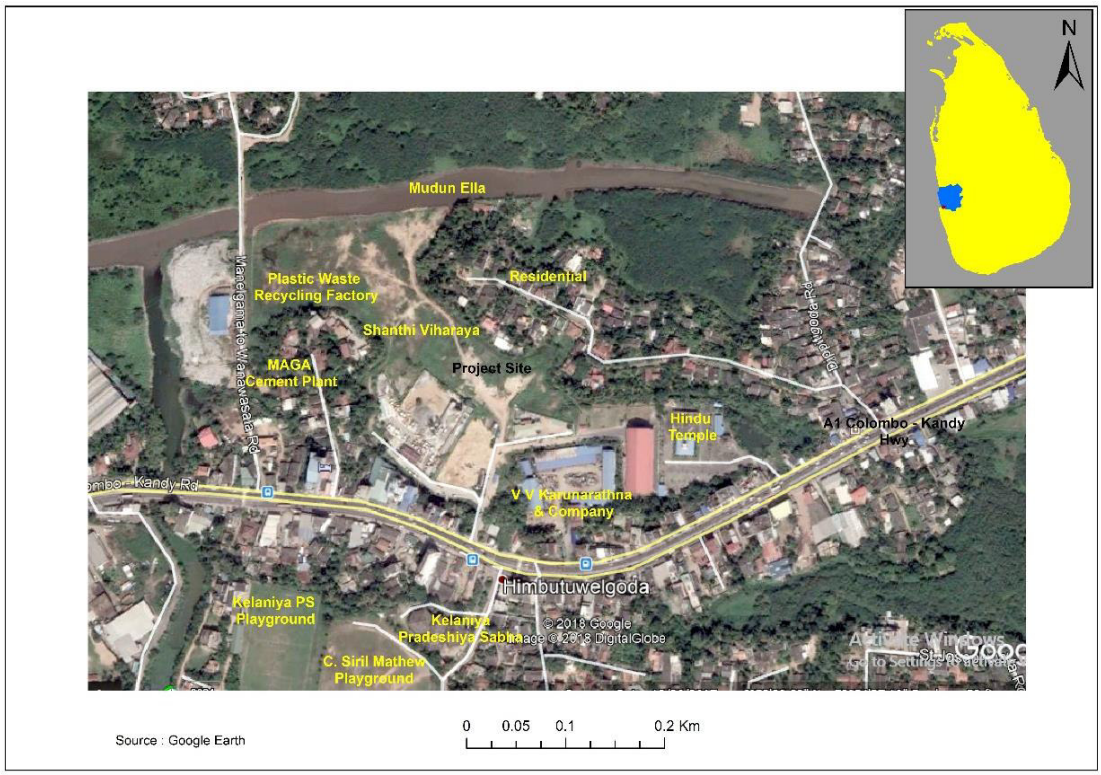
4.2 Location Area and Connectivity

125. Geographically, the project area is located at $8^0 21' 38.74''$ N latitude and $80^0 30' 12.18''$ E longitude in the Kelaniya Pradeshiya Saba limits of Gamphaha District, Western Province. The Project is located in the Kaleniya Division that covers an area of 2197.48 ha. Kelaniya Divisional Secretariat consists of 37 Grama Niladhari divisions. The project area comprises Kelaniya, Kiribathgoda and Paliyagoda.

a. The project site is 547m to the metro Colombo Solid Waste transfer site, 80 m to the Kelniya Pradeshiya Saba managed waste disposal site, 100m to the Buddhist temple Shanthi viharaya, 380.55m to hindu temple, 318.74m to Atomic Energy Regulatory Council, 297.31m to Don café, 297.31m to SLRDC office for sand deposit and 112.37m MÄGA Cement batching plant.

b. The Colombo Kandy A1 highway passes near the project site. Kelaniya Division is one of the main commercial hubs located 10km from the Colombo city. Wanawasala railway station is 1 km from the project site. The project area is 0.23m from the Bulugaha junction served with two bus stops. Project road predominately traverse through plain terrain. Refer Index Map - Figure 2 for location.

Figure 8: Map show the location of the project and the surrounding



Source: Prepared by TMS

- Land Use

126. The total land use coverage in Kelaniya is 2297.48 ha. The land use system of the region is dominated home gardens (848.67 ha). The built-up area consist 428.12ha while paddy land and wetlands accounts for 276.44ha. Kelani River and its tributaries cover 56.59 ha. Table 13 highlights the landuse patterns in the DSD.

127. Before urbanization occurred, Kelaniya was composed of wetland and paddy land[7]. The land use pattern in the project area today, is urban with predominately mixed development. Project surrounding land can be categorized into residential and commercial area (70%), protected mash area (25%) and streams (5%). Proposed site is a filled wetland (mainly abandoned paddy land). Land use of the project area

[7] Kaliniya DSD resource profile 2014

consists of private land, state land, residential land, industrial land, and several natural habitats, (wetland and streams).

Table 13: Land use Pattern

Land Use	Hectare	As % of the DSD
Kelani River	56.59	2.4%
Built – Up area	428.12	18.6%
Paddy and Wetlands	276.44	12.03%
Residential	462.5	20.13%
Home garden	848.67	36.93%
Cemeteries	3.34	0.14%
Playground	13.68	0.59%
land Filling	94.58	4.11%
Water retention areas	4.62	0.20%
Solid waste dumping yards	3.05	0.13%
Total hectare	2197.48	

4.3 Seismicity

128. The project is located in the western province of Sri Lanka which is not an active seismic region. The area does not have any potential risk of damage due to earthquake. However the stability of the bedrock and peat soil should be considered during building design.

4.4 Geology, Soil and Topography

129. The location is in the Kelaniya Divisional Secretariat which is geologically composed of gravel, alluvial soil and clay. The northern parts of the DSD is composed of alluvial soil while majority of the area is composed of gravel, The southern and the central parts of the DSD is mainly composed of an alluvial soil layer and clay is more predominant closer to the Kelaniya river and other associated water bodies.

a. The alluvial soil types are good for paddy cultivation and the project site is composed of highland series of rock types (permanently granulite facies rocks) of hornblende gneiss, biotite gneiss, quartzite, cordiertite garnet granulite or gneiss with the intrusions of granite, charnokite and charnokitic gneisses etc. some of the surface and the near surface material belong to Quaternary sediments. Part of the soil

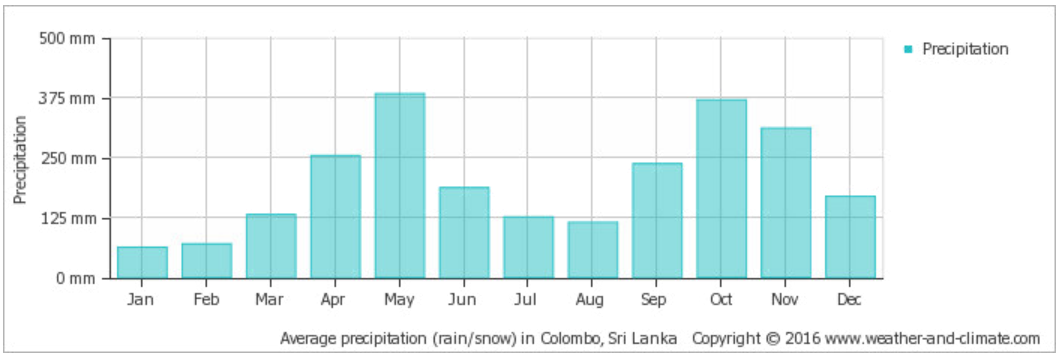
overburden consists of soil formed by weathering and underlying Precambrian metamorphic rocks[8]

b. The initial designs of FCT academic building should consider that net allowable carrying capacity of 3.0MN/m^2. The carrying capacity in skin friction within the basement rock or the ultimate skin friction coefficient is 140 kN/m^2, which is less than ICTAD recommended guidelines and propose the design. Refer the geotechnical soil assessment recommendation.

4.5 Climate and Meteorology

130. Climate conditions in the study area: Kelaniya division lies within the wet zone and according to agro ecological classification, the project area comes under the category of WL3 (Wet Zone Low Country). It experiences a uniform rainfall pattern and receives rainfall from both monsoon periods as well as during inter-monsoon periods (South-West Monsoon from June to September, North-East Monsoon from December to March and in between two inter-monsoon periods of two months each). Rainfall and Temperature details of the project area are given in the Figure 9 Rainfall at FCT Project area receives highest rainfall (266mm) in the month of April and the lowest (88mm) in the month of January with an average annual rainfall of about 2216.7mm.

Figure 9: Average monthly precipitation over the year (rainfall) at the project site



131. The temperature in the area is somewhat constant throughout the year (daily mean is about 27.2 °C). Past meteorological data was collected from the nearest Kribathgoda station for the period of January 1, 1980 to December 31, 2016 establish the baseline

[8] Geotechnical investigation for proposed building for faculty of computing and technology, university of Kelaniya ,: April 2018

climatic conditions of the area. The key parameters of collected meteorological data have been summarized in Table 14

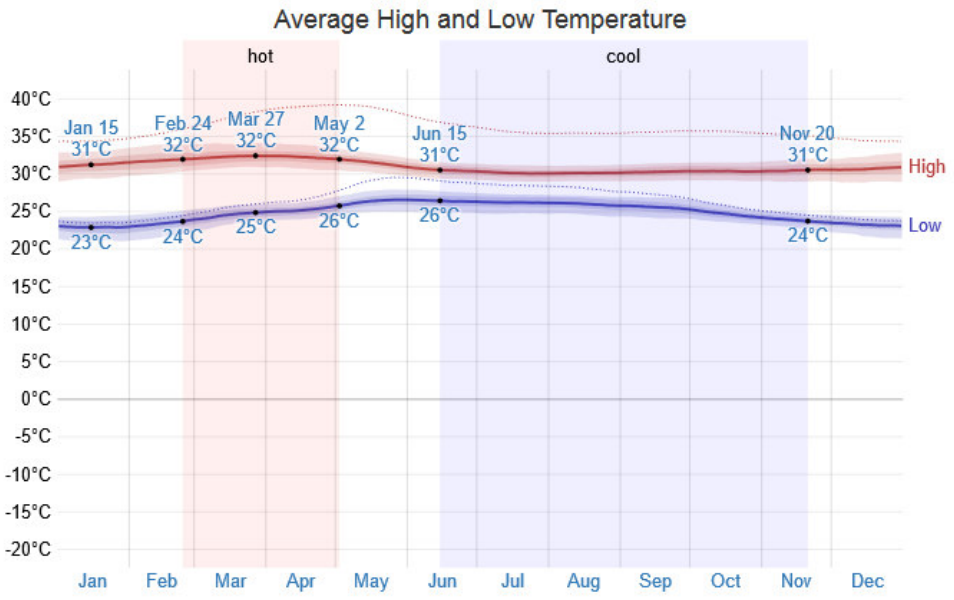
Table 14: Summaries of the Climatological Data (based on the Kiribathgoda Station)

Parameters	Monthly	Annual
Mean daily Max temperature (^{0}C)	31 ^{0}C	32.22 ^{0}C
Mean daily min temperature (°C)	23 ^{0}C	23.88 ^{0}C
Total rainfall (mm)	237mm	3450 mm
Wind speed (km/h)	9.3 km/h	10km/h
Cloud cover (partly cloudy/ mostly cloudy)	Partly cloudy – 12% of the time	Mostly cloudy – 56% of the time

Source : Sri Lanka Meteorological Department Monthly Range; 2 Annual Mean/Total

132. **Temperatur**e: The hot season lasts for 2.3 months, from February 24 to May 2, with an average daily high temperature above 32°C. The hottest day of the year is March 27, with an average high of 32°C and low of 25°C. The cool season lasts for 5.2 months, from June 15 to November 20, with an average daily high temperature below 31°C. The coldest day of the year is January 15, with an average low of 23°C and high of 31°C. The monthly mean minimum and maximum daily temperature chart shown in centigrade is given in Figure 10.

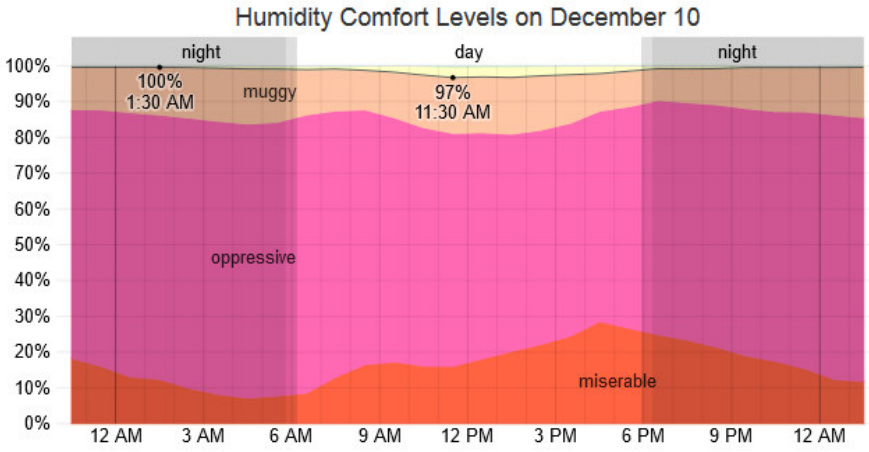
Figure 10: Variation of Temperature Average in the Project Area



The daily average high (red line) and low (blue line) temperature, with 25th to 75th and 10th to 90th percentile bands; thin dotted lines are the corresponding average perceived temperatures.

