

Initial Environmental Examination

July 2018

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

CURRENCY EQUIVALENTS

(as of 11 July 2018)

Currency unit	–	Sri Lanka rupee/s (SLRe/SLRs)
SLRe1.00	=	\$0.006278
\$1.00	=	SLRs159.27

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
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
MHECA	–	Ministry of Higher Education and Cultural Affairs
MOMDE	–	Ministry of Mahaweli Development and Environment
MSL	–	mean sea level
NEA	–	National Environmental Act
NIRP	–	National Involuntary Resettlement Project
NWRB	–	National Water Resources Board
PAA	–	Project Approving Authority
PP	–	project proponent
REA	–	Rapid Environmental Assessment
SLLRDC	–	Sri Lanka Land Reclamation and Development Cooperation
SLSI	–	Sri Lanka Standards Institute
SPS	–	Safeguard Policy Statement

STHRDP	–	Science and Technology and Human Resource Development Project
TA	–	technical assistance
TMS	–	Total Management Solutions
UDA	–	Urban Development Authority
UOK	–	University of Kelaniya
WRB	–	Water Resource Board

NOTE

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

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EXECUTIVE SUMMARY

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). This project aims to increase the technology-oriented workforce to transform Sri Lanka's growing economy by supporting a series of Universities across the country. The objectives of the IEE 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 requirement of statutory clearances;
- Baseline environmental monitoring and survey;
- Predict impacts on relevant environmental attributes and mitigation measures to minimize the impacts.

The sub project. The sub project under study is the new Faculty of Computing and Technology (FCT) in Kelaniya. Phase I of the project will involve the construction of a 10-story academic building (1600m²), 5 storied administration building (836.12 m²), student center (1000 m²), location for service building, transformers, waste water treatment, solar panel system, rain water treatment plant, and garbage collection / recycling plant. Phase II will include academic building 2 (1000 m²), security building (100 m²), staff accommodation (600 m²).

The new FCT will provide training on subjects such as nanotechnology, robotics and industrial automation, bio-systems technology, ICT, e-learning, etc. The university will enroll 425 students on average annually.

Description of the environment. The proposed location for the FCT is in Kelaniya in the Gampha District, Western Province, Sri Lanka. The project site is located alongside the Colombo - Kandy Road and is within 1km of the Kiribathgoda town. The land location points are 8°21'38.74" N 80°30'12.18" E. The government granted the university with a 3-acre 2 route 49.45 perch land.

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 surface water ways. The sub project location faces flood risk during the monsoonal season as it is a filled marshland bordered by a canal system with poor drainage.

Policy, legal and administrative framework and sub project categorization. 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. Since the site was a filled marshland, to be in line with the SPS Environment Policy Principle 2 and 8 a rapid biodiversity assessment and a flood risk assessment were carried out for the sub project site. Principle 9 triggered a gap in the national legislations where IFC-WB EHS standards were more stringent over the national standards.

ABD IP and IR safeguards are not triggered under this sub project. Though the land was acquired for the subproject it was not done in anticipation of ADB financing and is unencumbered.

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. However, environmental and other clearances from Government of Sri Lanka will have to be obtained prior to commencement of the sub project and have been identified in the IEE. The IEE was carried out as a requirement of ADB under its safeguards policy to be eligible for their financing.

Analysis of Alternatives. 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 and located 1.13km to the main UOK Campus. There is no other suitable land in the vicinity that can be acquired for this project in Kelaniya, therefore location alternatives were not considered. However, structural design alternatives are being considered to address flood risk. The technology alternative using solar panel is also considered.

Public Consultation (PCM). Consultations with stakeholders, SLLRDC engineers, and State Engineering Corporation have been conducted to discuss engineering and potential flood risk issues as a result of development of the site. Initial stakeholder consultation was held on 3rd May 2018 and was attended by 23 people including government officers, neighboring stakeholders, students and staff. The main concern that was highlighted at the meeting is the flood risk being exacerbated with infilling of site and the instability of the soil requiring skilled engineering designs for the building. There were requests to try and enrich the degrading ecosystem in the surrounding area. Subsequent meetings were held with SLLRDC on 23rd May who were not represented at the initial stakeholder meeting to agree on potential solutions to the flood risk as the site. The public participation processes undertaken during project detailed design ensure that stakeholders and affected people are engaged during the preparation/finalization of the IEE.

Monitoring and Reporting

PMU will prepare quarterly monitoring reports, environmental monitoring report will be submitted by the MHECA to ADB semi-annually during construction and annually post-construction. Social monitoring reports will not be required as IR is Category C and IP safeguards are not triggered.

Grievance Redress Mechanism: The project will follow the GRM process identified in the IEE. Assessment of the existing GRM shows that it has provided citizens with an effective platform for redress of their grievances. This IEE describes the existing GRM including informal and formal channels, time frame and mechanisms for resolving complaints about environmental performance.

Anticipated Impacts and Mitigation Measures. A summary of the potential environmental impacts during construction and operation phase along with recommended mitigation measures are provided in the IEE in the form of an EMP. The FCT project is unlikely to cause significant adverse impacts because: most predicted impacts are localized and likely to be associated with the construction process with is temporary. Also the project has identified the adoption of mitigation measures against potential increase of flood risk in the area by refraining from further filling of the land. They have also identified the coordinated management and improvement of the canal system.

Recommendation: The negative environmental impacts arising due to execution of the proposed FCT of UOK is negligible as compared to the long term socio-economic benefits to be delivered to youth and community.

The negotiations initiated with SLLRD to develop a flood water management plan by UOK, to clean and maintain the project associated canal system and to develop the access road should be closely followed up and expedited.

The detailed engineering design of the building should ensure strong foundation and flood resilience as it has been decided to carry out minimal filling of the site to minimize any increase in the flood potential. The IEE is based on preliminary design and will be updated once detailed engineering design is developed.

FCT of UOK should follow up with Kelaniya Pradesha Saba to ensure that the open dumpsite is relocated to the new venue 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.

Negative impacts are mitigated to acceptable levels with proper engineering design and the incorporation or application of recommended mitigation measures as suggested in the EMP. Green building design should be followed.

The EMP section on construction should be made part of the bid and contract documents. Contractor/s EMP implementation shall be monitored by UOK.

Stakeholders shall be consulted during all phases of the sub project and relevant sub project related documents disclosed. The GRM process shall be active throughout the sub project cycle.

Conclusion: The IEE 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 not pose any significant long term environmental threat (mainly flood risk). Most impacts are likely to be 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 EMP provide appropriate guidance for suitable environmental and social safeguards. Accordingly, the proposed subproject can be recommended for implementation with strict adherence to EMP and GRM provided in this IEE. The subproject is unlikely to cause significant adverse environmental impacts and does not require further environmental assessment.

I. INTRODUCTION

A. Subproject Background

1. 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}

2. 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 Dalugama 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.

3. 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). Ministry of Higher Education and Cultural Affairs (MHECA) will be the executing agency and UOK will be the implementing agency. According to the Circular 33 of the Ministry of Finance and Mass Media (MOFMM), the project will establish the project steering committee (PSC), PMU at MHECA, and Project Implementation Unit (PIU) at UOK for project implementation. The UGC will support the project in their capacity for quality assurance and provide technical inputs for competitive research and innovation grant process.

4. This subproject aims to increase the technology-oriented work force which will contribute to transform Sri Lankans growing economy. Under this subproject the University of Kelaniya (UOK) will build a new Faculty of Computing and Technology (FCT) in Kelaniya. This will be referred to as the subproject in this report.

5. 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 FCT which will implemented by the UOK. The subproject will be composed of phases I and II⁴ Both phases will be funded by ADB.

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

⁴ TA 8235

6. Three undergraduate courses in Bachelor of Engineering Technology, ICT and Computer Science are 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 425 students enrolled.

7. 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. 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.

B. Objectives of the IEE

8. The objectives are to:

- Determine the category of the subproject 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;
- Determine the appropriate extent of scoping;
- Determine the requirement of statutory clearances;
- Provide a baseline environmental monitoring and survey; on biodiversity, biophysical resources
- Predict impacts on relevant environmental attributes and mitigation measures to minimize the impacts.

9. Recommendations will be provided for mitigating any negative impacts wherever possible through the EMP. The EMP 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 subproject anticipated environmental impacts that will arise due to subproject activities, necessary measures that have to be adopted to mitigate them and public views and suggestions regarding the subproject. Accordingly, a single consolidated IEE report will be submitted to ADB and also be made available to the PP to facilitate their decision making.

C. Approach and Methodology

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

11. **Reconnaissance Survey:** A reconnaissance survey was carried out identify the value environmental components surrounding the subproject. Location of environmentally protected areas; surface water bodies; environmentally sensitive receptors (educational institutions, religious structures, medical facilities etc.) at the subproject site has been identified during the survey. The Consultant conducted preliminary analysis of the nature, scale and magnitude of the impacts that the subproject is likely to cause on the environment, especially on the identified

Valued Environment Component (VECs). Site inspection of proposed subproject was carried out on 16th February 2017 (refer Annex 01 for details).

12. 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. The stakeholder consultation was carried out on 3rd May 2018. 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. 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 subproject. This will be carried out by ADB with the data obtained by 1st of May 2018 from the Department of Census and Statistics.

13. **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 MOMDE were reviewed.

14. **Environmental Screening & Scoping:** Screening has been conducted with specific consideration such as location of the subproject 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.

15. **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 quality⁵ at the subproject site secondary data was referred from numerous reports. Rapid biodiversity assessment was carried out to assess the importance of the biodiversity surrounding the subproject site and to obtain baseline data of the biodiversity surrounding the subproject 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.

16. **Stakeholder Consultation:** Consultations on environmental issues have been carried out with relevant stakeholders identified through stakeholder analysis. Refer Chapter 7 for further details.

17. **Analysis of Alternatives:** The environmental analysis of alternatives mainly focuses on structural designs from an environmental management perspective to reduce flood risk. Refer Chapter 5 for details.

18. **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

⁵ Soil report for the site

phase. For each impact predicted, feasible and cost-effective mitigation measures have been suggested to reduce potentially significant adverse environmental impacts to acceptable levels.

19. **Environment Management Plan:** The EMP (Part III) has been prepared as per the requirements of ADB Safeguard Policy Statement. The EMP includes management of construction camp; rain water harvesting, storm water 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; monitoring requirements; etc. At the same time, information was collected to prepare a Basic Information Questionnaire (BIQ) for environment clearance from CEA.