133. **Humidity**: Unlike temperature, which typically varies significantly between night and day, dew point tends to change more slowly, so while the temperature may drop at night, a muggy day is typically followed by a muggy night. The perceived humidity level in Kelaniya, as measured by the percentage of time in which the humidity comfort level is muggy, oppressive, or miserable, does not vary significantly over the course of the year, staying within 4% of 96% throughout.(Refer table 11)

Figure 11: Humidity comfort level

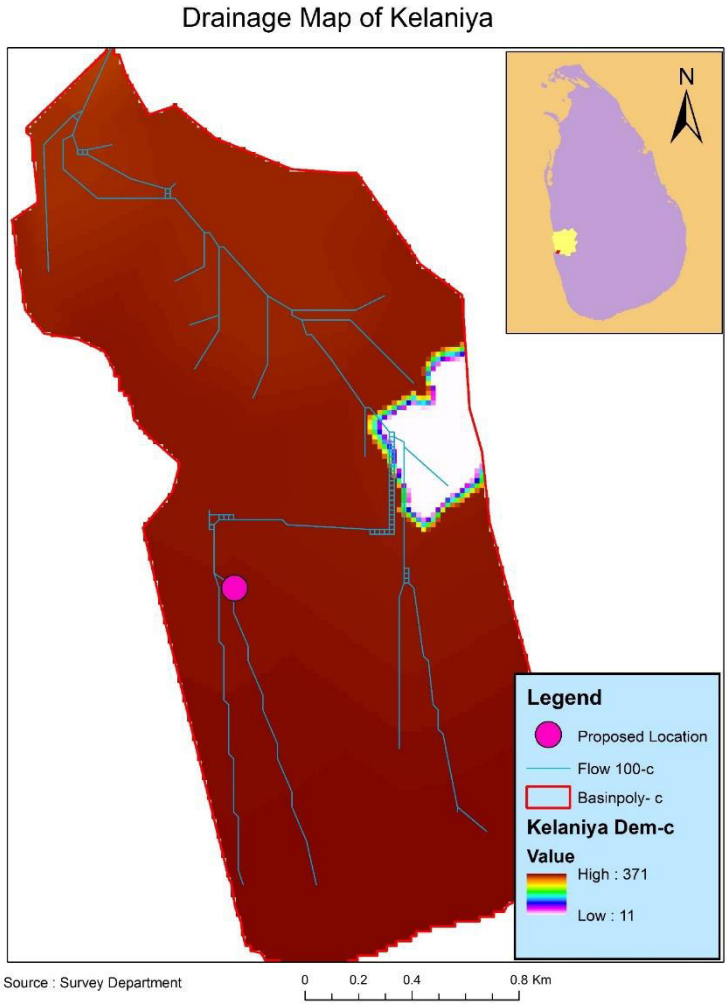


The percentage of time spent at various humidity comfort levels, categorized by dew point: dry < 13°C < comfortable < 16°C < humid < 18°C < muggy < 21°C < oppressive < 24°C < miserable. Civil twilight and night are indicated by shaded overlays.

134. **Wind speed and direction: The** average hourly wind speed in Kelaniya experiences significant seasonal variation over the course of the year. The windier part of the year lasts for 5.3 months, from May 5 to October 13, with average wind speeds of more than 15.7 km per hour. The calmer time of year lasts for 6.7 months, from October 13 to May 5. The predominant average hourly wind direction in Kelaniya varies throughout the year. The wind is most often from the west for 8.3 months, from March 2 to November 11, with a peak percentage of 98% on July 15. The wind is most often from the north for 3.7 months, from November 11 to March 2, with a peak percentage of 77% on January 1.

135. **Drainage and the River Systems:** Mudun Ela and Sepala Ela connect to the Kalu Oya and after connect to the Kelani River. Drainage is controlled by topography. The study site is currently managed by SLLRDC and is maintained largely as a wetland which gathers local flood waters of the high ground where settlements are abundant. Water from the wetland drains in to the Kelani River which is at about 2 km in direct distance to the wetland.

Figure 12: Drainage map of proposed site



Source: Prepare by TMS

136. The drainage pattern of the study area is dendritic to semi dendritic. The study area is located downstream of the Mudun Ela basin. The Mudun Ela and Sepala Ela, support the drainage system in this area[9]. The watershed of Mudun Ela is bounded by Wattala in the north, Kelaniya in the east, Kelani river flood bund in the south, and Colombo - Negombo road on the west as shown in Figure [110.] This can be identified under 3 catchment sub sectors such as Peliyagoda, Dalugama – Telengapatha, Naramminiya-East of Kandy Road.

137. The observed flood levels of Kelani River at Nagalagama Street which is very close to the proposed project are as follows:

[9] Kelaniya DSD Resource Profile 2014
[10] Flood Risk Assessment Report For Proposed Science And Technology Site at Dalugama 2018

- 3.87 m MSL in Year 1947[11]
- 2.88 m MSL in Year 1989[12]
- 2.29 m MSL in Year 2016[13]

138. **Flood Risk Assessment:** A flood risk assessment was conducted in the month of February, 2018 to study the risk of flooding in the project area. (Refer Annex 10) A very detailed analysis has been carried out to determine flood impact of the proposed project subjected to the current maintenance aspect, flood situation and flood mitigation approach. The study analyzed secondary data that dated back to 2003. Detailed assessment of flood risk has been carried out by taking into consideration the catchment characteristics, location of the project site, topography, proposed master plan, existing drainage network, degree of flood and historic observed data.

a. The study involved tasks such as
   - **i.** Rainfall analysis and development of updated IDF curves.
   - **ii.** Setting up of hydrological and hydraulic models.
   - **iii.** Calculation of probable floods and generation of flood inundation maps and their floods risk to the proposed project

b. Average height of the flood bund along the Kelani River is at 4.57 m MSL in the vicinity of the project area. However due to low elevation of marshy area, it is subject to local flooding in its own catchment during rainy season. Therefore well designed drainage scheme for the Mudun Ela project is being implemented by SLLRDC.

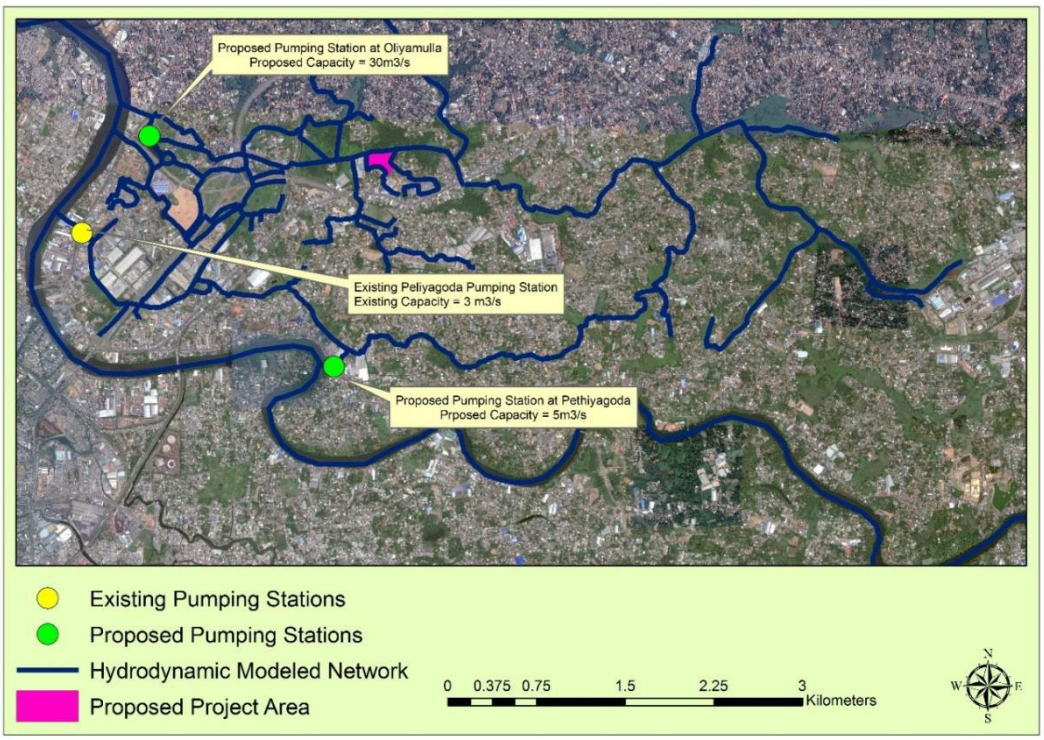
c. This includes action to provide an improved storm water drainage system, main canals and lakes and establishment of three pumping stations. These pumping stations will be regulated by SLLDC & the Irrigation Department. One such pumping station has been already constructed at Peliyagoda. Other two pumping stations have not been constructed yet.

d. There is a future proposal to establish pumping stations and mitigation the flooding in the Mudun Ela basin. Updated drainage proposal for the basin is shown in Figure 12 &16.

[11] Ibid
[12] Ibid
[13] Ibid

e. To obtain information on when the other proposed pumping stations would be installed, the Client would need to consult SLLRDC to receive latest information on the scheduled dates of implementation[14].

Figure 13: Pumping stations nearby project site



Source: Flood Risk Assessment for Project Site

f. Based on the results of the Model Studies during this assessment the following was highlighted.

i. From model results for existing situation, it was found that the existing ground level of the project site is not protected for 25 year return period.

ii. Even after implementation of proposed drainage improvements, it is not possible to expect safety of the project at 1.5 m MSL without raising the existing ground at this location. Ground levels to be raised by about 1.25 m[15].

iii. The required level of reclamation is dependent on factors such as

[14] Ibid
[15] ibid

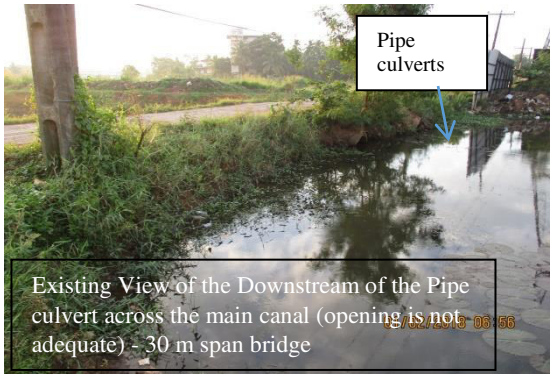
iv. Protection level of the proposed infrastructures

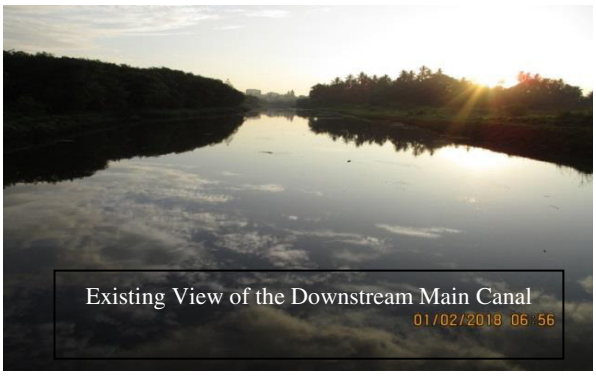
v. Maintenance of the sewerage system during floods.

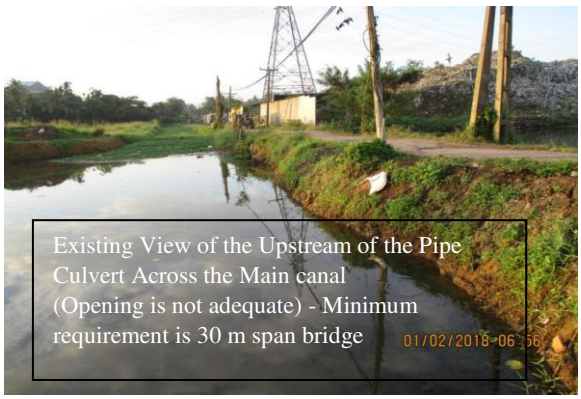
vi. Surface drainage system within the project area for future development to be developed.