D. Structure of IEE Report

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

Part I. IEE Report

Executive Summary

Chapter 1- Introduction

Chapter 2- Description of the Subproject

Chapter 3- Policy, Legal, and Administrative Framework

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. EMP

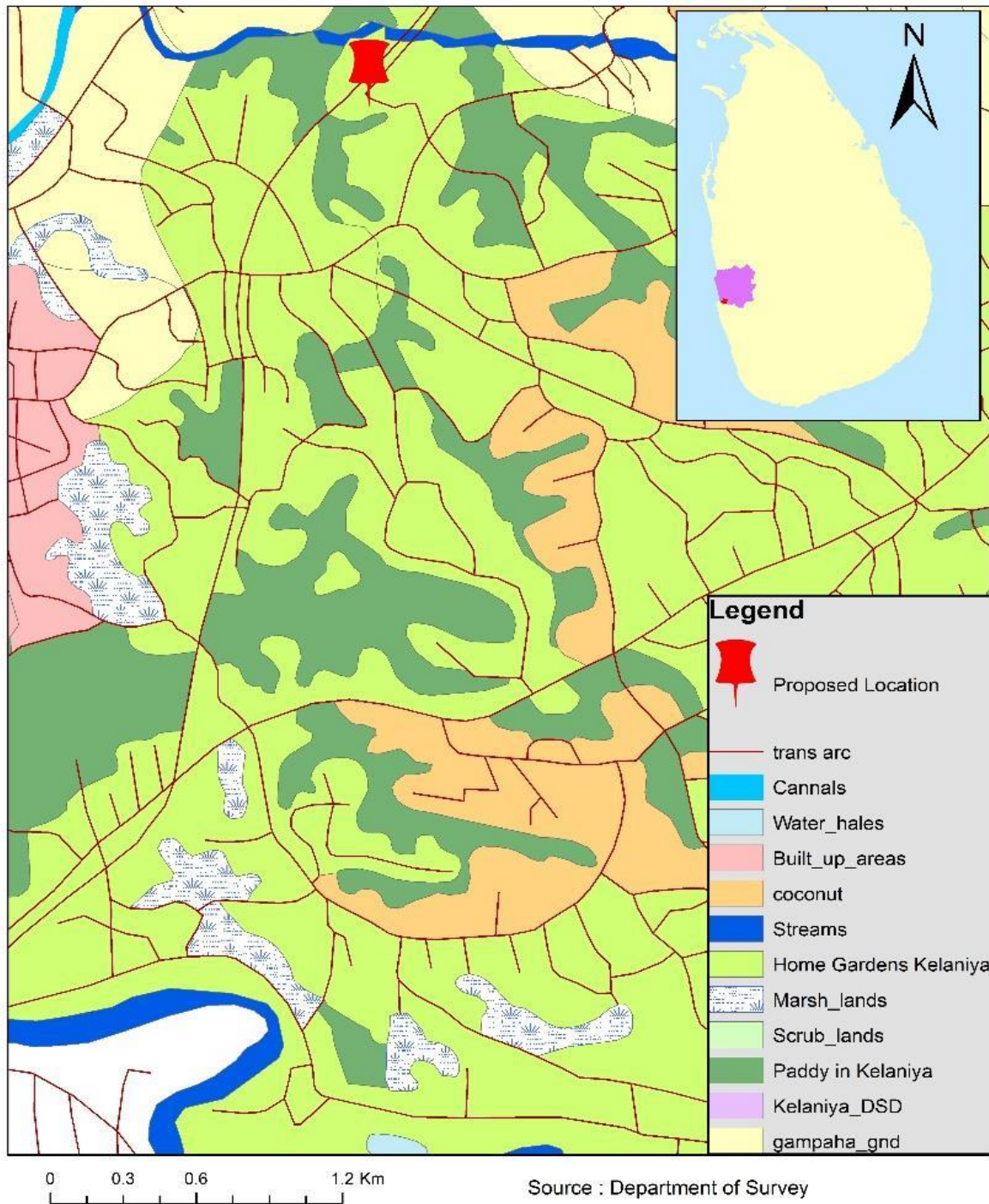
II. DESCRIPTION OF THE SUBPROJECT

A. Subproject Location

21. The proposed construction of the new FCT is located in Kelaniya, Gampha District, Western Province, Sri Lanka. The subproject 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 1.

Figure 1: Location of Subproject Site

Proposed Technology Faculty in UOK



Source: Prepared by TMS.

22. The proposed subproject site is located 1 km from the existing campus of the University of Kelaniya. The land location points are $8^{\circ}21'38.74''$ N $80^{\circ}30'12.18''$ 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 subproject 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 02). The subproject site is 122.32m from a waste collection site and 100m from the Shanthi Viharaya Buddhist Temple. The main environmentally sensitive receptors to dust and noise during construction will be the temple, few residents and the degraded wetland ecosystem surround the subproject.

23. The subproject land is government owned and was previously an abandoned paddy field. The land acquisition/transfer process has been discussed in the ADB IR DD Report prepared for STHRDP. The UOK is in the process of obtaining approval from the SLLRDC/ CEA since the subproject area was a reclaimed land. Once the internal drainage plan is laid down to the subproject site, seek approval from the SLLRDC. (refer Annex 3)

Figure 2: Pictures of Subproject Associate Site

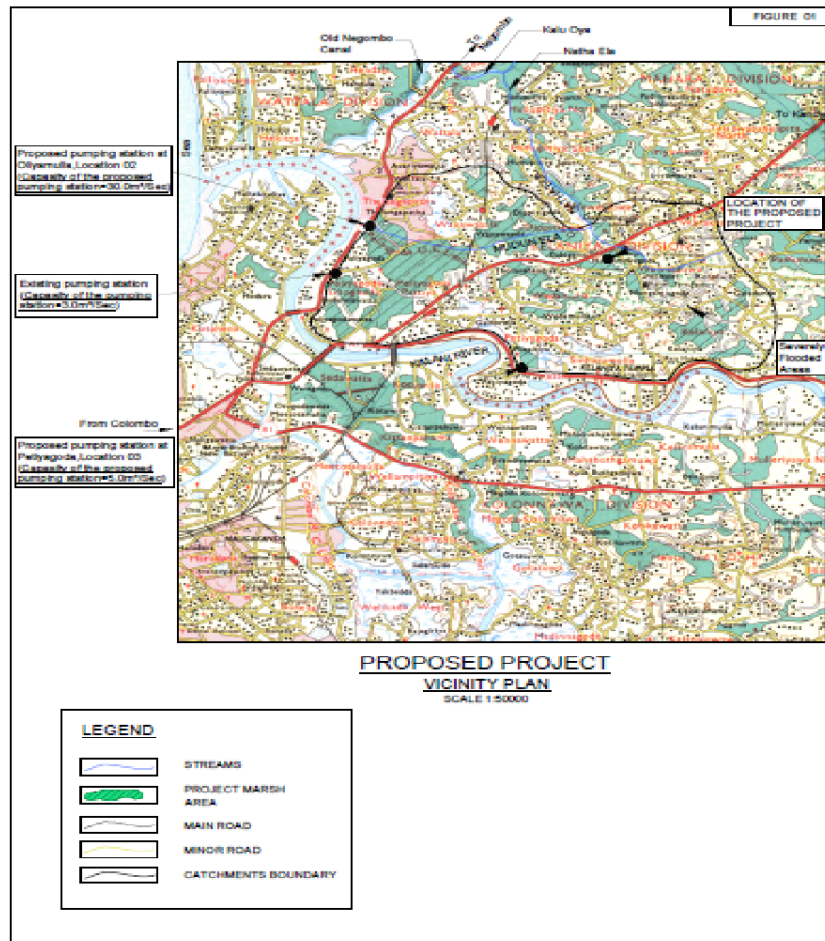


Figure 3: Partly Build Access Road to Subproject Site and Stagnant Canal



Captured by TMS.

Figure 4: Proposed Subproject Vicinity Plan



B. Description of the Subproject

24. The sub project land was initially owned by SLLRD which was an abandoned wetland. SLLRDC developed the land and transferred that land to UOK on 4th January 2017 (Refer letter dated 04.01.2017) for a payment of Rs 431,745 867.00. UOK made this payment on 23rd of December 2016. Receipt No RK 00041853 is provided).

25. The proposed FT will involve construction of a new faculty with facilities to conduct lectures for technology students. The FCT will function as an independent campus. 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 FCT. The subproject will be implanted in two stages.

26. **Phase I** of the subproject will involve the construction of the 10-story academic building (1000m²), 5 storied administration building (500m²), building for student centers (1000 m²), location for service building, transformers, waste water treatment, solar panel system, rain water treatment plant, garbage collection / recycling plant.

27. **Phase II** include 5 storied academic building 2 (1000 m²), security building (100 m²), staff accommodation (600 m²).

28. The academic building will consist of pile foundation with RCC columns, beams, slabs, stair case with stainless steel hand rails, plastered and painted. Zn/Al roof covered on a metal frame, gypsum board ceiling for toilets, powder coated doors 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 installed⁶

29. The details of the building structure is as follows:

- Lecture Halls with student capacity of 400, 200, 100, 50, 30
- Auditorium with a occupancy rate of 1000 people.
- Laboratories – chemistry, physics, electronic and robotics, biochemistry 1 and 2nd year student lab, biochemistry 3rd and 4th year students lab, two research labs with student capacity of 30, biotechnology lab, engineering technology lab, industrial technology lab, product design lab, engineering workshop. 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 and 50 students, multi media lab with 40 computers, network security lab, embedded system lab, game and animation lab, high performance computing, Software designing lab, language lab, data center, IT store room, IT staff room.
- Student group work areas
- 6 areas for students reading with a capacity of 50
- Staff rooms and faculty office rooms
- Faculty library
- Admiration building: Board Room capacity 150. Three board rooms for department to share, 120 staff areas, 100 temporary staff areas, faculty office area, office areas for the department, office area for the technical and allied staff, student center and the gymnasium, staff lunch area, faculty common area, three cafeteria each having a student capacity of 200, sanitary facilities, carrier guidance center, office for research students, store room, ground floor parking, security and maintenance.
- Waste water treatment plants- Detail plans not are not available but should target capacity of about 600 people.
- Rain water harvesting system: Detail designs are in progress. Currently information is not available. They will become available with the detail designs

30. The layout plan of FCT of UOK is shown below in Figure 5. The site plans and 3D views have been shown in Figure 6.

⁶ Cost estimates from the state engineering cooperation.

Figure 5: Site Plan of the FCT of UOK

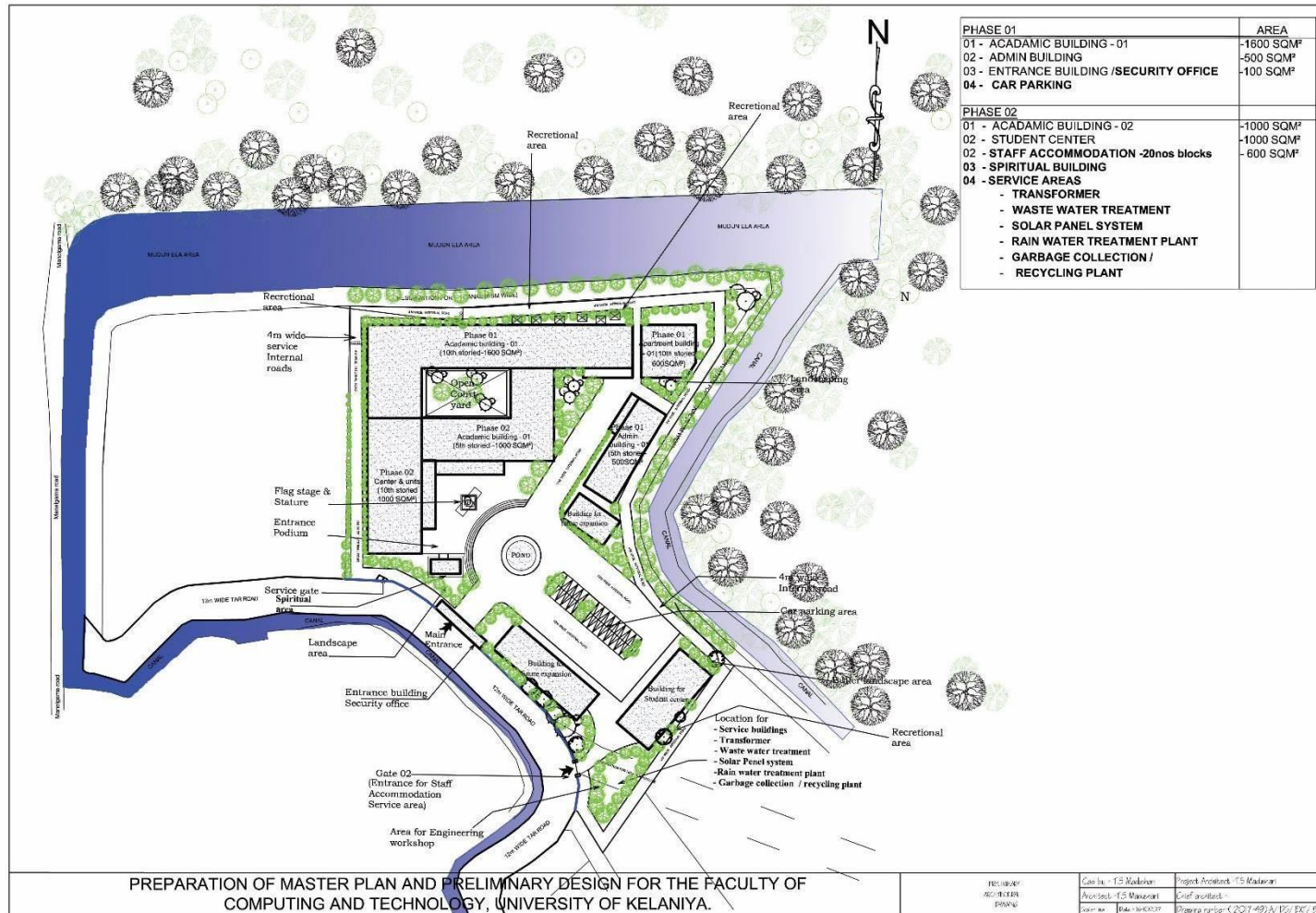


Figure 6: 3D View of the FCT Building UOK



31. The FCT 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.

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

33. **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.

34. **Utilities:** To facilitate utilities to the FCT 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.

35. **Land Acquisition:** UOK has secured adequate land to build the faculty. Subproject 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.

36. **Demand analysis study:** Detailed analysis on demand for graduate students will be carried out to justify the public investment for the FCT. Two types of data will be collected (i) employment outcome of recent graduates from the university (ii) industry demand for graduates from 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.

37. The FCT 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.

38. **FCT 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 useful 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 subproject.

39. **Development of infrastructure:** Development of FCT will be carried out to conform to new state-of-the-art standards including the adoption of the “Green Building” concept.

40. **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. 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.

41. **Sources of Construction Materials:** Soil and material investigation for a FCT is very essential to assess the availability of suitable construction material in the vicinity of the subproject. 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.

- **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 subproject 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.
- **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 depository that is 50m from the site.
- **Cement:** Local and imported cement in bag or bulk form is available for construction. Cement shall conform to SLS 107 for building.
- **Cement block & clay bricks:** these should be tested according to SLS 847 and SLS 39 for compressive strength, dimensions and water absorption.
- **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.

42. **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.

43. 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.

44. **Cost of the Subproject:** The total cost estimated for major items associated with the proposed subproject (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 subproject. The estimated civil work cost for phases I and II is Rs. 3,661 million. The total subproject cost during phase I and II will be Rs. 5,150 million. Refer Table 01.

Table 1: Subproject Cost As Per The Submission To National Planning Department

No.	Activity	Cost (Rs. Mn.)
I.	Civil Works (Phase I & II)	3661
II.	Furniture & Equipment (Phase I & II)	967
III.	Books & Software (Phase 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 (Phase I& II)	160

III. POLICY, LEGAL, AND ADMINISTRATIVE FRAMEWORK

A. Applicable Measurable Environmental legislations

45. 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.

46. The following section outlines the broad legal and institutional framework in Sri Lanka for environmental management, relevant to the proposed subproject. The legislations relevant to the subproject are listed below. Further details are provided in Annex 04. This subproject comes under the purview of the following sector level Acts. The procedure under the CEA is explained in Annex 04 along with the rest of the laws that are listed below.

- **The Constitution of Sri Lanka** (Articles 18, 27(14), Articles 154 (A), 9, 19 and (III) 17)- Covers environmental governance at the provincial level. In the event of public nuisance / grievance this becomes applicable to address the court of law.
- **National Environmental Act** No. 47 of 1980 (and its amendments of 1988) EIA is covered under this Act- This is discussed separately below since this is the main environment regulatory enactment.
- **Disaster Management Act** No. 13 of 2005- Comes into force in case of a national or regional level disaster. This is relevant due to the flood risk in the area.
- **Pradeshiya Sabha Act** No. 15 of 1987- body which regulates the planning and zonation of the region. This will be relevant for obtaining planning approval for the sub project.
- **Sri Lanka Land Reclamation and Development Corporation Act** No 15 of 1968- Governs the regulation of Mudun Ella and associated drainage system in the subproject area.
- **Mines and Minerals Act** No. 33 of 1992 – Relevant for the extraction of building material from the natural environment,
- **Fauna and Flora Protection Ordinance**, Act No. 49 of 1983 – Protection and management of wetland fauna and flora at site.
- **National Water Supply and Drainage Board Law** of No. 2 of 1974 – supply of water for the sub project.
- **Prevention of Mosquito Breeding, Act** No. 11 of 2007 – to ensure that the site is free of mosquitoes related habitats as this is an area identified for dengue epidemics.
- **The Urban Development Authority, Law**, No 41 of 1978- regulates the zonation of the Kelaniya Urban development. Provides guidelines for the FCT green building certification. refer Annex 5

- **State Land Ordinance**, Act No. 13 of 1949, Land Acquisition Act No. 09 in 1950 and subsequent amendments in 1983 and 1986, and Land Acquisition regulation of 2008- Relevant for land transfer from state to state agency.

47. **National Environmental (Amendment) Act 47 of 1980 and its amendments:** 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).

48. 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 does not require an IEE because it is not within a designated protected area.

49. 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.

50. 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 for the subproject will to be initiated. A summary of the statutory clearances required for the FCT is presented in Table 02.

Table 2: Statutory Clearances Required for the Subproject

Type of Clearance	Activity	Name of the Authority	When required
Environment Clearance (Environmental Protection Licensing) Regulation No. 1533/16 of 2008	Implementation of the subproject and waste water treatment.	CEA	Before construction
Permission for storm water drainage and infilling	Implementation of the subproject. On regulations pertaining reservation and	SLLRDC	Before construction
Clearance for development activities	Implementation of the subproject and construction of the building. They will direct to obtain	UDA	Before construction

	approval from the Kelaniya Pradeshiya Saba and CEA		
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 and to provide aces and material storage	DS	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 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

51. Apart from the clearances for the overall subproject work, the contractor, before starting the construction work, has to obtain required clearances listed in Table 3 for operating his equipment and carrying out construction work.

Table 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 Bureau (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 generated 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

No	Construction Activity & Type of Clearance Required	Statutory Authority	Statute Under which Clearance is Required
			(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- <ul style="list-style-type: none"> • 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

52. **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. 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 center so made by the local authority. 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 4 Timeframe for Planning & Implementation.

Table 4: 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	4 times a year

53. **Feasibility and costing:** Present feasibility and cost for equipment and building of the FCT at UOK were completed in December 2017. Bidding document was prepared for FCT in Dec 2017 and technical bids will be evaluated by July 2018. The contracts for the civil works of this subproject are expected to be awarded by December 2018.

B. Administrative Framework

54. **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. CEA advise the MOMDE on matters concerning prevention, control and abatement of water and air pollution; coordinate the activities of CEA and provide technical and research assistance; prepare manual, codes, guidelines & standards etc. University of Kelaniya will be required to obtain an environmental recommendation letter or EPL from CEA. The NEA regulations stipulate that canteen facilities with capacity of over 50 will require an EPL (UOK proposes 3 canteens with 200). This will fall under EPL category B.

55. According to the BIQ, the proposed subproject falls in to the un-prescribed category. According to the BIQ and IEE/EIA Environmental Guidelines of CEA, the proposed subproject 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 subproject under un-prescribed category has to be obtained through a letter. (Annex 6- BIQ has been filled out and ready to be submitted to CEA for environment clearance.).

56. 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 wastewater, quality should conform to regulation No. 1534/18 dated 01.02.2008 under the NEA.

57. **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.

C. International Agreements

58. Sri Lanka is signatory to numerous environmental conventions. The applicable international agreements are provided below.

- Conventions on Wetlands of International Importance especially as waterfowl habitats / Ramsar (entered into force in Sri Lanka in 1990)
- Convention on International Trade in Endangered Species of Wild Fauna & Flora/ CITES (entry into force in Sri Lanka in 1979).
- Convention on the conservation of Migratory Species of Wild Animals/ CMS (1990).
- United Nations Framework Convention on Climate Change/ UNFCCC (Sri Lanka ratified it in November 1993)
- UN Convention on Biological Diversity / CBD (Sri Lanka ratified in 1994).
- Plant Protection Agreement for Asia and the Pacific region (Sri Lanka ratified in 1994).
- Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (Sri Lanka ratified in 1992).

D. ADB Safeguard Policy Statement, 2009

59. The Asian Development Bank has defined its Safeguard requirements under its 'Safeguard Policy Statement 2009 (SPS 2009). It has three operational policies on the environment,

indigenous people, and involuntary resettlement. These three policies involve a structured process of impact assessment, planning, and mitigation to address the adverse effects of the subprojects throughout its cycle. The safeguard policies require that (i) impacts are identified and assessed early in the project cycle; (ii) plans to avoid, minimize, mitigate, or compensate for the potential adverse impacts are developed and implemented; and (iii) affected people are informed and consulted during project preparation and implementation. The policies apply to all ADB-financed projects.

60. The Environment Safeguards Policy ensures environmental soundness and sustainability of projects and supports the integration of environmental considerations into the decision-making process. The subprojects under the project are screened according to type, location, scale, and sensitivity and the magnitude of their potential environmental impacts, including direct, indirect, induced, and cumulative impacts.

61. ADB's SPS 2009 classify a project depending on following four categories.

- 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.
- 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.
- 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.
- Category FI. A proposed project involves the investment of ADB funds to or through a financial intermediary. The financial intermediary must apply and maintain an environmental and social management system, unless all of the financial intermediary's business activities have minimal or no environmental impacts or risks.

62. **Policy Principles:** Ensures that the screening process is used for proposed project, as early as possible, to determine the appropriate extent and type of environmental assessment so that appropriate studies are undertaken and potential impacts and risks assessed. There are 11 guiding Policy Principles for environmental safeguards to ensure environmental soundness and sustainability of projects and to support the integration of environmental considerations into the project decision-making process. Environmental safeguards are triggered if the subproject is likely to have potential environmental risks. Their relevance to the subproject is discussed in Table 5.