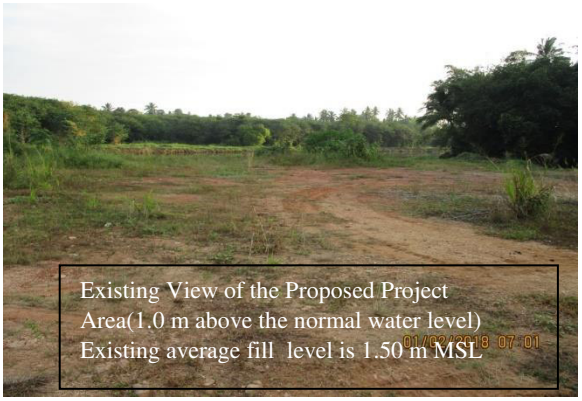
139. On site observations show that currently project site is supported by a poor drainage system which is not regularly cleared nor maintained properly. Figure 13 show the drainage system surrounding the site.

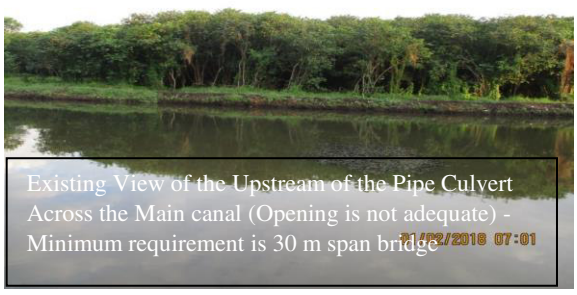
Figure 14: Plates on the drainage system adjoining the site











a. From the above plates on the drainage system of site it can be concluded that SLLRDC does not clean or dredging Mudun Ela canal on a regular basis according to a schedule. On the other hand Kelaniya Pradeshiya Sabhas does not maintain the local drainage which results in the canal water being stagnant.
b. Presently at the site, the existing average fill level of the project area: 1.50 m MSL. The final recommended fill level after considering the flood and sewerage disposal impacts of the project is 2.75 meter above MSL Therefore the total compacted quantity of gravel required to fill the land up to the final level is around 38,000.00 m^3 which will cost about Rs 60 million.
c. In 2016 the project associated areas experience 137.7mm of heavy rains[16] that resulted in a flood. The flood affected area for Mudun Ella basin developed by Department of Irrigation flood is show in Figure 15. The project area was flooded in 2016.
d. Years 2016 and 2010 the surrounding area of the project site experienced flooding. Maga cement batching plant located adjoining the site was flooded. Figure 16- Flood situation at Maga cement batching plant adjoining the project site.
e. DPC level of an unprotected house in the vicinity: 2.04 m MSL and it was flooded in 2010[17].
f. **Conclusion** The flood risk assessment concludes that there is no risk of flooding during extreme (25 year and 50 year and 100 year floods) provided the project

[16] Sri Lankan floods 2016- Wikipedia website https://en.wikipedia.org/wiki/2016_Sri_Lankan_floods
[17] Flood Risk Assessment 2018

site is above 2.50 m MSL. Therefore it is recommended to fill the project site at least up to 2.75 m MSL by keeping minimum freeboard. DPC level of the proposed building should be 0.50 m above the final reclamation level[18].

g. DPC level of the proposed buildings should be 0.50 m above the recommended fill level. DPC level of the proposed building should be 3.25 m MSL. The SLLRDC has proposed pumping station with drainage canal system to reduce the flooding in the area. One pumping station is already constructed together with main canal system. Proposed pumping station at Oliyamulla will be implemented in near future.

h. However this flood risk assessment did not in detail evaluate the scenarios of flood impact surrounding residencies if the project area is reclaimed and developed. Our consultations with the surrounding stakeholders revealed that the flood level have increased over the year due to reclamation of surrounding lands (refer figure 15 and 16).

Figure 15: Flood inundation area map for Mudun Ela basin 201

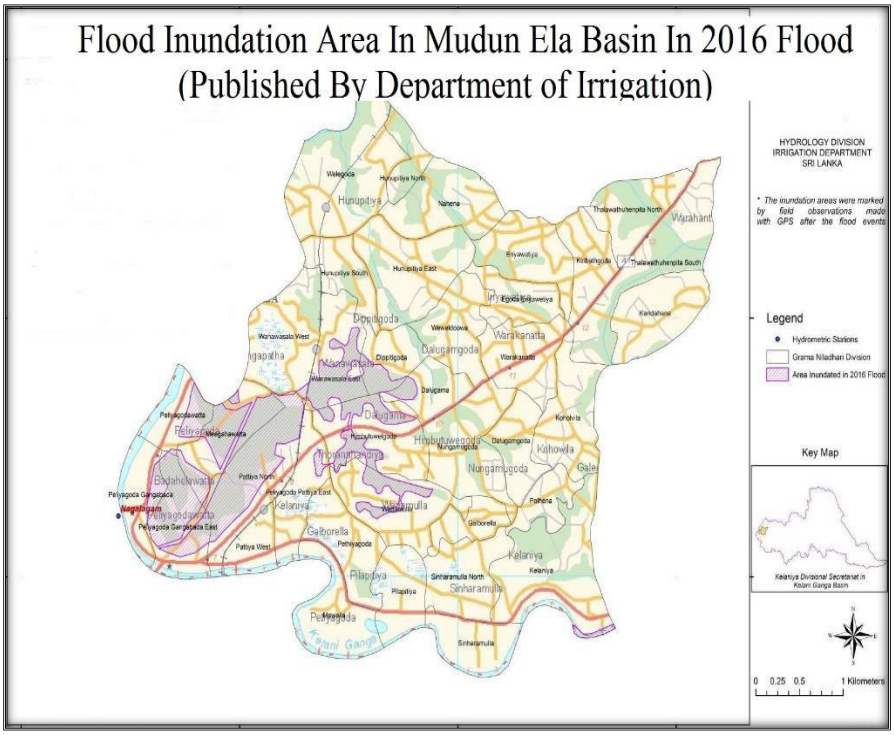
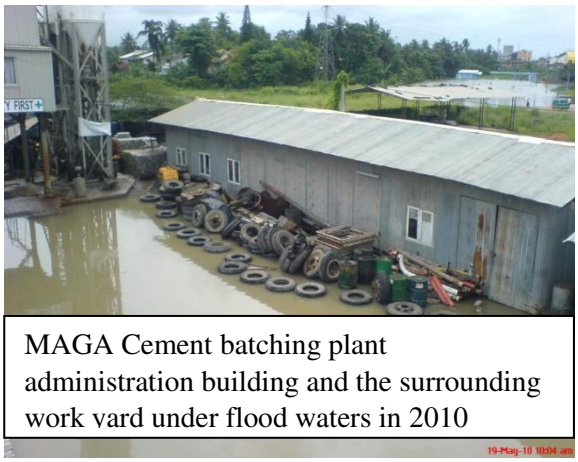


Figure 16: flooding situation at Marga site

[18] Ibid


MAGA Cement batching plant administration building and the surrounding work vard under flood waters in 2010

4.6 Ambient Air Quality

140. To draw up a baseline status of the ambient air quality the UOK will take the measurements prior to the commencement of the development project.

141. To assess the baseline value for the background noise level, ambient noise monitoring will be conducted by the UOK prior to the construction activities at the site.

4.7 Surface and Ground Water Quality

142. The baseline data on water quality will be collected for two locations within the project area by the UOK and will be monitored, analyzed and assessed during the construction and operational period. The water quality results will indicate quality of the adjoining surface water. An assessment of water quality will be done to check coliform count, BOD, COD to obtain the baseline value. Before the construction, it is recommended that the above test be carried out. The geotechnical report states that the groundwater quality is acidic with pH 6.66.

- The project site runs a possible risk of flooding during the rainy season. The main cause for flooding can be attributed to :
- Discharge from catchment area itself
- Floods in the lower basin due to heavy rain in the upper catchment
- Insufficient discharge from the Kelani river outfall due to the high tidal effect
- Insufficient canal capacity to carry high runoff

4.8 Ecology and Biodiversity

143. Introduction: A rapid bio diversity assessment was carried out in January and February, 2018 to assess the whether there were any threatened or endemic species within the project area. The study area is a flat marshy land located in the low country wet zone and is in the WL3 agro ecological zone and floristic region 1[19]. (Refer Annex 11)

a. Initially, the whole study site was rapidly surveyed to identify different micro habitat types. Based on this initial survey, sampling points and transects were selected for various taxonomic groups as well as to cover all the micro habitats identified. Then transects were confined to the canal embankments, roads and

[19] Rapid Biodiversity Assessment 2018

along other higher ground. Faunal sampling was repeated twice in two months in the same plots & transects. Floral sampling was done only once since there was no considerable changes anticipated within two weeks in the vegetation. The study site is shown in Fig 16 and location coordinates are given in Table 15 and Table 16.

Figure 17: Location of the project area with the sample points

Table 15: Sampling locations of the terrestrial flora & fauna

Plot	Latitude (N)	Longitude (E)	Alt (ft)	Vegetation type
1	6.9711	79.9029	18	Sedges
2	6.9705	79.9021	14	Sedges and semi aquatic herbs
3	6.9729	79.9025	19	Annona woodland
4	6.9716	79.9034	19	Annona woodland
5	6.9712	79.9040	12	Annona and semi aquatic herbs
6	6.9715	79.9053	22	Annona woodland
7	6.9725	79.9047	21	Disturbed vegetation
8	6.9727	79.9042	22	Home garden
9	6.9724	79.9059	28	Annona woodland
10	6.9718	79.9082	21	Annona woodland
11	6.9717	79.9091	14	Sedges
12	6.9705	79.9085	17	Annona woodland
13	6.9720	79.9045	11	Panicum & herbs
14	6.9693	79.9060	23	Panicum & herbs

Table 16: Sampling locations of the aquatic flora & fauna

Plot	Latitude (N)	Longitude (E)	Alt (ft)	Vegetation type
1	6.9718	79.9017	15	*Eichhornia crassipes*
2	6.9705	79.9016	12	*Eichhornia crassipes*
3	6.9710	79.9039	11	No vegetation
4	6.9705	79.9041	9	No vegetation
5	6.9705	79.9058	21	*Hydrilla verticillata*
6	6.9713	79.9060	22	No vegetation
7	6.9714	79.9074	19	No vegetation

144. Several micro habitats were identified during the survey and these include;

i. **Reed and grass dominated vegetation:** About 20% of the study area falls within this category. The dominant large sedge species of this habitat are *Actinoscirpus grossus* and *Rhynchospora corymbosa.*

ii. **Annona woodland:** Woodland consisting of *Annona glabra* covers about 50% of the study site. More than 90% of the sample area is composed of invasive vegetation.

iii. **Disturbed scrubland:** 5% of the total study area is subjected to illegal garbage dumping. It consists of sparse vegetation of exotic weeds and shrubs. Butterflies are quite common in this habitat. Out of the 33 species of butterflies observed in the study area 31 species of butterfly that were recorded fall under the IUCN category of least concern (LC). The Smallest Swift a nearly threatened species (NT) and Blue Glassy Tiger vulnerable species (VU) were recorded at the site.

iv. **Land filled habitat (actual project area):** The invasive grass species, *Panicum maximum,* is growing in this habitat. Herbaceous weeds are also growing in the location.

v. **Aquatic habitats:** About 5% of the study area consists of surface water bodies with stagnant water. Small canal along the eastern boundary of the site is fairly unpolluted.

vi. **Flora:** A total of 131 angiosperm species belonging to 49 families were identified within the study area. Highest number of species were represented by the family Fabaceae (19 species) followed by families Convolvulaceae and Malvaceae (08 species each). 26 families were represented by only a single species (Annex 11 Table 1). Among the total number of recorded species, 83 (63.35 %) species were native to Sri Lanka while the remaining 48 (36.65 %)

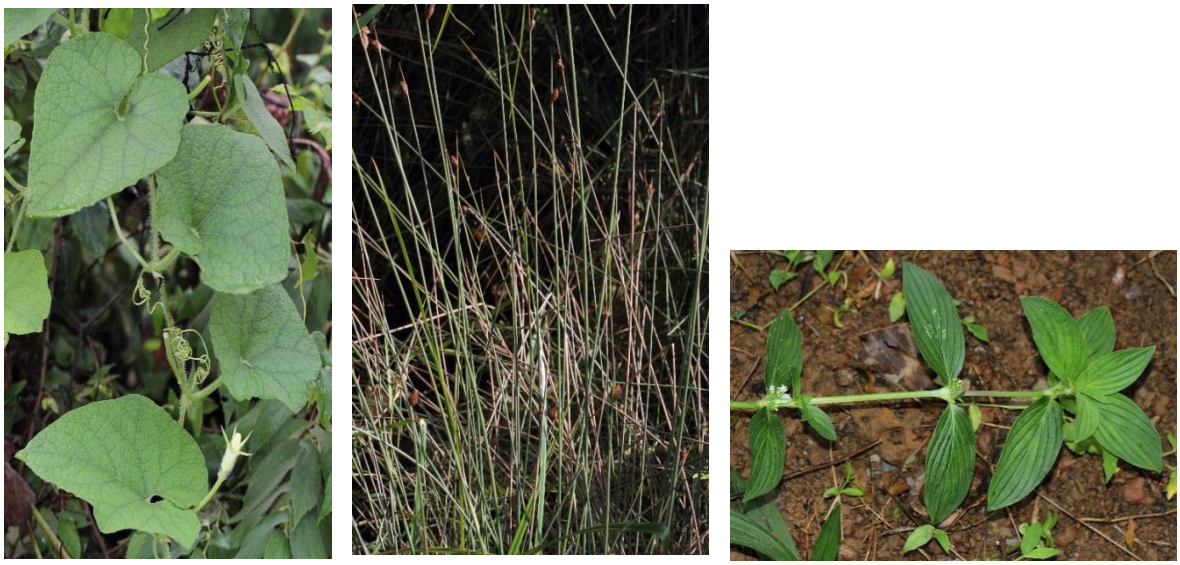
species are either naturalized exotic species or invasive alien species. There were no endemic plant species found in the study area. Most of the native plants in the site were common species, where 73 of them were listed as 'least concern' and only 4 species as 'near threatened' in National Red Data List, 2012. Three species which belongs to 'threatened' categories were recorded in the study site. (Refer table 17 & Figure 17)

Table 17: The threatened species recorded in the study site

Family	Species	NCS	DS
Cucurbitaceae	*Gymnopetalum scabrum*	VU	Native
Cyperaceae	*Lepironia articulate*	VU	Native
Rubiaceae	*Exallage auricularia*	VU	Native

Abbrevations: NCS – National Conservation Status; **DS** – Distribution Status; **VU** – Vulnerable

Figure 18: Sample plates of floral species



Gymnopetalum scabrum (NCS – VU) *Lepironia auriculata* (NCS – VU) *Exallage auricularia* (NCS – VU)

145. Four trees were found at the project site and these all wetland associates species. These were invasive species found in urban wetlands.