Table 5: SPS Policy Principle

	Policy principles	Met	Comments
1	Use a screening process for each proposed project, as early as possible, to determine the appropriate extent and type of environmental assessment so that appropriate studies are undertaken commensurate with the	✓	All screening for environmental, IR, IP carried out

	significance of Potential impacts and risks.		
2	Conduct an environmental assessment for each proposed project to identify potential direct, indirect, cumulative, and induced impacts and risks to physical, biological, socioeconomic (including impacts on livelihood through environmental media, health and safety, vulnerable groups, and gender issues), and physical cultural resources in the context of the project's area of influence. Assess potential trans boundary and global impacts, including climate Change. Use strategic environmental assessment where appropriate	X	Flood risk identified for the sub project influence area therefore a flood risk assessment was recommended and carried out. There is gap in updated records of flooding scenarios in the region.
3	Examine alternatives to the project's location, design, technology, and components and their potential environmental and social impacts and document the rationale for selecting the particular alternative proposed. Also consider the no project alternative.	✓	Location alternative was not considered.
4	Avoid, and where avoidance is not possible, minimize, mitigate, and/or offset adverse impacts and enhance positive impacts by means of environmental planning and management. Prepare an environmental management plan (EMP) that includes the proposed mitigation measures, environmental monitoring and reporting requirements, related institutional or organizational arrangements, capacity development and training measures, implementation schedule, cost estimates, and performance indicators. Key considerations for EMP preparation include mitigation of potential adverse impacts to the level of no significant harm to third parties, and the polluter pays principle.	✓	EMP prepared
5	Carry out meaningful consultation with affected people and facilitate their	✓	Stakeholder consultations were

	<p>informed participation. Ensure women's participation in consultation. Involve stakeholders, including affected people and concerned nongovernment organizations, early in the project preparation process and ensure that their views and concerns are made known to and understood by decision makers and taken into account. Continue consultations with stakeholders throughout project implementation as necessary to address issues related to environmental assessment. Establish a grievance redress mechanism to receive and facilitate resolution of the affected people's concerns and grievances regarding the project's environmental performance.</p>		<p>carried out on 3rd May 2018 and was attended by 23 people with female representation. EMP recommends continuous stakeholder consultations.</p>
6	<p>Disclose a draft environmental assessment (including the EMP) in a timely manner, before project appraisal, in an accessible place and in a form and language(s) understandable to affected people and other stakeholders. Disclose the final environmental assessment, and its updates if any, to affected people and other stakeholders.</p>	✓	Done
7	<p>Implement the EMP and monitor its effectiveness. Document monitoring results, including the development and implementation of corrective actions, and disclose monitoring reports</p>	X	EMP prepared for implementation but lacking in house capacity for implementation.
8	<p>Do not implement project activities in areas of critical habitats, unless (i) there are no measurable adverse impacts on the critical habitat that could impair its ability to function, (ii) there is no reduction in the population of any recognized endangered or critically endangered species, and (iii) any lesser impacts are mitigated. If a project is located within a legally protected area, implement additional programs to promote and enhance the conservation aims of the protected area. In an area of natural habitats, there must be no significant conversion or degradation, unless (i) alternatives are not available, (ii) the overall</p>	X	Biodiversity assessment was carried out since it was reclaimed wetland and there was no available baseline data.

	benefits from the project substantially outweigh the environmental costs, and (iii) any conversion or degradation is appropriately mitigated. Use a precautionary approach to the use, development, and management of renewable natural resources.		
9	Apply pollution prevention and control technologies and practices consistent with international good practices as reflected in internationally recognized standards such as the World Bank Group's Environmental, Health and Safety Guidelines. Adopt cleaner production processes and good energy efficiency practices. Avoid pollution, or, when avoidance is not possible, minimize or control the intensity or load of pollutant emissions and discharges, including direct and indirect greenhouse gases emissions, waste generation, and release of hazardous materials from their production, transportation, handling, and storage. Avoid the use of hazardous materials subject to international bans or phase outs. Purchase, use, and manage pesticides based on integrated pest management approaches and reduce reliance on synthetic chemical pesticides.	X	National standards for air, noise and sewage discharge are below the IFC-WB EHS standards. Therefore, IEE recommend the adoption of more stringent standards.
10	Provide workers with safe and healthy working conditions and prevent accidents, injuries, and disease. Establish preventive and emergency preparedness and response measures to avoid, and where avoidance is not possible, to minimize, adverse impacts and risks to the health and safety of local communities	✓	IEE has in cooperated these conditions.
11	Conserve physical cultural resources and avoid destroying or damaging them by using field-based surveys that employ qualified and experienced experts during environmental assessment. Provide for the use of "chance find" procedures that include a pre-approved management and conservation approach for materials that may be discovered during project implementation.	✓	Chance find will not be relevant since this is a reclaimed mash land.

63. There are 12 IR Safeguard policy principles to avoid involuntary resettlement wherever possible; to minimize involuntary resettlement by exploring sub project and design alternatives; to enhance, or at least restore, the livelihoods of all displaced persons in real terms relative to pre-project levels; and to improve the standards of living of the displaced poor and other vulnerable groups. IR safeguards are triggered under physical displacement (relocation, loss of residential land, or loss of shelter) and economic displacement (loss of land, assets, access to assets, income sources, or means of livelihoods) as a result of (i) involuntary acquisition of land, or (ii) involuntary restrictions on land use or on access to legally designated parks and protected areas. It covers them whether such losses and involuntary restrictions are full or partial, permanent or temporary. The subproject was classified as Category C for IR safeguards.

64. IP Safeguards have 9 guiding Policy Principals to design and implement projects in a way that fosters full respect for Indigenous Peoples' identity, dignity human rights, livelihood systems, and cultural uniqueness as defined by the Indigenous Peoples. IP safeguards do not get triggered under this subproject or the overall project.

65. **Conclusion:** The proposed subproject 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. As per the ADB's Safeguard Policy Statement the proposed FCT subproject of UOK was classified as Category 'B' for environment requiring Initial Environmental Examination (IEE). In order to meet Environmental Policy Principles 2, 7, 8, and 9, additional activities were identified where necessary. All other Policy Principles have been met.

IV. DESCRIPTION OF THE ENVIRONMENT

A. Methodology used for Baseline Study

66. 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. The literature survey broadly covered the following:

- Subproject 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.
- 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.
- Several visits to the project site 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

B. Location Area and Connectivity

67. The subproject is located in the Kelaniya Division that covers an area of 2197.48 ha. Kelaniya Divisional Secretariat consists of 37 Grama Niladhari divisions. The subproject area comprises Kelaniya, Kiribathgoda and Paliyagoda. The Colombo Kandy A1 highway passes near

the subproject site. Access to the site is provided by a 12ft wide tarred road on the south western corner of the land. The subproject is served with two bus stops. The site is an almost leveled land, with some undulations. The existing ground elevation within the site is varying between 99.0m and 99.8m with respect to an arbitrary datum established on site⁷.

68. The land is a filled marshland with water logged conditions. Observations show that there is very little water flow in the canal system surrounding the subproject. FCT is to be built in an area that is highly flood prone. In 2016 at Nagalagama Street which is close to the subproject site recorded 1.5 feet of flood levels on previous flood occasions.

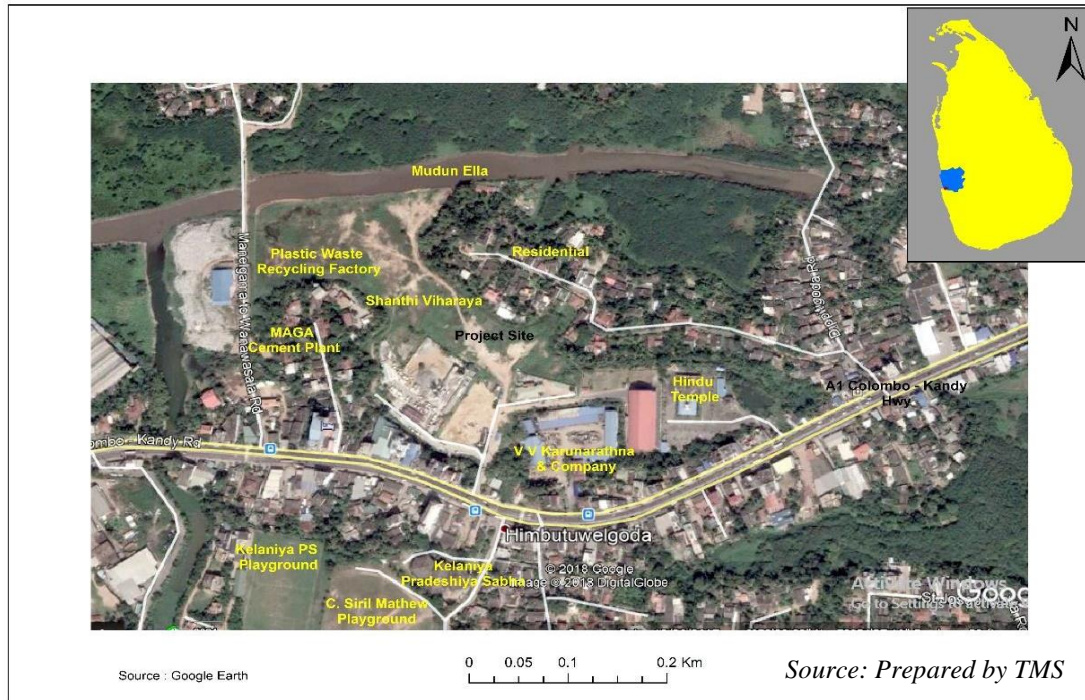
C. Area of Influence

69. The subproject area of influence consists of the following significant establishments; the Kelaniya Pradeshia Saba managed waste disposal site (80m), Shanthy Viharaya (temple – 100m), Hindu temple (380m), Atomic Energy Regulatory Council (318m), SLRDC office for sand deposit (297m) to and MÄGA Cement batching plant (112m).

70. Proposed development activities in the area include proposed FCT development and the proposed Pali and Buddhist Faculty of Graduate Studies immediately bordering FCT. The proposed Metro Colombo Solid Waste transfer site will be established 150 m from FCT. Colombo metropolitan regional recyclable waste will be collected and transferred to Aruwakkalu near Puttalam by train. The waste will be loaded at Wanawasala railway station (1km). While there is already a pumping station at Paliyagoda, infrastructure development is under for pumping stations at Oliyamulla and Pethiyagoda. Remaining degraded wetland area on the northern boundary of the subproject site (beyond Mudun Ella) has been identified for mixed development. See Figure 7 for area of influence.

⁷ Geotechnical Report (G/5257) 2017

Figure 7: Map Show The Location Of The Subproject And The Surrounding



D. Land Use

71. 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 6 highlights the landuse patterns in the DSD. Before urbanization occurred, Kelaniya was composed of wetland and paddy land⁸. The land use pattern in the project area today, is urban with predominately mixed development. Subproject 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 consists of private land, state land, residential land, industrial land, and several natural habitats, (wetland and streams).

Table 6: 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%

⁸ Kaliniya DSD resource profile 2014

Land Use	Hectare	As % of the DSD
Solid waste dumping yards	3.05	0.13%
Total hectare	2197.48	

E. Seismicity

72. The subproject 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.

F. Geology, Soil and Topography

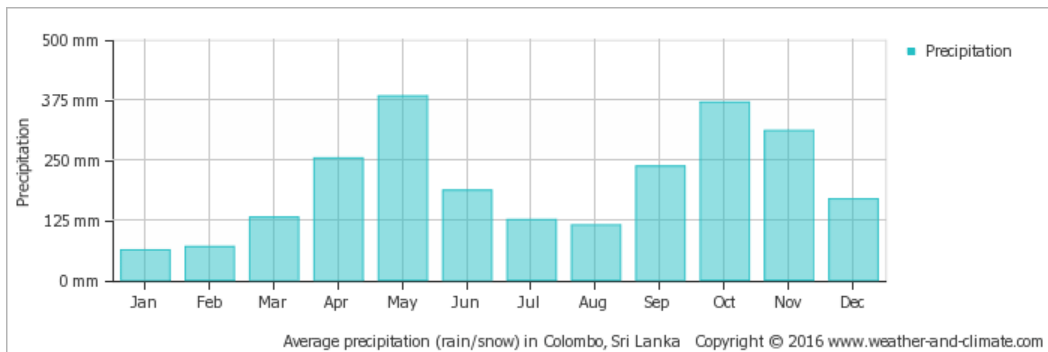
73. The location is in the Kelaniya Divisional Secretariat which is geologically composed of gravel, alluvial soil and clay. The northern parts of the DSD is composed of alluvial soil while majority of the area is composed of gravel, the southern and the central parts of the DSD is mainly composed of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

- The alluvial soil types are good for paddy cultivation and the subproject site is composed of highland series of rock types (permanently granulite facies rocks) of hornblende gneiss, biotite gneiss, quartzite, cordierite 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 rocks⁹
- The initial designs of FCT academic building should consider that net allowable carrying capacity of 3.0MN/m². The carrying capacity in skin friction within the basement rock or the ultimate skin friction coefficient is 140 kN/m², which is less than ICTAD recommended guidelines and propose the design. Refer the geotechnical soil assessment recommendation.

G. Climate and Meteorology

74. Climate conditions in the study area: Kelaniya division lies within the wet zone and according to agro ecological classification, the subproject area comes under the category of 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 subproject area are given in the Figure 8 Rainfall at FCT subproject 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.

⁹ Geotechnical investigation for proposed building for faculty of computing and technology, university of Kelaniya, April 2018.

Figure 8: Average Monthly Precipitation Over the Year (Rainfall) At the Subproject Site

75. 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 climatic conditions of the area. The key parameters of collected meteorological data have been summarized in Table 7.

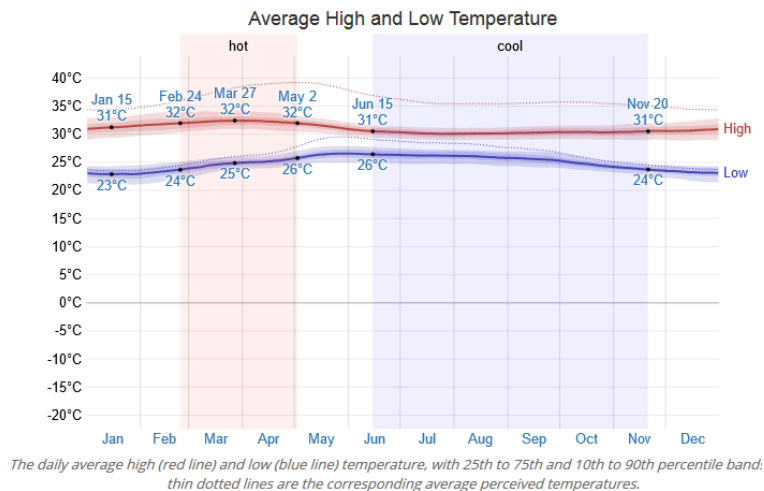
Table 7: Summaries of the Climatological Data (based on the Kiribathgoda Station)

Parameters	Monthly	Annual
Mean daily Max temperature (°C)	31 °C	32.22 °C
Mean daily min temperature (°C)	23 °C	23.88 °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.

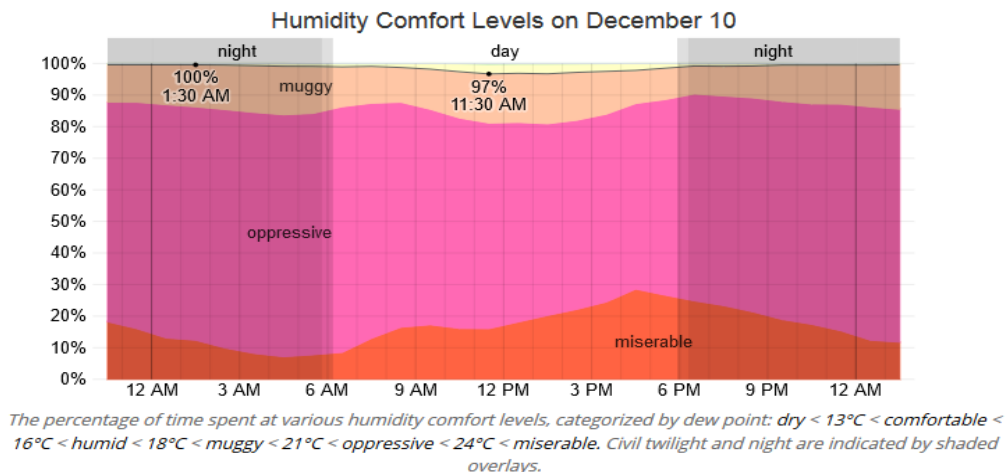
76. **Temperature:** The hot season lasts for 2.3 months, from February 24 to May 2, with an average daily high temperature above 32°C. The hottest day of the year is March 27, with an average high of 32°C and low of 25°C. The cool season lasts for 5.2 months, from June 15 to November 20, with an average 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 09.

Figure 9: Variation of Average Temperature



77. **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 figure 10).

Figure 10: Humidity Comfort Level



78. **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.

H. Ambient Air Quality and Noise

79. To draw up a baseline status of the ambient air quality the UOK will take the measurements prior to the commencement of the development subproject. Particulate matter, SO₂, NO₂ and Ozone will be monitored at regular intervals as stipulated in the monitoring plan in Chapter 8. Since the IFC- WB EHS guidelines are more stringent than the NEA the limits provided IFC- WB EHS will be adopted in this subproject. See table 15 for details.

80. 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. Since the IFC- WB EHS guidelines are more stringent than the NEA the limits provided IFC- WB EHS will be adopted in this subproject. See Table 16, 17, for details.

I. Surface and Ground Water Quality

81. The baseline data on water quality will be collected for three locations within the subproject area (ie. Mudun Ella, and the two connecting canal bordering the project site) by the UOK and will be monitored, analyzed and assessed during the construction and operational period. An assessment of water quality will be done to check coliform count, BOD, COD and other parameters to conform NEA standards. IFC- WB EHS does not provide any standards for the surface water. Before 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. Ground water testing will require only if it is used for the subproject.

J. Drainage and the River Systems:

82. 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.

83. 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 area¹⁰. 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 Figure11. ¹¹. This can be identified under 3 catchment sub sectors such as Peliyagoda, Dalugama – Telengapatha, Naramminiya- East of Kandy Road. The observed flood levels of Kelani River at Nagalagama Street which is very close to the proposed subproject are as follows:

- 3.87 m MSL in Year 1947¹²

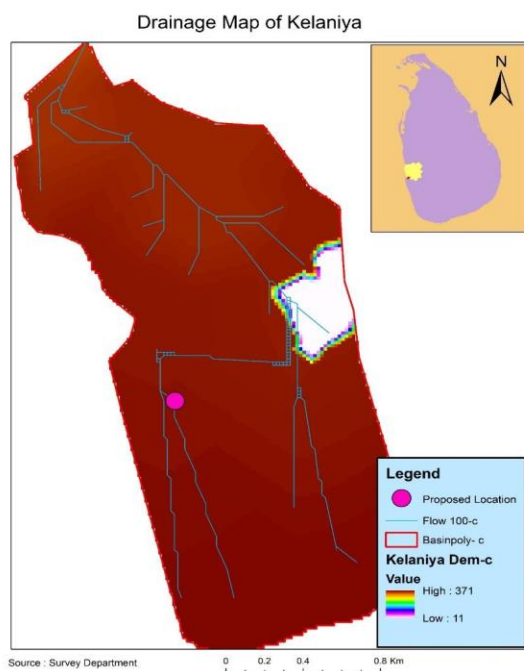
¹⁰ Kelaniya DSD Resource Profile 2014

¹¹ Flood Risk Assessment Report for Proposed Science and Technology Site at Dalugama 2018

¹² Ibid

- 2.88 m MSL in Year 1989¹³
- 2.29 m MSL in Year 2016¹⁴

Figure 11: Drainage Map of Proposed Site



Source: Prepare by TMS.

84. **Flood Risk Assessment:** A flood risk assessment was conducted in the month of February 2018 to study the risk of flooding in the subproject area. (Refer Annex 7) A very detailed analysis has been carried out to determine flood impact of the proposed subproject 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 subproject site, topography, proposed master plan, existing drainage network, degree of flood and historic observed data. 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 subproject

85. Average height of the flood bund along the Kelani River is at 4.57 m MSL in the vicinity of the subproject 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. 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

¹³ Ibid

¹⁴ Ibid

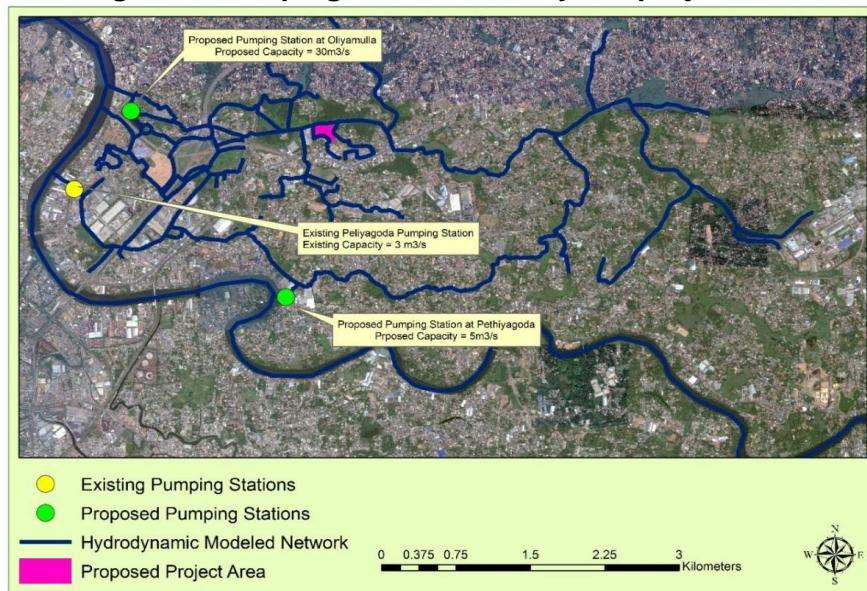
constructed yet. However, SLLRDC have pledged at least one more pumping station will be implemented in time for the FCT project. The location details for the existing and the proposed pumping stations are provided in Figure 12.

86. Based on the results of the model studies during this assessment the following was highlighted.

- The existing ground level of the subproject site is not protected for 25-year return period.
- Even after implementation of proposed drainage improvements, it is not possible to expect safety of the subproject at 1.5 m MSL without raising the existing ground at this location. Ground levels to be raised by about 1.25 m¹⁵. However, the later discussions with SLLRDC it was decided that minimum filling be carried out with design alternatives (on columns) to minimize increased flood risk to the immediate surroundings.

87. The required level of reclamation is dependent on factors such as protection level of the proposed infrastructures, maintenance of the sewerage system during floods, surface drainage system within the subproject area.

Figure 2: Pumping Stations Nearby Subproject Site



Source: Flood Risk Assessment.