146. **Fauna:** The recorded fauna species of the study area comprised of 119 vertebrates and 60 invertebrate species. Avifauna is the most diverse taxa observed with 67 species while butterflies are the second most diverse group with 33 species (see Table 18 for a summary. The detailed list of animal species observed in the study site is

given in Rapid Bio diversity Assessment Annex 1in Part II Annex 11, Tables 2-8). Figure 18 shows pates on few least concerned species of fauna found in the project site.

Table 18: Summary of fauna species recorded

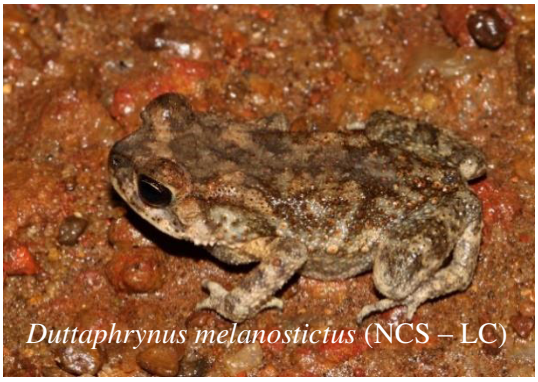
Taxa	Species	Endemics	Exotic [1]	Threatened				NT
				CR	EN	VU	Total	
Dragonflies	21	0	0	0	0	1	1	4
Butterflies	33	0	0	0	0	1	1	1
Mollusacans	06	1	1	0	0	0	0	1
Freshwater Fish	14	0	4	0	0	0	0	0
Amphibians	07	1	0	0	0	0	0	1
Reptiles	18	2	0	0	0	0	0	1
Birds	67	0	7	0	0	0	0	2
Mammals	13	1	0	0	2	1	3	0
Total	179	5	12	0	2	3	5	10

Abbreviations used: [1] - Migratory species of birds were listed under this category; **CR** - Critically Endangered; **EN** - Endangered; **VU** - Vulnerable; **NT** - Near Threatened

Figure 18: Endemic Species


Asian Groundling (NCS – LC)


Wandering Wisp (NCS – LC)


Duttaphrynus melanostictus (NCS – LC)


Squirrel (NCS – LC)

Five endemic species of fauna were recorded during the survey period within the study area. These comprised of a mammal species - Sri Lanka purple-faced langur (*Semnopithecus vetulus*), two reptiles, namely, the common Lankaskink (*Lankascincus fallax*) and the Sri Lanka checkered keelback (*Xenochrophis asperrimus*), one amphibian – the common shrub frog (*Pseudophilautus popularis*) and one mollusc (*Acavus phoenix)*. Out of these, only the purple-faced langur is recognized as a species with a risk of extinction at the national level. The other four species are widespread endemics.

147. **Conclusion:** Based on the findings of this study, there is a moderately rich assemblage of fauna and flora including few species of endemic and threatened species. There are many drivers of change operating in the wetland ecosystems such as spreading of invasive species, encroachment, unregulated waste disposal to the ground as well as to water and changes in the hydrology as a result of flood management. With these environmental pressures, it would be difficult to maintain the ecological balance in and around the project site unless there is a well thought out holistic management plan for the broader area.

4.9 Educational, Medical and Religious Properties

148. Within Kelaniya DSD there were 23 pirivena schools, 6 central governmental schools, 26 municipal council schools, 43 Buddhist dharma schools, 10 Christian dharma schools, and 3 Islamic schools.

149. Kiribathgoda government hospital is the main hospital in Kalaniya DSD. There are 33 midwifes and 6 health officers within the DS. For maternal care, there are 6 maternal clinics with one Ayurveda hospital. Kelaniya Raja Maha Viharaya which plays an important role in the Buddhist culture is an archeologically important site. The existence of the Vihara dates back to 5th century BC in Mahawansa (prehistoric records). The Viharaya is located 2.52km from the project site. It is also an important tourist destination because of its famous paintings and sculptures by Solias Mendis depicting various events of the Sri Lankan history.

150. The Vidyalankara Pirivena (school for the Buddhist priests) is one of the largest Buddhist pirivenas in the country and in 1978; it became the University of Kelaniya.

4.10 Demographic details of affected population

151. There is a total of 37 GN Divisions within the Kelaniya Divisional Secretariat. The total DS population is 136,092 of which 49% % is male and 51% is female. Kelaniya is predominantly a Sinhala area having 84% Sinhala, 6% Tamil, 6% Lanka Yonaka, 4% other (including Indian Tamil, Burgher, Malay, Baratha, Lanka Chetty). When considering the ethnicity within the DSD, 75% of the population is Buddhist, 5% Hindu, 9% Islam, 9% Roman Catholic, and 2% are Christian. There were 51,111 housing units.

152. Agriculture and Livestock practices: Within Kelaniya DSD, cultivation of vegetables plays a more important role than paddy cultivation. Vegetable varieties such as brinjal, radish, long beans, bitter gourd, etc are cultivated. Apart from vegetables, other crops such as flowers, fruits and mushroom are also cultivated. Livestock also plays an important part in economic activities in Kelaniya DSD. However, due to the land unavailability and urbanization, space for livestock rearing is limited.

153. **Industry and Economy**: Prehistorically, Kelaniya was famous for the clay industry. However, in the modern context Kelaniya DSD is in close proximity to the export processing zones Biyagama and Katunayake. The project site is located 5km and 11,7 km from each of these zones. Other industrial zones and such as the Watuwala, Ekkala, Setswana industrial processing zone and Colombo port and harbor are located close to UOK.

154. The agriculture sector provides employment for 0.95%, 4.5% in industrial sector and 6.4% in service sector in total labor force in the Kalaniya DSD. Population in Kelaniya engages in agricultural, industrial and fishing with some employed in the government sector. The predominant work force in Kelaniya engages in the service and industry sectors.

4.11 Analysis of alternatives

155. Although the proposed Technology Faculty Development project is located in close proximity to a wetland, impacts associated with construction stage are temporary and short term. Any long term impacts can be managed by adhering to the ESMP. Also, there is no existing facility in the vicinity that can be developed as an alternative to the proposed project. Therefore, examination of

alternatives to the project‘s location, design, technology, and components show that it is compliant:

156. By looking at the Table 19 below it can be concluded that “With” project scenario, with positive/beneficial impacts will greatly enhance social & economic development of the region and improve the environment, when compared to the “Without” project scenario, which will further deteriorate the existing environment and quality of life. Hence the “With” project scenario with some reversible impacts is an acceptable option rather than the “Without” project scenario. The implementation of the project therefore will contribute positively to improve the environmental quality in area and the associated surroundings. It will result holistic development of the economy and improve the region and the country.

157. There will not be considerable increase in the pollution levels during construction. Dust and particulate matter during construction will affect the air quality on a short-term basis. It will improve the access road to project site It will provide mitigation not only for air, noise, vegetative cover; wildlife and soil erosion but will also provide other appropriate mitigative measures such as maintaining reservation on the banks of the Mudun Ella canal and landscaping, negative impact on the environment.

158. The FCT Project of UOK forms an important training center for the technology students and since is it located close to major EPZ such as Katunayake and Biyagama, and Colombo which is the business capital in Sri Lanka. The proposed improvement project infrastructure would help to train graduates in computing/ICT, engineering technology under modern conditions and standards. The proposed building for the FCT will ensure that highly skilled technology trained graduates with a competitive edge in the job market are produced. Keeping this in view, the site conditions and the scope of development of the area, the ‘With’ and ‘without’ project scenarios have been compared as shown in Table 19.

Table 19: Project Scenario

With Project		Without Project	
Impacts		Impacts	
Positive	**Negative**	**Positive**	**Negative**
Provision of facility to train graduates that are geared to job market and economic and best use of the available space	Water retention surrounding area reduced	Nil	Unemployed graduates who cannot secure jobs are trained which become a social problem of unrest.
Use of the land that could not be used for other purpose except as flood retention area is being used to improve the regional economy and education.	May contribute to increased flooding in the area.	Land widely available for flood water retention. Reduced the threat of flooding for surrounding community	Nil
Improvement in ecology through maintenance of the cannal bank and other flood retention work	Impact on the fauna that was foraging in the fresh water canal	Nil	Increased flooding in the adjoining area and the project site
Improved drainage in project site and the surrounding area	Loss of new habits for the fish species and other fauna and floral species in the area.	Nil	Flooding conditions during rainy season will be increased
Enhanced trade and commerce	Increase of noise during the construction phase	Nil	Microlevel trade in the area will be limited
The dust associated with vehicles movement on access earth roads will also be eliminated	Short term increase in dust due to earth work	Nil	Further deterioration of the project access road
Increased access to job markets	Nil	Nil	Reduced employment/ economic opportunities
Employment to local workers during the execution of the project	Outsourcing people from other parts of the country will increase traffic congestion and demand for logistics	Nil	
Better access to other social services such as communication centers, and food cafes	More social networking facilities will create social unrest	Nil	Arrest of possible significant enhancement and economic development of the region

Strengthening of local economies and local industries	Nil	Nil	In absence of the project, it will be difficult for the Sri Lankan government to finance such a technology education development facility for UOK from its own resources

159. The selected site is strategically located in the Western Province and within close proximity to the 2 main Export Processing Zones (EPZ) in Sri Lanka: Biyagama and Katunayake. It is easily accessible to the student community. It is also within 1.13km to the main UOK Campus in Kelaniya. Since there is no free land space in close proximity that can be developed this will be the most suitable site that is economically feasible to the university at this point.

a. Considering existing flooding condition, available drainage system and stability of the bedrock at the project site the construction should be on floating pillers.
b. Within the building designs alternatives to minimize the impacts of flooding, sewage treatment facility with least impact on the water table, to improve energy efficiency of the building should be discussed.

5 ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

5.1 Introduction

160. The proposed work under FCT Development Project will impact on the environment in two distinct phases. During the construction phase which may be regarded as temporary or short-term; the other during the operation stage which will have long term effects. The negative impacts can be reduced or minimized only if proper safeguards are put in place during the design and construction stage itself. These can include reducing pollutant discharge from waste at FCT, By enhancing the landscape to support the wetlands. An effective mitigation strategy will utilize a combination of both options to arrive at practically implementable measures. Efforts will be worked out to minimize any adverse impacts on the various environmental and social components. Where the impacts on various environmental components are unavoidable, mitigation measures will be worked out to minimize the impacts. The mitigation measures recommended during the construction phase should be included in the contract agreement with the contractor and discussed with them to ensure smooth implementation from the beginning.

5.2 Land and Environment

a) Topography and Geology

161. **Construction Phase**: The impacts on existing topographical setting originate primarily from embankment preparation and opening up borrow pits to fulfill the requirement of huge quantity of earth material to raise the DPC level of the proposed building to 3.25 m MSL. Disfiguration of land may result from unplanned opening up of borrow pits / quarry sites. Aggregate and sand will be procured from the authorized suppliers and prevalent rules will be followed for borrowing of soil. Hence the impact on geology of the region is insignificant.