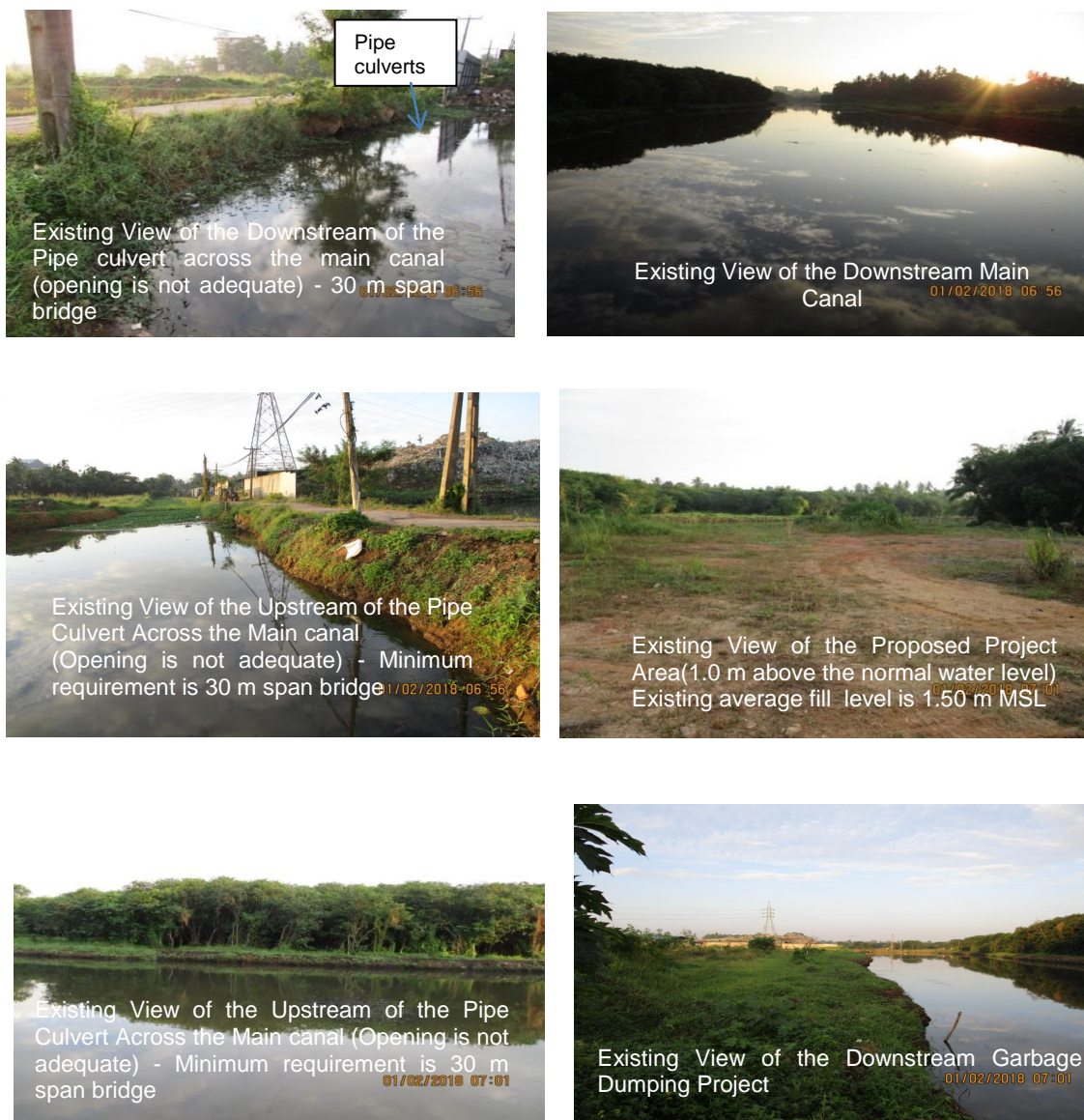
88. On site observations show that currently subproject site is supported by a poor drainage system which is not regularly cleared nor maintained. Figure 13 show the drainage system surrounding the site.

89. From the above plates, it can be concluded that SLLRDC does not clean or dredge 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.

¹⁵ ibid

90. In 2016 the subproject associated areas experienced 137.7mm of heavy rains¹⁶ that resulted in a flood. The flood affected area for Mudun Ella basin developed by Department of Irrigation is show in Figure 14. A Similar flood occurred in 2010 during which the Maga cement batching plant located adjoining the site was flooded. See Figure 15- Flood situation. DPC level of an unprotected house in the vicinity: 2.04 m MSL and it was flooded in 2010¹⁷.

Figure 13: Plates on the Drainage System Adjoining the Site



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

¹⁶ Sri Lankan floods 2016- Wikipedia website https://en.wikipedia.org/wiki/2016_Sri_Lankan_floods

¹⁷ Flood Risk Assessment 2018.

92. However, this flood risk assessment did not in detail evaluate the scenarios of flood impact surrounding residencies if the subproject 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). Therefore, discussions were carried out with SLLRDC on strategic planning to avoid filling which may further exacerbate the flood situation in the area.

Figure 14: Flood Inundation Area Map for Mudun Ela Basin 2016

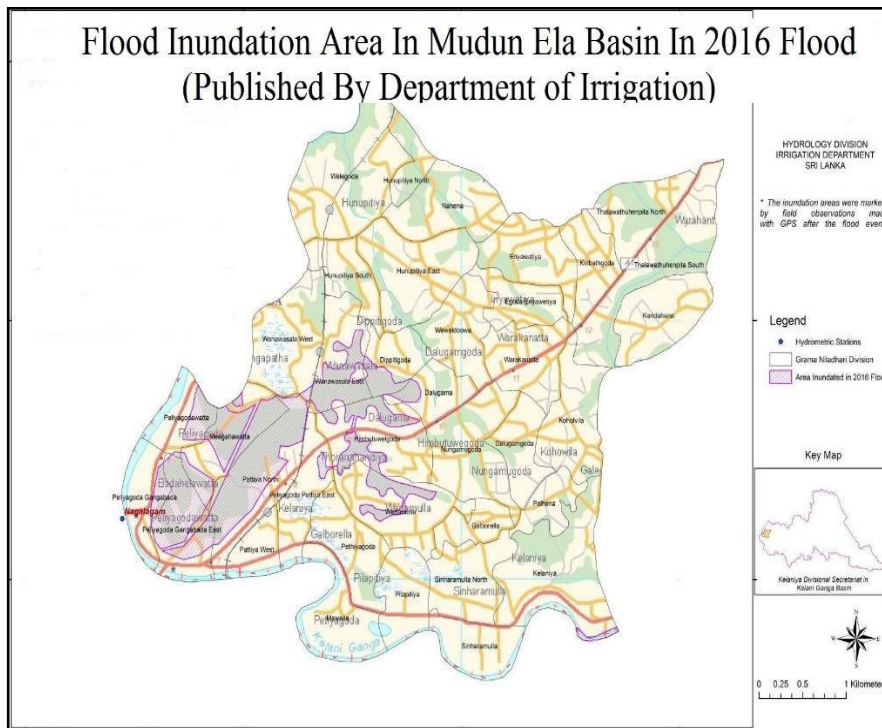
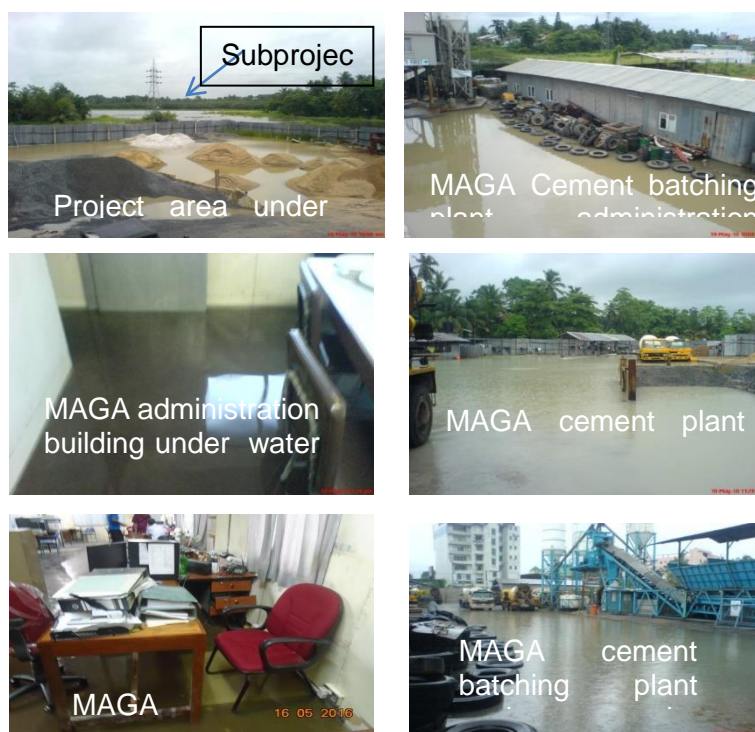


Figure 15: Flooding Situation at MAGA Site



K. Ecology and Biodiversity

93. 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 subproject area. This assessment is based on the National Red List 2012. This list is based on a scientifically accepted set of National Criteria developed along the same conceptual framework used by IUCN International, but applicable to the type of data available for Sri Lankan species. Therefore, this list cannot directly compared with the IUCN global red list.

94. The TOR for the assessment is provided in Annex 08. 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 1¹⁸. 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 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 Figure 16 and location coordinates are given in Table 8 and Table 9.

¹⁸ Rapid Biodiversity Assessment 2018.

Figure 16: Location of the Subproject Area with the Sample Points



Table 8: 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 9: Sampling Locations of the Aquatic Flora & Fauna

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

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

- **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*.
- **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.

- **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.
- **Land filled habitat (actual subproject area):** The invasive grass species, *Panicum maximum*, is growing in this habitat. Herbaceous weeds are also growing in the location.
- **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.
- **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 09 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 10 & Figure 17)

Table 10: The Threatened Species Recorded in the Study Site

Family	Species	NCS	DS
Cucurbitaceae	<i>Gymnopetalum scabrum</i>	VU	Native
Cyperaceae	<i>Lepironia articulate</i>	VU	Native
Rubiaceae	<i>Exallage auricularia</i>	VU	Native

Abbreviations: NCS – National Conservation Status; DS – Distribution Status; VU – Vulnerable.

Figure 17: Sample Plates of Floral Species



Gymnopetalum
(NCS – VU)

scabrum *Lepironia auriculata* (NCS – VU)

Exallage auricularia (NCS – VU)

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

97. **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 11 for a summary. The detailed list of animal species observed in the study site is given in Rapid Bio diversity Assessment Annex 09 in Part II, Tables 2-8). Figure 18 shows pates on few least concerned species of fauna found in the subproject site. Fauna found at subproject site when compared with the IUCN red list only *Rattus rattus* (common house rat) is listed under least concerned category. Locally this animal is considered a pest.

98. 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.

Table 11: Summary of Fauna Species Recorded with their Status According to the National Red List

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
Molluscans	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

99. **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 subproject site unless there is a well thought out holistic management plan for the broader area.

L. Educational, Medical and Religious Properties

100. 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.

101. Kiribathgoda government hospital is the main hospital in Kalaniya DSD. There are 33 midwives 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 subproject 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. 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.

M. Demographic Details of Affected Population

102. 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 religions 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.

103. 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.

104. **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 subproject 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.

105. 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.

V. ANALYSIS OF ALTERNATIVES

106. Although the proposed FCT subproject 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 EMP. By looking at the Table 12 below it can be concluded that “With” subproject scenario, with positive/beneficial impacts will greatly enhance social & economic development of the region and improve the environment, when compared to the “Without” subproject scenario. Hence the “With” subproject scenario with some reversible impacts is an acceptable option rather than the “Without” subproject scenario.

107. 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. Also, there is no existing facility in the vicinity that can be developed as an alternative to the proposed subproject therefore alternative location options were not considered.

108. The FCT of UOK forms an important training center for the technology students and since it is located close to major EPZ such as Katunayake and Biyagama, and Colombo which is the business capital in Sri Lanka.

109. The technology alternative of using solar power system is considered at this stage since the project proposes a state of the art green building infrastructure that will be procured later on in

the project cycle. The proposed improvement in the subproject include latest infrastructure that would help to train graduates in computing/ICT, engineering technology under modern conditions and standards. Keeping this in view, the site conditions and the scope of development of the area, the 'With' and 'without' subproject scenarios have been compared as shown in Table 12.

110. Structural design alternatives are being considered, taking in to account the flood risk assessment finding and the stakeholder discussions. Considering existing flooding condition, available drainage system and stability of the bedrock at the subproject site. 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 will be adopted.