Impacts:

- Disfiguration & change in existing profile of the land due to proposed project location.
- Disfiguration of topography due to indiscriminate digging of borrow pits
- Uncontrolled digging of borrow pits resulting in water accumulation & breeding of vector disease

- Disturbance on geological setting due to quarrying

162. **Construction of Borrow Areas:** about 38,000.00 m^3 of borrow materials (Total compacted quantity of gravel) is to be used if the site is to be filled. This has to be obtained from earth generated through cutting of the existing borrow areas. Therefore, 38,000.00 m^3 Cum earth[20] will required from the borrow area. The details of proposed borrow areas investigated with their respective locations would have to be given by the PIU and the site engineer concerned.

Mitigation Measures: All construction works are directly related to the land environment. Therefore, contractor needs to prepare / follow several mitigation / management plan / guidelines for various construction activities. These guidelines are listed below and detailed out in "Part-III ESMP".

- ICTAD Guidelines for Siting and Layout of Construction Camp Guidelines for Siting,

Storage of construction materials should be located sufficiently away from the road frontage. Sand, rubble, metal bitumen and cement should be covered. All cement, bitumen (barrels), oil and other chemicals should be stored and handled on an impervious surface above ground level (e.g. concrete slab) and should be enclosed ensuring that no storm water flows in to the structures. There should be adequate ventilation to avoid accumulation of fumes and offensive odour that could be harmful

- ICTAD Operation and Re-Development of Borrow Areas Guidelines for Siting,

Extraction of construction materials should be undertaken only from mines and quarries approved by Geological Survey and Mines Bureau (GSMB).

Gravel for the compaction and filling is supplied from government authorized pits. If new material extraction sites need to be located, those should exclude areas which are public and environmentally sensitive.

Burrow areas shall not be opened without permission of the site engineer.

[20] Flood Risk Assessment Report For Proposed Science And Technology Site at Dalugama 2018

Environmental requirements and guidelines issued by the CEA, GSMB and LAs should be followed with respect of locating material extraction sites, other operations and rehabilitation of extraction sites at the end of use.

Transport, loading and unloading of construction materials should not cause a nuisance to surroundings by way of noise, vibration and dust. All drivers should have valid license for the category of vehicles they drive and follow the speed limits of roads. Construction materials should not exceed the carrying capacity of trucks and the local road.

- .ICTAD Operation and Re-development of Quarrying and Stone Crushing Operations
- ICTAD Guidelines for Siting and Management of Debris Disposal Site
- ICTAD Guidelines for Preparing Comprehensive Waste Management Plan

163. **Operational Phase**: In the operation phase, the temporarily modified land use pattern such as temporary construction camps / tents would be dismantled. The FCT project, after completion of its construction, would consist of neat landscape pleasing environment. The proposed FCT of UOK is in a reclaimed wetland which is a located in a congested stretch of residential / commercial area. Squatter settlement and encroachment on the project land may be very likely to take place unless proper controlled measures are adopted.

Impact:

i. Likely change of land use due to squatter / encroachment within project land area and the surrounding
ii. Likely change of land use due to building and access road development in the project area.

Mitigation Measures:

i. Immediately after the construction phase, it is necessary to ensure that no further deterioration or major land use changes such as ribbon development takes place in a manner that will jeopardize the interests of the UOK.

ii. Squatter development along the project shall be strictly avoided by proper regulation and vigilance.

iii. Land use control measures will be prepared & administered to avoid occurrence of induced development as far as possible.

iv. All debris, piles of unwanted earth, spoil materials and temporary structures should be cleared away from the project site and disposed at locations designated or acceptable to the SLLRDC, LA and CEA. Project landscape activities have to be done as per either detailed design or typical design guidelines given as part of the bid documents.

5.3 Water and Environment

164. **Drainage and Hydrological Flow**: The FCT project site has been identified as a flood risk area by the flood risk assessment. Nearby wetlands are protected by SLLRDC, UDA, Kelaniya Pradeshiya Saba or other agencies.

Impacts:

i. Since the project site is near the wetland and no proper storm water drainage systems are in place, there will be a risk of flooding during heavy rains.

ii. Poor or non-availability of drainage facilities on the access roads is another factor contributing to local flooding.

iii. Increased incidence and duration of floods due to obstruction of natural drainage courses by the FCT building construction embankments

iv. Chances of filling of existing drainage courses during earth filling

v. Blockage of existing natural drainage paths especially Mudun Ella due to construction activities will also create temporary floods.

vi. Increase of mosquitoes and other vectors increasing health risk.

vii. Aesthetics of the surrounding buildings could be affected due to mud and sedimentation transport due to flooding.

viii. Based on the visual observation records taken in the vicinity during the flood risk assessment it is evident that SLLRDC does not satisfactorily carry out its responsibilities on maintenance of the drainage channel system surrounding the project site on a regular basis.

ix. The canal that flows parallel to the access road is highly polluted and stagnant. The adjacent settlements untreated water disposed to the canal.

If this is not properly mitigated it would be a continuous health risk which will result in unpleasant odor and sight.

Mitigation Measures: As the existing channel will be suitably augmented and properly reinforced & additional drainage structures will be constructed, it will not obstruct the water flow in the channels. Construction activities will not aggravate flooding condition in the area if mitigation measures are followed by the contractor.

x. Adequate building and roadside drains will be provided along property to facilitate its better maintenance.
xi. Detailed drainage survey and flood risk assessment investigations have been carried out and accordingly capacity of existing drainage works & cross drainage (CD) structures have to be duly augmented wherever necessary, to accommodate high discharges to avoid flooding & formation of water pool at the project site.
xii. Construction works of culverts will be taken up during the lean flow periods in drought period to minimize the impacts on drainage.
xiii. Maintain design features such as drainage structures.
xiv. Construction work near natural drainage channels and Mudun Ella channel be carried out in such a way that flow of water is not blocked and even if it has to be blocked mitigation to be adopted.
xv. Suitable drainage at construction site & camp will be provided to eliminate the chances of formation of stagnant water pools that leads to soil erosion & breeding of mosquitoes.
xvi. Propose a storm water drainage system around the FCT complex to capture flood waters during heavy rain and reduce runoff.
xvii. Reduce the inflow locations adjacent to the site, i.e. the side drains of the road need to be constructed by the relevant authorities (SLLRDC, Keaniya Pradeshiya Saba RDA).
xviii. Removal of the pipe culverts that are obstructing the free flow of water in the project associated area. Consult the Kelaniya Prdeshiya Saba and the Department of Railway to remove the pipe culverts that are obstructing the water flow at Manel Gama and Wanawasala railway station.

xix. Drains, channel on the eastern boundary of the project site and Mudun Ella channel should be cleaned regularly to ensure smooth flow of water. This includes the regular maintenance of the downstream main peripheral drain and culvert across the Colombo Katunayake Expressway. These are being maintained by Road Development Authority. UOK will have to keep close connections with the relevant authorities in ensuring the water channels are cleaned especially prior to the commencement of the rainy season.

xx. Temporary earth drains should be provided until required line or earth drains are provided after excavation and other construction activities.

xxi. Design and maintenance of the suitable sewerage system during floods for the FCT. Avoid construction of sanitation or other facilities that will use and store harmful materials in areas that flood.

5.4. Water Use

165. During the construction period water is required for compaction of embankment, dust suppression, concrete mixing and domestic use in the construction camp. The estimated tentative water requirement during construction stage will be calculated by the site engineers before the commencement of the project. See Table 20

166. During this period water is required for compaction of embankment, dust suppression, concrete making and domestic use in construction camp. The estimated tentative water requirement during construction stage will be calculated by the Site engineers. The estimates for tentative water requirement to be developed by the UOK (see Table 20).

Table 20: Breakup of fresh water requirement during construction

SN	Purpose	Quantity (KL)
1	For road construction a) Construction related to earthwork b) Construction of GSB c) Construction of WMM d) Bridges, culverts, retaining walls & other structures	
2	Dust suppression	
3	For drinking & other household purpose	

167. **Operation Phase**: the water will be a limiting resource unless a proper water supply system is established. Ground water should not be used for construction since it is unsuitable at the project site with an acidic pH .Water would have to be supplied from outside for the construction purposes in bowsers.

Mitigation:

- Obtain the water supply connection to the site from the NWSB and calculated the requirements of water when the FCT is in operation and during construction activities in order to avoid likely impacts on other users.
- The contractor will arrange water required for construction in such a way that the water supply to nearby communities remain unaffected.
- If tube-wells are to be bored, from the polluted water table to supply the water required for construction, a prior approval of the NWRB has to be obtained by the Contractor. Without permission from NWRB, contractor will not be allowed to extract ground water.
- Wastage of water during the construction should be minimized.

168. **Water Quality Monitoring**: Apart from provision of the mitigation measures, water quality shall be monitored to understand the effectiveness and further improvement in designs in reducing the concentration of pollutants. The monitoring plan shall be functional in construction as well as in operation stages. Once the detail pans are available monitoring points and the intervals will be decide by the Environmental Officer. Refer the environmental monitoring plan given with the ESMP

169. **Silt Fencing**: Silt fencing should be provided to prevent sediments from the construction site entering into the nearby water channels. The silt fencing consists of geo textile with extremely small size supported by a wire mesh mounted on a panel made up of angle / wooden frame and post. The frame will should be installed at the edge of the water body along when construction is in progress. It is proposed to install silt trap at the edge of all water bodies located along the project site location.

170. **Ground Water Recharge Pit/ Rainwater Harvesting Structures:** Unlined drain in the project may also be connected with the ground water recharge pit to facilitate the recharge of runoff water in to the ground, augmenting the water table

of the project area. Ground water recharge pits shall be constructed to facilitate the infiltration of runoff water into the ground. Paved surface of the FCT project will reduce the percolation of runoff water and decreases the ground water recharge. Location of proposed ground water recharge pits will be reviewed by the Sr. Environmental Specialist of the Independent Engineer and finalized in consultation with PIU. These locations should be permanent which shall be handed over to the university maintenance engineering body at the end of the project so that the water shortages can be reduced to a certain extent.

171. **Adopt flood control measures:** Engineers should adopt flood control measures which will be utilized to manage the outlined flood hazard to the proposed development. These measures include any flood defenses that the proposed development site may benefit from, design and layout of the development and how the flood hazard to the site will be managed i.e. raising finished floor levels, Sustainable Drainage Systems and waste water management, sewerage system etc.

172. Insert flood mitigation measures, such as flood resistant and resilient construction techniques, subscription to the Environment Agency flood warning service, reference to a "Site Flood Plan" for the development. Outline recommendations for surface water management and sustainable urban drainage system (SuDS) - this will be important to manage the site from future flooding scenarios.

173. The study area has a flood problem. Building side drains to receive discharge from embankment surface and surrounding area runoff and carry it safely to the nearest outfall point ensuring safety to the embankment toe, which is the area most vulnerable to erosion / failure.

174**.** **Functional Sanitary facilities**: The ground water at the site is unsuitable for consumption and therefore would have to depend on securing the water connection. The water connection needs to be secured through NWSDB for use during construction and operation. It is important that functional sanitary facilities are maintained in the university to avoid health risks and spread of disease.

175. Regular sanitary facility checks and maintenance to be carried out by niversity. Already the design lay out of the building proposes a maintenance space. Maintenance staff should be employed for running of these sanitary facilities

176. Water storage facilities such as provision of a water storage tanks should be in place so that there will not be any shortage experienced during project implementation.

5.5 Air Environment

177. **Construction Phase:** Particulate matter would be the predominant pollutant affecting the air quality during the construction phase as it is likely to generate considerable quantities of dust, especially during dry condition. Dust will be generated mainly during excavation, backfilling, hauling & transportation activities to the site, loading/ unloading, spilling of material during transportation, and open storage of fine construction materials.

178. Undesirable gaseous pollutants will be generated mostly by the construction machineries. However, suspended dust particles may be coarse and will be settled within a short distance of construction area. Therefore, impact will be temporary and restricted within the closed vicinity of the FCTP and the access road only.

179. **Air quality monitoring** Apart from provision of the mitigation measures, air quality shall be monitored. The monitoring plan shall be functional during the construction period.

180. The maximum desirable limits as per the National Ambient Air Quality Standards are given in Part 1 Annex-12 and the monitored values should correspond with the table. All deviated results shall be reported to IE, for remedial measures.

5.6 Noise Environment

181. **Construction Phase:** During the construction phase, noise will be generated due to movement of operation of light & heavy construction machinerie!s (i.e., dozer, tipper, loader, excavator, grader, scraper, roller, concrete mixer, generator, pump, vibrator, Drilling machines, crane, compressor etc.) that are known to emit sounds with moderate to high decibel value.

182. Noise generated from sources mentioned above will be intermittent and mostly during daytime. Moreover, Shanthi viharaya and the settlements around the project will have an impact. However since there is already a concrete batching plan that is operated within the vicinity of the Budhdist temple this will not cause significant impact by the time it reaches them. However, the workers are likely to be exposed to high noise levels that may affect them.

Impact: Increase in noise level due to construction activities like operation of construction equipment.

183. Between 80-95 dB (A). The magnitude of impact from noise will depend upon types of equipment to be used, construction methods and also on work scheduling. Typical noise level of various activities associated with the projects is presented below Table 21 and 22 Operation of construction machinery will lead to rise in noise level to the range

Table 21: Noise Level of Road Construction Activities

Sl. No.	Construction Activity	Noise Level dB(A)
1.	Grading & Clearing	84
2.	Excavation	89
3.	Foundations	88
4.	Erection	79
5.	Finishing	84

Note: Measured at Leq assuming 70 dB(A) ambient noise level

184. General conclusion can be based on the types of construction work anticipated, the likely equipment required and their associated range of noise levels. Typical noise level of principal construction equipment is presented below

Table 22: Typical Noise Level of Construction Equipment

Clearing		**Structure Construction**	
Equipment	**Noise Level dB(A)**	**Equipment**	**Noise Level dB(A)**
Bulldozer	80	Crane	75-77
Front end loader	72-84	Welding generator	71-82
Jack hammer	81-98	Concrete mixer	74-88
Crane with ball	75-87	Concrete pump	81-84
Concrete vibrator	76		
Excavation & Earth Moving	Air compressor	74-87	
Bulldozer	80	Pneumatic tools	81-98
Backhoe	72-93	Bulldozer	80
Front end loader	72-84	Cement & dump trucks	83-94

Dump truck	83-94	Front end loader	72-84
Jack hammer	81-98	Dump truck	83-94
Scraper	80-93	Paver	86-88
Grading & Compaction	**Landscaping and Cleanup**		
Grader	80-93	Bulldozer	80
Roller	73-75	Backhoe	72-93
Paving	Truck	83-94	
Paver	86-88	Front end loader	72-84
Truck	83-94	Dump truck	83-94
Tamper	74-77	Paver	86-88

U.S. Environmental Protection Agency, Noise from Construction Equipment and Operations. Building Equipment and Home Appliance. NJID.300.1. December 31, 1971

185. The construction noise is generally intermittent and depends on the type of operations location and function of the equipment and the equipment usage cycle, it attenuates quickly with increases in distance

Mitigation: All machinery, equipment and vehicles should be maintained in a good condition by engaging skilled mechanics and regularly maintained in compliance with National Emission Standards (1994). Noise control regulations stipulated by the CEA in 1996 (Gazette Extra Ordinance, No 924/12) should strictly be implemented for crushers, construction vehicles and equipment. The maximum permissible noise levels at boundaries of the land in which the sources of noise is located for construction activities are 75dB (A) L eq and 50 dB (A) Leq during day time and night time respectively (Day time: 6.00 am - 7.00pm, night time: from 7.00 pm - 6.00 am). However Contractor should limit working time for activities that create noise from 6.00 am to 6.00 pm.(Note: LAeq'T' means the equivalent continuous, A- weighted sound pressure determined over a time interval T (in dB)

5.7 Impact on the Fauna and Flora

186. **Construction Phase:** The species richness presently in the project area and the surroundings are moderate. Activities such as site clearing, construction of culvert, mining of boulders, removal of trees and green cover vegetation and etc.,

will potentially impact on the ecological resources of the area by means of disturbing habitat, increasing soil erosion and surface runoff, creating noise and vibration at the project site etc.

iii. Several invasive species have been established in the project site and the associated ecosystem. Construction machinery would bring in more invasive species in to the area. Overall impacts will be insignificant on the fauna and flora as it is already a disturber habitat.

iv. Egrets, black headed ibis and painted storks that were observed feeding at the waterholes will be disturbed with the construction work. Construction activities would increase the level of fumes and the noise at the site.

v. Effect on aquatic fauna can occur in case of accidental oil spill & toxic chemical release find its way into the water bodies during construction and operation of the FCT.

Mitigation: Adoption of certain practices of mitigation will ensure that the project land and its surrounding habitat will be enriched without further degradation.

i Outright removal should not be done for the invasive species, as they are providing necessary ecosystem functions. Thus selective replacement of such exotic and alien invasive species with native species should be done.

ii Saplings for tree planting program should comprise of native or endemic species which is suitable to the existing climatic condition of the project areas. Native plant species listed in the Table 23 are suggested for the tree planting program which will enrich the habitat.

iii Actions should be taken for speedy cleaning up of oil spills, fuel and toxic chemicals in the event of accidents.

iv All the construction workers and staff of the project unit should be made aware and educated about the presence of the flora and fauna in the area. Environmental awareness program should be provided to the Contractor, labours and all staff deployed at the site.

v All staff / workers should be instructed not to chase or disturb any fauna seen near the project area.

vi Noise has to be kept under control by regular maintenance of equipment and vehicles. "No honking" board shall be placed near the boundaries. Noisy activity shall be prohibited during night time.

vii Construction debris should not be dispose in the wetland areas.

viii Implementing sediment and erosion controls during construction will minimize adverse Impacts on the water bodies. Construction activity will be avoided near water bodies during rainy season.

ix Natural vegetation and natural slope in canal embankments should be maintained within the canal reservation. Concrete walls or Gabion walls not recommended.

Table 23: list of species suggest for habitat enrichment

Family	Species	Sinhala name	Type
Sapotaceae	*Mimusops elengi*	Muuna mala	Tree
Calophyllaceae	*Calophyllum bracteatum*	Valu keena	Tree
Myrtaceae	*Syzygium caryophyllatum*	Dan	Shrub
Melastomataceae	*Melastoma malabathricum*	Maha boowitiya	Shrub
Phyllanthaceae	*Glochidion zeylanicum*	Hunu kirilla	Shrub
Phyllanthaceae	*Margaritaria cyanosperma*	Karw	Tree
Phyllanthaceae	*Bridelia moonii*	Pth kela,	Tree
Apocynaceae	*Wrightia antidysenterica*	Idda	Shrub
Bignoniaceae	*Stereospermum tetragonum*	Dunu madala	Tree
Calophyllaceae	*Calophyllum inophyllum*	Doba	Tree
Combretaceae	*Terminalia bellirica*	Bulu	Tree
Dilleniaceae	*Dillenia retusa*	Godapara	Tree
Elaeocarpaceae	*Elaeocarpus serratus*	Weralu	Tree
Euphorbiaceae	*Mallotus tetracoccus*	Buu kenda	Tree
Lamiaceae	*Clerodendrum infortunatum*	pinna	Shrub
Lauraceae	*Cinnamomum verum*	Kurudu	Tree
Lauraceae	*Litsea longifolia*	Rath keliya	Tree
Lecythidaceae	*Barringtonia racemosa*	Diya midella	Tree
Fabaceae	*Erythrina fusca*	Yak Erabadu	Tree
Lythraceae	*Lagerstroemia speciosa*	Murutha	Tree

5.8 Induced and Cumulative impacts

187. According to the ADB Environment Safeguards Sourcebook cumulative impact is described as: "The combination of multiple impacts from existing projects, the

proposed project and anticipated future projects that may result in significant adverse and / or beneficial impacts that cannot be expected in the case of a stand-alone project." The sourcebook also describes induced impacts as: "Adverse and / or beneficial impacts on areas and communities from unintended but predictable developments caused by a project, which may occur at later or at a different location.

188. Economic activities supporting FCT like lodging, and restaurants are expected to increase with new student population and induce development in the project area. The project area has good infrastructure for training of highly skilled graduates in the IT field. Hence the project will trained these students in the ICT and other fields to be involved in the industrial activities.

189. The construction of the FCT will provide better technologically trained graduates to meet the future demands of the industry. This will lead to (i) Reduction in travel time to access well-resourced laboratories that are located in different places in the district (ii) state-of-the-art ICT and research labs to carry out education and research (iii) access to new teaching and learning methods (iv) competitive edge to secure quality job that ensures personnel security (v) Being located close to proposed logistics hub, increased opportunities to collaborate with local and overseas companies engaged in logistics and supply chain management activities.

190. In terms of environment safeguard issues, the project is expected to enhance the disturbed surroundings with habitat enriched green building on site. However, during the operation phase, the solid waste and waste water treatment will generate issues if not properly managed. Improvement in local economic conditions can also result in unorganized and illegal establishment of settlements and businesses along the access roads creating new problems of social issues. To address these potential problems, relevant local authorities will have to monitor developments and strictly enforce rules.

5.9 Climate Change Impact and Risk

191. Changes in the atmosphere have been detected that could drastically alter the climate system and the balance of ecosystems. Rising CO2 concentrations increase the energy retention of Earth's atmosphere, leading to a gradual rise of average temperatures and global warming. This leads to unprecedented changes in the weather patterns including precipitation levels, intensities and frequencies.

192. **High Precipitation Impacting Channel /Embankment**: Heavy rains can cause disruption of the water ways surrounding the project site and embankments, surface water drainage problems, among others. Increased channel flow will result from precipitation and storminess may result in damages to embankment of the channel, pavements, and other building structures (such as down pipes etc). If bridge / culvert capacities are reduced or exceeded it can cause flooding to occur.

193. **Flood:** The study area has a flood problem. A Flood Risk Assessment Report has been prepared. See Annex 10.

Mitigation: Several mitigation measures can be adopted and these include adoption of flood risk reduction strategy. This would include:

i. Ensure the adoption of key engineering measures taken to address flood risks in the design of the building. Required inputs should be sought from architects and engineers regarding this and consider recommendations that are given in the flood risk assessment. The architectural design should be geared to accommodate flood related disaster.
ii. A drainage management plan should be developed for the site to ensure that the canal embankments do not become eroded, which would destroy the marginal vegetation and increase the flooding risk.
iii. Adopt measures suggested by CEA, SLLRDC on construction near a wetland. Obtain their approval and clearances prior to construction.
iv. Design and construction must be adequate to resist the anticipated forces of flood.
v. Make sure that the waterways are cleaned regularly - obtain the assistance of the Kelaniya pradeshiya saba for this purpose. Faculty has to carry out regular maintenance of channel, culverts and drains adjoining the site to make sure that there are no local flooding conditions. Allocate fund by the PIU for this purpose.

5.10 Design of FCT buildings under the green building

194. FCT building design and layout will follow the guidelines of the Green Building SL certification systems so that it is designed for higher performance, lower environmental impact. Under this system a building would be evaluated under

eght categories and these include Management (MN),Sustainable sites (SS), Water efficiency(WE) , Energy & atmosphere (EA) , Material & Resources (MR) , Indoor environment quality (EQ) , Innovation & design process (ID) and Social & cultural awareness (SC)

Impact: Flaws in the technology faculty design may lead several negative impacts that may influence the students' wellbeing and function of the training complex. Lack of thermal circulation and lighting condition within the school complex will increase the electricity requirement and cause occupational safety issues for the students and staff. In the absence of a properly designed waste water and solid waste disposal system in the hotel school complex, it may lead to health and environmental degradation of the immediate surroundings. In the absence of a disability access such as elevators or stair ways in the building design will prevent disable students from enrolling for the training program. Therefore these aspects will be required to be thought of at the design stage of the project Lack of provision of adequate sanitary facilities for the maximum capacity of students and staff can lead to sanitation issues. This may lead to outbreaks of illnesses among the student population. .

Mitigation: Overall building design should incorporate design features that improve the energy efficiency and water saving devices. In whole the green building designs principles should be applied wherever possible. Ensure maximization of natural lighting and thermal circulation in the building. Employ passive design strategies, including building shape and orientation, passive solar design, and the use of natural lighting, to dramatically impact building energy performance.

195. Including safety and health measures with due regard to future maintenance and repairs. The labs and cafeteria kitchen should be equipped with fire alarms and fire extinguishers. Fire and emergency evacuation routes should be incorporated sufficiently. Gas storage areas should be built in to the designed and should be placed in a place that is ventilated. Demarcatean area within the building design for storage of cleaning equipment and garbage storage until disposal. Though a general room has been identified in the lay out plans there is no garbage collection area that is being demarcated.

196. To avoid overcrowding of the sanitary facilities it is important that in the design the toilets should be constructed based on the ratio 1:25 within the hostels.. Design a waste water sewage tank that has a low operation cost and requires minimal maintenance. It should be properly designed to separate the sewage and the

bathing water so that it does not exceed the limits of the occupancy level of the building. The choice of technology will depend on volume of wastewater and sewage generated; economy of scale; regulatory requirements, etc. (Design details are in Annex 6). The project management unit of UOK has initiated the process reevaluating the building designs.

5.11 Risk of Fire and Emergency Preparedness

197. **Operational Phase**: Once the FCT building is in operation, there could be incidents of student unrest or technical errors in the laboratories that may trigger off fire**.**

Impact: This may cause damage to property and risk lives

Mitigation: Several mitigation measures can be adopted and these include adoption of disaster risk reduction strategy and preparedness. This would include: Identification of an emergency evacuation point in the building and placing emergency alarm system in the building to warn the student population of any such situations. Emergency evacuation points and plan should be designed and practiced.