Table 12: Subproject Scenario

With Subproject		Without Subproject	
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 canal 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 subproject site
Improved drainage in subproject 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	Micro level 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 subproject access road
Increased access to job markets	Nil	Nil	Reduced employment/ economic opportunities
Employment to local workers during the execution of the subproject	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 subproject, it will be difficult for the Sri Lankan government to finance such a technology education development facility for UOK from its own resources

VI. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

111. The proposed work under FCT Development 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 flood mitigation, and the maintenance of the canal system. Efforts will be worked out to minimize any adverse impacts on the various environmental and social components through a practically implementable strategy. 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.

A. Land and Environment

112. **Construction Phase:** The impacts on existing topographical setting originate primarily from embankment preparation and opening up borrow pits to fulfill the requirement of earth material to raise the DPC level of the proposed building to a maximum of 2.0 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.

113. Impacts:

- Disfiguration & change in existing profile of the land due to proposed subproject location.
- Disfiguration of topography due to indiscriminate digging of borrow pits. Approximately 10,800 m³ earth¹⁹ will be required from the borrow area for filling purposes. This has to be obtained from earth generated through cutting of the existing borrow areas
- Uncontrolled digging of borrow pits resulting in water accumulation & breeding of vector disease
- Disturbance on geological setting due to quarrying

114. **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.

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

¹⁹ Based on Flood Risk Assessment Report for Proposed Science and Technology Site at Dalugama 2018.

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.
- 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

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

116. **Impact:**

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

117. **Mitigation Measures:**

- 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.
- Squatter development along the subproject shall be strictly avoided by proper regulation and vigilance.
- All debris, piles of unwanted earth, spoil materials and temporary structures should be cleared away from the subproject site and disposed at locations designated or acceptable to the SLLRDC, LA and CEA.
- Subproject landscape activities have to be done as per either detailed design or typical design guidelines given as part of the bid documents.
- The faculty head with the appropriate support staff allocated for the purpose will be responsible for the maintain of the shrubs, tree and landscape of the area. Minimum

of 90% of survival of plans will be maintain any shortfall of this amount will be replaced during the monsoonal period.

B. Water and Environment

1. Drainage and Hydrological Flow

118. The FCT site has been identified as a flood risk area by the flood risk assessment. Nearby wetlands are protected by SLLRDC, UDA, Kelaniya Pradeshiya Saba and other agencies.

119. Impacts:

- Since the subproject 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.
- Poor or non-availability of drainage facilities on the access roads is another factor contributing to local flooding.
- Increased incidence and duration of floods due to obstruction of natural drainage courses by the FCT building construction embankments.
- Chances of accidental filling of existing drainage courses during earth filling may lead to blockage which will contribute to temporary floods.
- Increase of mosquitoes and other vectors increasing health risk.
- Aesthetics of the surrounding buildings could be affected due to mud and sedimentation transport due to flooding.
- 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 subproject site on a regular basis.
- The canal that flows parallel to the access road is highly polluted and stagnant. The adjacent settlements untreated waste water disposed to the canal. If this is not properly mitigated it would be a continuous health risk and will also result in unpleasant odor and sight.

120. 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.
- Adequate building and roadside drains will be provided along property to facilitate its better maintenance.
- 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 pools at the subproject site.
- Construction works of culverts will be taken up during the lean flow periods in drought period to minimize the impacts on drainage. Maintain design features such as drainage structures.
- 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.

- Temporary earth drains should be provided until required line or earth drains are provided after excavation and other construction activities
- 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).
- Removal of the pipe culverts that are obstructing the free flow of water in the subproject associated area. Consult the Kelaniya Pradeshiya Saba and the Department of Railway to remove the pipe culverts that are obstructing the water flow at Manel Gama and Wanawasala railway station.
- Drains, channel on the eastern boundary of the subproject 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.
- 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.
- **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 should be installed at the edge of the water body when construction is in progress. It is proposed to install a silt trap at the edge of all water bodies located along the subproject site location.
- **Ground Water Recharge Pit/ Rainwater Harvesting Structures:** Unlined drain in the subproject 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 subproject area. Paved surface of the FCT 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 Environmental Consultant, and an Independent Engineer to finalize 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 construction. The rainwater that will be harvested will be used only for irrigation and gardening purposes and therefore no rainwater treatment system will be adopted.
- **Adopt flood control measures:** Engineers should adopt flood control measures which will be utilized to manage the outlined flood hazard to the proposed development. Flood hazard to the site will be managed by building on pillars, raising finished floor levels, sustainable drainage systems and waste water management, sewerage system etc. "Site Flood Plan" should be developed. Outline recommendations for surface water management and sustainable urban drainage system (SuDS) - this will be important to manage the site from future flooding scenarios in respect to the region.

2. Water Use

121. 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 (contractor)

before the commencement of the subproject. The estimates for tentative water requirement during construction to be developed by the UOK with the contractor. (See Annex 10). The details of extraction of water for construction will be finalized by the contractor once awarded.

122. **Impacts**

- **Construction phase:** Water supplied from outside for the construction purposes in bowsers till pipe born water supply is established may lead to water resource contains. Quantity of water used during construction is to be calculated by contractor.
- **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 or operation since it is unsuitable at the subproject site with an acidic pH. Estimated water consumption for the FCT will be approximately 10,000 l per day (considering occupancy of 600 and gardening).

123. **Mitigation:**

- Upon completion of detail building design water requirement for the construction phase should be calculated and source identified. This task should be carried out by the contractor.
- Obtain the water supply connection to the site from the NWSDB 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.
- **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 plans are available monitoring points will be established by the Environmental Consultant. Water quality parameters will be monitored bi-annually during construction and annually during operation. Any release of waste water into the adjacent water bodies has to conform to values provided in Table 13.

Table 13: Waste Water Quality Standards (Sri Lanka Standards Institute)

Parameter	Unit	Bathing Water	Raw water for Drinking	Agriculture Water
Colour	Pt units.	-	100	-
pH	-	6.0-9.0	6.0-9.0	6.0-8.5
Conductivity	dS/m	-	-	0.7
Nitrates	mg/l	5	5	5

Total phosphate	mg/l	0.7	0.7	0.7
BOD5	mg/l	4	5	5
Total coliform	MPN/100 ml, (*P=95%)	1000	5000	1000
Fecal coli form	MPN/100 ml, (*P=95%)	50	-	-
Aluminum	mg/l		0.2	0.5

- Any release of sanitary sewage discharge should conform to IFC-WB EHS standards. This is in line with the SPS 2009 requirements. Refer Table 14 for standards.

Table 14: Sanitary Sewage Discharge Water Quality Standards Comparison

NEA standards (Tolerance limits for discharge of effluents into public sewers with central treatment plants)			IFC-WB EHS Guidelines 2007 (Indicative Values for Treated Sanitary Sewage Discharges)	
	Unit type of limit	Tolerance limit values	Units	Guideline Value
pH			pH	6-9
BOD	mg/l, max.	350	mg/l	30
COD	mg/l, max.	850	mg/l	125
Total nitrogen	mg/l, max.	500	mg/l	10
Total phosphorus			mg/l	2
Oil and grease	mg/l, max.	30	mg/l	10
Total suspended solids	mg/l, max.	500	mg/l	50
Total coliform bacteria			MPNb / 100 ml	400a

- **Functional Sanitary facilities:** It is important that functional sanitary facilities are maintained in the university to avoid health risks and spread of disease. Regular sanitary facility checks and maintenance to be carried out by university. Already the design lay out of the building proposes a maintenance space.
- Maintenance staff should be employed for running of these sanitary facilities with training on monitoring and repairing of leaks, non-functionality, etc.. 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 subproject implementation.

C. Air Environment

124. **Impact**

- 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.
- 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.

125. **Mitigation:**

- Wet down and spray water at construction site, quarries if required.
- Dust emissions during transportation of construction materials should be controlled by enforcing speed limits on the vehicles and ensure transported material is covered with tarpaulin.
- Take steps to avoid dust emissions during loading and unloading of construction material. Tarpaulin covering is mandatory on trucks/lorries which are used for transporting materials
- All filling works are to be protected or covered in a manner to minimize dust generation
- 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 gazette under NEA
- The Contractor shall maintain a record of pollution under control for all vehicles and machinery used during the contract period, which shall be produced for verification whenever required
- The air quality monitoring will be conducted as per the plan in chapter 8 and will follow IFC-WB EHS standards. This is in line with the SPS 2009 requirements. Refer Table 15 for air quality standards.

Table 15: For Air Quality Standards Comparison

NEA standards	IFC -WB EHS Guidelines
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	Averaging Period	Guideline value in mg/m ³	Averaging Period	Guideline value in mg/m ³
Sulfur dioxide (SO₂)	24 hrs	80	24hrs	125 (Interim target-1)* 50 (Interim target-2) 20 (guideline)
Nitrogen dioxide (NO₂)	24hrs	100	1-year 1-hour	40 (guideline) 200 (guideline)
Ozone	8-hour daily Maximum	-	8-hour daily maximum	160 (Interim target-1) 100 (guideline)

*Interim targets are provided in recognition of the need for a staged approach to achieving the recommended guidelines.

D. Noise Environment

126. During the construction phase, noise will be generated due to movement of operation of light & heavy construction machineries (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. Noise generated from sources mentioned above will be intermittent and mostly during daytime.

127. **Impact.** Increase in noise level due to construction activities and operation of construction equipment will cause disturbance to the surrounding community and the wetland associated fauna. Moreover, Shanthi viharaya and the settlements around the subproject will have an impact. However, since there is already a concrete batching plant that is operated within the vicinity of the Buddhist 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.

- Typical noise level of various activities associated with the subproject is presented below in Table 16 and Table 17 provides typical noise level associated with the operation of construction machinery.
- 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 increase in distance. Therefore, since immediate surroundings of the subproject site is not developed target impact is diluted. Also, the areas are highly commercialized having a lower impact.

Table 16: 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

Table 17: Typical Noise Level of Construction Equipment

Clearing	Structure Construction
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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.

128. **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.
- Contractor must ensure that all vehicles and equipment used in construction shall be fitted with exhaust silencers.
- At the construction sites, noisy construction work such as crushing, operation of diesel generator sets, use of high noise generation equipment shall be stopped during the night time between 10:00 p.m. to 6:00 a.m.
- The maximum permissible noise levels at boundaries of the land in which the sources of noise is located for construction activities will conform to IFC-WB EHS mix development standards. This is in line with the SPS 2009 requirements. These standards override the NEA standards. Refer Table 18 below.

Table 18: Comparison of Noise Level Standards

NEA standards		IFC Guidelines		
	Day time 6am-7pm	Night time 7pm-6am	Daytime 07:00 - 22:00	Nighttime 22:00 - 07:00
Commercial Areas	65	55	70	70

Industrial Area	70	60	70	70
Mixed Residential/ Residential; institutional; educational	65	55	55	45

E. Impact on the Fauna and Flora

129. **Impact** (The species richness presently in the subproject 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 subproject site etc.
- Several invasive species have been established in the subproject 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. *Eichonia crassipes* and *Anona glabra* are currently the most common invasive species covering about 50% of the habitat. However, other species may also invade the habitat. Please refer table 19 below.

Table 19: Invasive Alien Species and Potentially Invasive Alien Species Recorded in the Study Site.

Scientific Name	Common Name
Alien invasive species	
<i>Alstonia macrophylla</i>	භවරි නුග, යකඩමරන්, අට්ටෝනියා, ගිනිකුරු ගස්
<i>Typha angustifolia</i>	හම්බු පත්
<i>Annona glabra</i>	වෙල් අනෝදා, වෙල් ආත්තා
<i>Eichhornia crassipes</i>	ජපන් ජබර
<i>Mikania cordata</i>	.i mdz
<i>Lantana camara</i>	ගඳපාන, කටු හිඟුරු, රට හිඟුරු
<i>Pennisetum polystachion</i>	රිලා වල්ග
<i>Panicum maximum</i>	ගිණි තණ, රට තණ, ගිනිකීරැස්ස
Potential alien invasive species	
<i>Ludwigia peruviana</i>	බෙරු දියනිල්ල, වෙල් කරාබු
<i>Mimosa diplotricha</i>	je,a ksosl=ind
<i>Muntingia calabura</i>	ජෑම්
<i>Acacia auriculiformis</i>	

- 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.
- 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.