5.12 Occupational Health and Safety and General Public

198. **Construction Phase**: Both within and outside of project affected areas could create accidental harm to general public and work force. Construction of culvert on the access road, excavation on site, removal of trees, working on building at heights processing and transportation of construction materials are the main causes associated with accidental risk.

Impact: Majority of skilled and unskilled workers should be selected from the project influence area to avoid generation of waste and sanitation problems from labour camps. About XXXX workers under the categories of supper skill, semi-skilled and unskilled will be engaged by the contractor. This may result in conflict situations among the workers and settlers near worker camps. Spreading of communal diseases is also possible due to migrant laborers.

Mitigation measures: ADB guidelines for contracted should be included in the contract issued to the contractor with any necessary modifications.

i. Contractor should organize awareness programs about personal safety for workers. This should provide briefing and training on safety precautions, their responsibilities towards safety, etc.
ii. Contractor shall comply with requirements for the safety of the workmen as per the International Labour Organization (ILO) convention No. 62, Safety and Health regulations of the Factory Ordinance of Sri Lanka to the extent that is applicable to his contract. Other than that, the contractor has to comply with regulations regarding safe scaffoldings, ladders, working platforms, gangways, stairwells, excavations, trenches, safe means or entry
iii. Use of licensed and trained vehicle operators, provision of protective footwear, helmets, goggles, eye-shields and clothes to workers depending on their duty (mixing asphalt, blasting, handling equipment) should be adopted.
iv. The construction labour camp should be equipped with first aid facilities and a trained personnel onsite in case of an injury.
v. Ample lighting around the construction site should be provided during the night.
vi. Excavated areas for construction should be barricaded using barricading tapes, sign board should be placed. Quarry operations, land excavations and blasting should be carried out and supervised by trained personnel.
vii. Regular safety checks for vehicles and equipment‘s, allocation of responsibility to relevant personnel, prohibition of alcoholic drinks and other substances which may impair judgment of workers engaged in construction activities, arrangement of proper first aid and transport facilities for injured people, installation of warning signs should be adopted.

5.13 Waste Disposal and Sanitation

199. Construction Phase: Impact

i. Solid waste associated with construction and other related works (construction debris, spoil, and waste generated from labour camps, officer‘s accommodations) may impose several negative

environmental and social impacts to the project affected area including impact on ecology, public health and scenic beauty. A proper permanent disposal site for these spoil material should be identified early on so that is will not impact the environment

ii. Presently at the UOK colour coded bins are placed for disposal of waste. However the waste is not processed within the university premises.

Mitigation

iii. Contactor and the engineers should consult the Kelaniya Pardeshya sabha at the onset of the project on waste collection and disposal.

iv. Labour camps, garbage disposal sites and material storage yards provide favorable habitats for vectors of diseases like mosquitoes and rats. Decaying wastes attract pests such as rats and flies which become unhealthy, dirty, and unsightly. Contamination of water bodies with wastewater, construction debris and spoil will create significant impact on aquatic lives and people inhabiting the area.

v. Seek approval from the DS for storage and disposal of spoil material and other gravel.

vi. Selected disposal site by the contractor should exclude areas which are close to public and environmentally sensitive areas. Prior approval for the disposal site should be obtained from LAs via Grama Niladhari.

vii. All debris and residual spoil materials (soil, sand, rock, and deadwoods) generated from construction activities shall be re-used wherever possible for site leveling, back - filling under instruction of Building Department Engineers & Construction Supervision Engineers from PIU. Dump materials should be placed without interference to the irrigation canals, water bodies, agricultural lands or any other environmentally sensitive sites

viii. Contractor should handle and manage waste generated from construction/labour camps without contaminating the environment or without risk to public/communities living near the sites. Proper solid waste disposal, sanitation and sewerage facilities (drinking water, urinals, toilets and wash rooms) should be provided to the site of

construction/labour camps. Location of labour camps should be approved by the Building Department Engineer and comply with guidelines/recommendations issued by CEA and Las.

ix. Practice cleanliness and good housekeeping practices on site. Provision of proper drainage facilities to minimize stagnation of water around worker based camps and keeping the drainage facilities clean at all times to prevent breeding of rats and other vectors such as flies. Garbage bins should be provided to all workers based camps, construction sites and should be dumped regularly in a hygienic manner under the inspection of Public Health Inspector (PHI) in the area.

200. **Operational Phase**: Waste disposal and sanitation becomes an important consideration with the occupancy level of the FCT buildings.

Impact: Domestic solid waste will be generated as a result of cooking activities and consumption of packed food brought in by the students. As solid waste would not be disposed daily and since Kelaniya is already having a waste management problem, piling up of waste will obscure the environment and lead to hygienic and health risks.

Mitigation:

i. Enter into an agreement with the Kelaniya Pradeshya Saba for waste collection and disposal on a daily basis.

ii. Train the students on importance of social responsibility and garbage disposal. Provide colour coded bins at several locations to encourage source separation.

iii. Establish a waste management plan for the institute. Ensure demarcated solid waste storage area with source separation for organic waste and other domestic non-organic waste. This storage facility should be able to accommodate solid waste up to 7 days until disposal.

iv. Establish a composting program and include a space provision in the design for this activity.

v. Prevent solid waste disposal to these canals, culverts and drains that will increase drainage congestion.

vi. Illegal garbage dumping & firing including asbestos dust will be a health issue to neighboring houses and it will be a health issue to students of the new faculty building.

5.14 Health and Safety of Trainees

201. There are no anticipated significant impacts during the operation and maintenance of the project. However, the students of the faculty may not be aware of occupational safety related issues and the impact associated with it. This may lead to injury and accidents during practical and training. When practical sessions are conducted in the labs, it may lead to emergencies and accidents.

Mitigation:

- First aid should be available on site in each of the labs.
- Fire extinguishers and alarm system to be provided. Fire escapes should also be provided for each building.
- Emergency switches should be properly covered and placed in each laboratory.
- A pedestrian crossing traffic light at the A1 highway should be provided so that it would be easier for the student and staff to cross over the road and this will ensure their safety.

6 PUBLIC CONSULTATION

6.1 Approach to Public Consultation

202. Public Consultation Meeting (PCM) provides an opportunity for the general public, private and community bodies to know the environmental and social impacts as a result of project implementation. Thus, the meeting was held for residents around the project areas, public sector and private sector agencies who are concerned with the project during the initial stage. Major purpose of the public consultation is to identify the environmental issues in the IEE study and to appraise the stakeholders on potential environmental impacts. This will provide an opportunity to collect their feedback so that adequate safeguards can be considered during the planning phases.

6.2 Methodology

203. **Arrangement:** Venue for the meeting was fixed at the meeting room of Vice Chancellors building at the University of Kelaniya. Affected communities and potential stakeholders such as a Buddhist monk from the adjoining temple, Grama Niladaries from Dalugama and Hubutuwalgoda villages, administrative officer and manager at the MÄGA cement batching plant, Manager at the SLLRDC sand deposit site, chairman Atomic Energy Council, UOK health inspector, UOK students in the applies science faculty etc. were invited to attend the meeting. Effort was made to make the gathering representative of the local population directly or indirectly affected by the potential impacts. About 40 participants were invited for the meeting however only 23 stakeholders came for the meeting. (Annex 04 provides the participant list).

204. Discussions, Questions and Answers: In the meeting, the participants were informed of the proposed project and potential environmental impacts due to the project. Thereafter, time was allowed for questions and answers to facilitate interaction with the stakeholders, exchange of information, collect their opinion on the environmental issues and any other issues that needed addressing. See Figure 18.

205. Collection of Feedback: A feedback questionnaire in local language (sinhala) was presented at the common forum and then asked each of the stakeholder to express their views regarding the question. These questions were presented by the consultants conducting the meeting and answers sourced. (Annex 04 provides the list of questions presented). Participants were encouraged to provide their opinion through the

feedback questionnaire, however it was kept voluntary. Some of the participants could not fill the forms as they could not read or write. The issues broadly covered in questionnaire included the following topics.

i. Current flood levels observed in the project associated area
ii. Nature of environmental problems presented in the surrounding and the issues and concerns.
iii. Disturbance due to project work for the surrounding community
iv. Improvement of the drainage in the canal system associated with the project
v. Issue of environmental pollution concerning solid and waste water waste disposal
vi. Stability of the building and foundation of the propsed building. Evaluation of current situation of other building
vii. Access road and accessibly issues from the main road

206. Record of the Meeting: General information of the participants such as Name, gender, and name of the organization the participant belongs to along with their signature was recorded during the public consultation meetings and is attached in the report as Annex 04. Registration was kept voluntary. Almost all of the participants registered themselves.

6.3 Analysis of the collected feedback

207. A total of 23 stakeholders participated in public consultation meeting. Information was gather on following topics

- Perception on noise vibration and dust
- Perception on water quality in the channels adjacent to the site
- Perception on the water drainage and flood assessment
- Perception of Perception on ecology and biodiversity issue
- Perception of building stability and the lay out plan
- Perception of the accessibility to the project site
- Perception of the education offered at the faculty
- Perception of the waste management site located close to the project site

a. **Outcome of the Public Consultative Meeting** The following are the major points of concern of the participants of PCM

i. Design and implement a drainage plan for the project.
ii. Manage the ecology in the surrounding habitat.
iii. Reservation limits to be maintained so that the dredging activities on the Mudun Ella canal can be done.
iv. Managing noise, dust and vibration at the site.
v. Establish a funding mechanism as well as a schedule for maintenance and cleaning work of the canal system associated with the project.
vi. Contact Ministry of Megapolis and Western Development and consult the future plan concerning the solid waste management dump site located 80m from the project site.
vii. Establishment of a waste water treatment plant to reduce water pollution and discharge.
viii. Proper road signage and speed control measures with a traffic light for pedestrian road crossing at the A1 road is one of the most sought after road safety measures by the stakeholders.

Figure 19: Plates of Stakeholder meeting

7 ENVIRONMENTAL SOCIAL MANAGEMENT PLAN

7.1 Environmental Social Management Plan

208. An environmental social management plan (ESMP) has been developed to provide mitigation measures to reduce all negative impacts to acceptable levels (refer Part III).

209. The EMP will guide the environmentally-sound construction of the project and ensure efficient lines of communication between MHEOH, project management unit (PMU), project implementing unit (PIU), consultants and contractors. The ESMP will (i) ensure that the activities are undertaken in a responsible non-detrimental manner; (i) provide a pro-active, feasible and practical working tool to enable the measurement and monitoring of environmental performance on site; (ii) guide and control the implementation of findings and recommendations of the environmental assessment conducted for the subproject; (iii) detail specific actions deemed necessary to assist in mitigating the environmental impact of the subproject; and (iv) ensure that safety recommendations are complied with. The ESMP includes a monitoring program to measure the environmental condition and effectiveness of implementation of the mitigation measures. It will include observations on- and off-site, document checks, and interviews with workers and beneficiaries.

210. The contractor will be required to submit to PIU, for review and approval, a site environmental plan (SEP) including (i) proposed sites/locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes; (ii) specific mitigation measures following the approved ESMP; (iii) monitoring program as per SEP; and (iv) budget for SEP implementation. No work will commence prior to approval of SEP

211. A copy of the ESMP/approved SEP will be kept at the site during the construction period at all times. The ESMP will be included in the bid and contract documents. Non-compliance with, or any deviation from, the conditions set out in this document constitutes a failure in compliance.

212. For civil works, the contractor will be required to (i) carry out all of the mitigation and monitoring measures set forth in the approved SEP; and (ii) implement any corrective or preventative actions set out in safeguards monitoring reports that the employer will prepare from time to time to monitor implementation of this IEE and

SEP. The contractor shall allocate budget for compliance with these SEP measures, requirements and actions.

7.2 Implementing Arrangement

213. MOHE of Government of Sri Lanka will be the Executing Agency for the Program, responsible for management, coordination and execution of all activities funded under the loan. A central Project Management Unit (PMU) attached to MOHE will be responsible for implementing the Technology and Human Resource Development Project. The PMU will be supported by Program Implementation Units (PIUs) with flexibility to re-deploy depending upon the implementation requirements.

214. The PMU and PIUs will be supported by several teams of Design Consultants in preparation of preliminary engineering designs

215. Project Management Consultant (PMC) centrally located in PMU and with field teams located in PIUs shall be responsible for implementation of the Program. All infrastructure contract will be procured through performance-based contracts (PBCs) and include build operate (BO) framework. Based on the preliminary designs prepared by Design Consultants, the DBO (design-build-operate). The preparation, review, and approval of project design and due diligence studies including bidding process is centralized at the PMU. PIUs will provide necessary support to PMU in preparation, and will play main role in supervising the construction process.

216. **Safeguards Compliance Responsibilities:** PO will ensure that environmental assessment is conducted, and the compliance, and corrective actions, if any are reported as required At the PIU, a Project Manager will be given additional responsibilities of safeguard tasks and will be designated as Assistant Environmental Officer (ASO). ASO will oversee the safeguards implementation at PIU level and report to PO (Environment) at PMU. Specifically ASO will coordinate public consultation, information disclosure, regulatory clearances and approvals, ESMP implementation and grievance redress.

217. **Monitoring and reporting** Monitoring of quality of water, air and noise during construction stage is a responsibility of the contractor by the approved Government Monitoring Agency. All construction activities such as site supervision, removal of trees, material extraction, verification of permits etc. by contractor will be

supervised by consultant engineer of building department. The environmental monitoring report will be submitted to safeguards officer of PMU at the MOHE.

218. The budgetary provision for the implementation of the ESMP of the project can be categorized in to two types and is presented below..

i. Environmental Social Management Plan Works to be implemented by the contractor under civil works contracts

ii. Environmental Social Management Plan Works to be implemented by the FCT

219. A capital cost provision of about Rs XXX has been kept towards implementation of environmental management plan. Summary of environmental budget is presented in Table 24.

Table 24: Monitoring Plan for FCT for Preconstruction, Construction, and Operation Phases

SI No	Field environment attribute	Phase	Parameters to be monitored	Location	Frequency a	Responsibility	Cost
	Air quality	During preconstruction phase	Nitrogen oxide, sulfur dioxide, carbon monoxide, particulate matter (both 10 micrometers and 2.5 micrometers or less in diameter)	FCT construction at UOK	Once in the preconstruction phase to establish baseline	Contractor through approved monitoring agency	
		During construction phase			Once in every 3 months (except monsoon season) during construction phase (24 months construction phase)		
		During operation phase			Once bi-annually except during monsoon season during first 2 years		
2	Water *quality*	During preconstruction phase	Eason Total dissolved solids, total suspended solids , pH, hardness, biochemical oxygen demand, fecal coliform	FCT or UOK groundwater	Once to establish the groundwater quality before construction	Contractor through approved monitoring agency	
		During construction phase			Once in every three month during construction phase		
		During operation phase			Once every year except during monsoon during two years		

	Noise levels	During preconstruction phase	Noise quality as per National Ambient Noise Standards on dB(A) scale	FCT or UOK construction siter	Once in the preconstruction phase to establish baseline	Contractor through approved monitoring agency	
		During construction phase			Once in every 3 months (except monsoon season) during construction phase		
		During operation phase			Once every season except monsoon season for first 2 year		

7.3 Grievance Redress Mechanism

220. The affected person(s)/aggrieved party can give their grievance verbally or in written form to the local site office of FCT project site at Bulugaha Junction Kelaniya. Grievances of affected person will first be brought to the attention of the site in charge, who can resolve the issue at the site level. If the matter is not solved within 7 days period by the site in charge, it will be brought to the Grievance Redress Committee (GRC) constituted for the purpose in PIU. This GRC shall discuss the issue in its monthly meeting and resolve the issues within one month of time after receiving the grievance. If the matter is not resolved by GRC at PIU level within stipulated time, it shall be referred to GRC at PMU level by Project Manager of PIU.

221. **Registering complaints** GRC at PMU shall discuss the issue and try to resolve it and inform the PIU accordingly. If the matter is not resolved by the GRC at PMU level within one month of time the matter will be referred to State Level Empowered Committee (SLEC), who will resolve the compliant within one month through mediation. The PIU and -project site office shall keep records of all grievances received including contact details of complainant, date of receiving the complaint, nature of grievance, agreed corrective actions and the date these were affected and final outcome. For this a complaint register will be maintained at each sub-project site. The complaint will be registered by the aggrieved party by duly filling the form provided,(refer Annex 13) PIU established a public response centre (PRC) helpline specifically addresses the issues arising out of project implementation. Compliant can be registered via any of the following means:

Through Public Response Center Help Line

Land Line Number:

Mobile No:

WhatsApp:

E-mail:

The cost for functioning of Grievance Redress Mechanism will be accounted for in project cost as part of PIU functional cost.

222. Additionally, person(s) / aggrieved party who are, or may be, adversely affected by the project may submit complaints to ADB's Accountability Mechanism. The accountability mechanism provides an independent forum and process whereby people can voice, and seek a resolution of their problems, as well as report alleged violations of ADB's operational policies and procedures. Before submitting a complaint to the Accountability Mechanism, affected person(s) / aggrieved party should first make a good faith effort to solve their problems by working with the ADB resident mission.

223. The PIU Level Grievance Redress Committee (GRC- PIU) – This committee will comprise of Project Manager, Site In charge and one officer from contractor team. The GRC- PIU will be headed by Project Manager (PIU). It will meet at least once a month. The agenda of the meeting will be circulated to all the members and the affected persons/aggrieved party along with venue, date and time at least a week prior to the meeting.

224. The PIU Officer (SO) will have the overall responsibility for timely grievance redressal on environmental issues and for registration of grievances, related disclosure, and communication with the aggrieved party.

225. This GRC at PMU will be headed by the managing director, and senior representative of PIU and other implementing agencies as relevant. The aggrieved party / person(s) can approach court of law any time with or without filing complaints at PIU or PMU level. The following mechanism is adopted from the World Bank mechanism currently identified for MOHE. The Mechanism may need further review once the implementation sets in.

8 INSTITUTIONAL IMPLEMENTING ARRANGEMENT

To be discussed and finalized between ADB and MOHE.

9. CONCLUSION AND RECOMMENDATIONS

9.1 **Conclusion:** The IEE study did not find an adverse incompatibility with the surrounding physical, biological, socio-economic or cultural environment and does not pose any significant long term environmental threat if all identified mitigation measures are carefully attended to. The only major concern that needs close attention to is the flood risk in the area. The most impacts likely during the construction phase are expected to be temporary in nature and could be mitigated with proper management and good practices. The GRM and ESMP provide appropriate guidance for suitable environmental and social safeguards. Accordingly, the proposed project can be recommended for implementation with strict adherence to ESMP and GRM provided in this IEE.

226. Most of the adverse impacts of FCTP during construction period are short term and temporary in nature. These impacts can be minimized through specific engineering and management solutions. Environment friendly construction methodology has been incorporated into the project design and the ESMP has been prepared to minimize the overall impacts on the environment during the proposed project civil works. Since the proposed project is likely to battle with flood risk issues, it is recommended that careful observations be made during the current rainy season on further design improvements. Further studies may be needed to assess the impacts on the immediate surroundings if filling of the land is carried out to the recommended level.

227. As per the Government of Sri Lanka regulation, Environmental Clearance is not required for the proposed project under the National Environmental Act. However, EPL Clearance from CEA & SLLRDC, Kelaniya Pradeshiya Saba clearance, UDA green building certificate will be required before start of construction.

9.2 **Recommendations:** The ESMP has been prepared incorporating various modern technologies and guidelines to reduce the environmental impacts of project constructions to make it a Green building. Therefore, it is recommended to follow the ESMP and associated Guidelines during construction and operation phases of the project.

9.3 Measures to be adopted to improve the habitat around the project site

228. **Solid waste transfer site**: The solid waste transfer station in Colombo located 547.58m away from the project site which occupies 18ha will impact the surrounding project site due to odor and vector problem unless it is properly managed. It is expected that two trains will be scheduled per day with a carrying capacity of 600 tons to be operated[21]. Currently the Kelaniya Pradeshiya Saba operated open waste disposal site is locate 80m from the project site, the piled up waste will impact the FCT project site. It is recommended that the UOK consult the Ministry of Megapolis and Western Development on schedule dates of operation of waste transfer to Aruwakkalu land fill in Puttalm via the railway line. On the western boarder of the project site develop a green belt as per the recommended list of flora on the rapid biodiversity assessment should be established.

229. **Flood risk**: It is recommended that flood water drainage plan is developed for the site. This plan should include measures to improve the flood risk by taking in to account the

- Protection level of the proposed infrastructures
- Maintenance of the sewerage system during floods.
- Improving the surface drainage system within the project area

230. With the information that is presently available there is no confidence that the project associated canal system will be properly maintained. Project associated network of waterways need to be regularly cleaned and maintained in order to ensure the free flow of water. For this purpose UOK will be required to consult the SLLRDC, RDA and the Kelaniya Pradeshiya Saba[22]. It is recommended that the project proponent should consult Deputy General Manager (SSLRDC) & Chairman Kelaniya Pradeshiya Sabha on main drainage and local drainage system. Contact RDA on regular maintenance of the downstream main peripheral drain and culvert across the Colombo – Katunayake expressway.

[21] Metro Colombo Solid Waste Management Project Ministry of Megapolis and Western Developmen September 2017
[22] Flood risk assessment February 2018

231. As recommended in the flood risk assessment, the project site should be filled at least up to 2.75 m MSL by keeping minimum freeboard. Minimum free board is 0.30 m. Maximum free board is dependent on the project requirement. DPC level of the proposed buildings should be 0.50 m above the recommended fill level[23] However the flood risk assessment has not evaluated impact of flooding scenarios on the project associated other buildings with the proposed ground improvements. Hence a detailed review of this should be carried out and engineering designs should consider to minimize the risk of flooding by adopting of flood management strategies within its design. These could be flooding basin or ponds that will capture the excess water during the monsoonal period.

232. **Project access road**: Additionally the project site and the access road needs to be developed by SLLRDC in order to minimize the risk of flooding. The discussion should focus the frequency of maintained and cleaning the canal network and availability of funds to carry out these tasks.

233. **Stability of the foundation**: According to the geotechnical information all building in the proposed FCT should be on bore and cast-in-site RC piling. The basement rock was only found at 16- 20m depth and therefore the stability of the bed rock has to be properly considered for the detailed engineering designs. In most of the bore hole investigations it was found that the ultimate skin friction coefficient (fμ can be taken as 140kN/m^2 which is less that that recommended in the ICTAD guidelines (ICTAD/DEV/15)[24]. It is of utmost importance that an expert authority be engaged to carry out detailed designs of this project.

234. **Provision of water supply**: The ground water quality of the project site is more towards an acidy pH value of 6.66[25]. Therefore measures should be adopted to supply potable water before construction and during construction. Make sure the construction workers are provided with drinking water from the onset of the construction phase.

[23] ibid
[24] Geotechnical investigation for proposed building for faculty of computing and technology, university of Kelaniya . April 2018
[25] idbid

235. **Solid waste disposal** generated during the construction and operational phase will obscure the environment and lead to pollution problems. The best way of disposal of waste is to develop a waste management plan for the project as included in the ESMP. Degradable solid waste can be composted while spoil material and other debris should be disposed at approved identified dump site.

236. **Waste water disposal**: Waste water should be treated in a treatment facility that can handle the occupancy capacity of the designed buildings and there should be adequate funding allocated for the operation of the facility though out FCT operation. The treated waste water can only be released to Mudun Ella. Mechanism should be adopted for removal of sludge that is collected in the treatment plant. As discussed above, the ESMP has been prepared incorporating various modern technologies and guidelines to reduce the environmental impacts of waste generated from the project. Sewage should be regularly removed by a gully bowers to avoid soil contamination.

237 **Disaster management plan:** During all stages of the project cycle flood associated disaster action plan should be developed to minimize the economic cost of the project and risks on life and property. More detail account is given in the ESMP.

238. **Habitat enrichment**: Based on the findings of the rapid bio diversity assessment field surveys, the study site supports a moderately rich assemblage of fauna and flora including few species of endemic and threatened species. However, there are many drivers of change operating on this wetland ecosystem such as such as spreading of invasive species, encroachment, unregulated waste disposal to the ground as well as to water and changes in the hydrology as a result of flood management. Therefore several measures could be adopted to improve the habitat around the project site. Planting of recommended species along the reservation of the canal with adequate provision to clean it is important. Consider the detailed architectural designs and develop a green belt with trees and shrubs on the western border of the land to minimize the impact of solid waste management transfer site.

239. **Partly constructed access road**: UOK needs to liaise with SLLRDC and expedite the process of developing the access road to the project site.

240. **Environmental monitoring:** Carry out the baseline monitoring of the environmental parameters in order to avoid or manage any environmental pollution associated with the project.

241. **Outcomes of meeting held on 23rd of May 2018: PIU members of UOK, TMS and SLLRDC:**

a) Construction and development of the access road to the site will be completed within two weeks.
b) Cleaning Mudun Ella and its feeder canals and improve water flow.
c) Canal adjacent to access road to be properly constructed and wider culvert to be built to improve the water flow. It was pointed out that there are several plans to improved water flow in these canal systems.
d) The chairman SLLRDC ensures that Paliysagoda pumping station will be established before the commission of FCT project. This will reduced flood impact. SLLRDC agreed to assist the UOK to develop a flood mitigation plan for the site. Chairman agreed to facilitate an engineer from SLLRDC upon the request of UOK.
e) The UOK was given assurance that the waste disposal site that is managed by the Kelaniya Pradeshiysa Saba will be relocated to the alternative solid waste management site (also close to current site).