130. **Mitigation:** Adoption of mitigation measure will minimize the impact on the subproject land and its surrounding habitat.

- Outright removal of vegetation should not be carried for the invasive species, as they are providing necessary ecosystem functions currently. Thus, selective replacement of such exotic and alien invasive species with native species should be done systematically. This will contribute towards the enrichment of the currently degraded habitat.
- Saplings for tree planting program should comprise of native or endemic species which is suitable to the existing climatic condition of the subproject areas. Native plant species listed in the Table 20 are suggested for the tree planting program which will enrich the habitat.

Table 20: List of Species Suggest for Habitat Enrichment

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

Family	Species	Sinhala name	Type
Lythraceae	<i>Lagerstroemia speciosa</i>	Murutha	Tree

- Actions should be taken for speedy cleaning up of oil spills from operating machinery, fuel and toxic chemicals in the event of accidents.
- All the construction workers and staff of the subproject 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.
- Vegetation regeneration at the subproject site should be monitored and managed to wean out invasive species and promote the native species.
- All staff / workers should be instructed not to chase, disturb or harm any fauna seen near the subproject area.
- Noise has to be kept under control by regular maintenance of equipment and vehicles. "No honking" board shall be placed near the boundary to the wetland.
- Noisy activity shall be prohibited during night time.
- Construction debris should not be dispose in the wetland areas.
- Natural vegetation and natural slope in canal embankments should be maintained within the canal reservation. Concrete walls or Gabion walls not recommended.

F. Waste Disposal and Sanitation

131. Impact

- 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 subproject 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 it will not impact the environment. Lack of regulated sanitary facilities will result in pollution of groundwater and surface water associated with the sub project.
- **Operation Phase:** Currently 350kg-400kg of solid waste is generated at UOK. Based on this estimated solid waste at the new FCT will be around 20kg per day. Majority will be organic.
- Unless regular maintenance and emptying of septic tanks is carried out there can be overflows that lead to environmental pollution.

132. Mitigation

- Contactor and the engineers should consult the Kelaniya Pardeshya sabha at the onset of the subproject on waste collection and disposal.
- 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.
- Seek approval from the DS for storage and disposal of spoil material and other gravel.

- 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.
- 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.
- 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.
- Under no circumstances should the solid waste be burned on site. Additionally, under no circumstances will any construction waste will be disposed of around the project site. Garbage bins should be provided to all workers-based camps, and construction sites
- 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.
- During the operational phase: Waste disposal and sanitation becomes an important consideration with the occupancy level of the FCT buildings. Presently at the UOK colour coded bins are placed for disposal of waste. However, the waste is not processed within the university premises.
- Septic tank capacity should be regularly monitored and emptied before reaching over capacity. This should be done in consultation with the LA to ensure dumping is carried out appropriately.

133. **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.
- Disposal of untreated waste water will further impact the ground and surface water.
- Disposal of waste water from some laboratories will require specialized waste and waste water management. For example, chemicals for bio labs.

134. **Mitigation:**

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

- Train the students on importance of social responsibility and garbage disposal. Provide colour coded bins at several locations to encourage source separation.
- 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.
- Develop in-house organics waste composting mechanism and nonorganic waste should be separated and given for recycling purposes. For organic waste management contact CEA engage in the Pilisaru program.
- Prevent solid waste disposal to these canals, culverts and drains that will increase drainage congestion.
- The used and expired chemical from bio labs would need to be stored and disposed by consulting CEA.
- University will obtain approval for waste and wastewater management system from UDA and CEA according to the government requirements.

G. Design of FCT Buildings Under the Green Building

135. 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 eight 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).

136. **Impact:**

- Flaws in the FCT 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 FCT, 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.
- 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.
- Waste generated from air-conditioning and solar systems will become a hazard to dispose into the environment. Lack of proper maintenance may lead to investment losses.

137. **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.
- 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.
- Demarcate an 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.
- 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. The project management unit of UOK has initiated the process reevaluating the building designs.
- The solar thermal panels that are installed will be operated by the supplier. Any waste that is generated will be taken by the supplier for possible reuse and recycle (agreement should be reached at the onset). Solar panels will be installed after construction and the requirement will be determined by the supplier together with UOK PMU based on the detailed designs. According to the procurement plan, separate contracts will be awarded to install solar panels. Buildings will be designed and constructed to meet the requirements for solar power. E-waste to be disposed of in an appropriate manner. Have an agreement with the local authority.
- Disposal of toxic chemicals from laboratories should be arranged with relevant institutions/private companies.
- Designs of buildings will be reviewed by ADB design review consultants to ensure the government and ADB requirements of environmental standards are met.

H. Resource Mobilization and Allocation

138. **Impacts** Allocation of space for labour camp, project office requires addition amount of space which may lead to space constrains. Inappropriate siting of labour camps will lead to social conflicts with neighboring communities. In this sub project there will be no conflict with the student community as it is a new location. No availability of adequate drinking water for labours will result in dehydration and health risks.

139. 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. Work force recruitment will depend on the contractor selected.

140. **Mitigation**

- 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
- 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. The one having least impacts on the environment will be approved by the PMU and Safeguards Cell. The intention of establishing construction camp within FCT plot is avoid impacts on surrounding land
- The storage location of construction materials shall be at the any building close to the FCT site.
- 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
- Majority of skilled and unskilled workers should be selected from the subproject influence area to avoid generation of waste and sanitation problems from labour camps

I. Occupational Health and Safety

141. Impact

- **Construction Phase:** Both within and outside of subproject 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.
- **Operation phase:** If student don't maintain personal hygiene, it can lead to health issues and disease outbreaks. At the same time hygiene and sanitation of staff working the canteens have to be maintained to limit health issues.

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

- Contractor should organize awareness programs about personal safety for workers. This should provide briefing and training on safety precautions, their responsibilities towards safety, etc.
- 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.

- 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.
- The construction labour camp should be equipped with first aid facilities and a trained personnel onsite in case of an injury.
- Ample lighting around the construction site should be provided during the night.
- Excavated areas for construction should be barricaded using barricading tapes, sign board should be placed.
- 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.
- During the operation phase, the under mentioned conditions should be included in the contractual arrangement with the canteen operator.
 - 1) Health checks of the canteen should be done annually
 - 2) Prepare set of rules on personal hygiene to be displayed and practiced
 - 3) Adopt food safety regulation imposed by the ministry of Health.
 - 4) Scalp hair should be covered especially in the kitchen area.
 - 5) Sign boards on hand washing should be displayed and adequate functional facilities provided.

J. Health and Safety of Trainees

143. **Impacts:** There are no anticipated significant impacts during the operation and maintenance of the subproject. 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.

144. **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.

K. Risk of Fire and Emergency Preparedness

145. **Impact: 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. This may cause damage to property and risk lives

146. **Mitigation:** Several mitigation measures can be adopted under the purview of the Dean of the Faculty.

- FCT of UOK will prepare a disaster management plan for the FCT giving special emphasis to fire, flood and cyclones. Emergency evacuation point in the building and an emergency alarm system in the building to warn the student population of any such situations have to be adopted. Emergency evacuation should be practiced during the operation phase.
- Another plan should be prepared for possible minor accidents of students and staff. The FCT should adopt a medical center within the FCT with required links with the closet hospitals in event of an emergency.

L. Induced and Cumulative impacts

147. According to the ADB Environment Safeguards Sourcebook cumulative impact is described as: “The combination of multiple impacts from existing project, 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.

148. **Impact:**

- Economic activities supporting FCT like lodging, and restaurants are expected positive impacts which will increase with new student population and induce development in the subproject area.
- 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.
- The construction of the FCT will provide positive impacts on the education and technology in the country providing modern 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.
- In terms of environment safeguard issues, the subproject is expected to enhance the disturbed surroundings with habitat enriched green building on site.
- During the operation phase, the generation of solid waste will aggravate the solid waste management problem in the area.

149. **Mitigation**

- Project associated development should be regularized and planned development encouraged by the local government. UOK should take these issues and concerns to discussion with the local authority.

- Water front areas should be conserved with a green belt using native species and replacing the invasive and the exotic species systematically. Habitat to be further enriched by maintaining clear water bodies devoid of any invasive species clog up the water body (e.g. *Salvinia* and *Eichonia*). This will promote free flow and attract aquatic fauna.
- To address these potential problems, relevant local authorities will have to monitor developments and strictly enforce rules.
- Enforce a solid management plan which will ensure the processing of solid generated onsite as far as possible.

M. Climate Change Impact and Risk

150. 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.

151. Impacts:

- **High Precipitation Impacting Channel /Embankment:** Heavy rains can cause disruption of the water ways surrounding the subproject 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.
- **Flood:** The study area has a flood problem. A Flood Risk Assessment Report has been prepared. See Annex 7.

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

- 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.
- 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.
- Adopt measures suggested by CEA, SLLRDC on construction near a wetland. Obtain their approval and clearances prior to construction.
- Design and construction must be adequate to resist the anticipated forces of flood.

- 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.

VII. PUBLIC CONSULTATION

A. Approach to Public Consultation

153. 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 subproject implementation. Thus, the meeting was held for residents around the subproject areas, public sector and private sector agencies who are concerned with the subproject 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.

B. Methodology

154. **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 11 provides the participant list). Female representation was six. Of the residents who were invited, representation was from the local temple. However, temple representation can be considered as a local community representation in local context.

155. **Discussions, Questions and Answers:** In the meeting, the participants were informed of the proposed subproject and potential environmental impacts due to the subproject. 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 19.

156. **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 11 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.

- Current flood levels observed in the subproject associated area
- Nature of environmental problems presented in the surrounding and the issues and concerns.
- Disturbance due to subproject work for the surrounding community

- Improvement of the drainage in the canal system associated with the subproject
- Issue of environmental pollution concerning solid and waste water waste disposal
- Stability of the building and foundation of the proposed building. Evaluation of current situation of other building
- Access road and accessibility issues from the main road

157. 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 11. Registration was kept voluntary. Almost all of the participants registered themselves.

C. Analysis of the Collected Feedback

158. A total of 23 stakeholders participated in public consultation meeting. Information was gathered on following topics. Female representation was 6.

- 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 subproject site
- Perception of the education offered at the faculty
- Perception of the waste management site located close to the subproject site

159. **Outcome of the Public Consultative Meeting** The following are the major points:

- Design and implement a drainage plan for the subproject.
- Manage the ecology in the surrounding habitat.
- Reservation limits to be maintained so that the dredging activities on the Mudun Ella canal can be done.
- Managing noise, dust and vibration at the site.
- Establish a funding mechanism as well as a schedule for maintenance and cleaning work of the canal system associated with the subproject.
- Contact Ministry of Megapolis and Western Development and consult the future plan concerning the solid waste management dump site located 80m from the site.
- Establishment of a waste water treatment plant to reduce water pollution and discharge.
- 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



VIII. GRIEVANCE REDRESS MECHANISM

A. Consultation and Information Disclosure

160. To ensure continued public and stakeholder participation in the FT subproject life cycle, periodic consultations shall be taken up at regular intervals at site during implementation. This participatory process will ensure that all views of the people are adequately reviewed and suitably incorporated in the design and implementation process.

161. **Information disclosure:** Once the IEE is approved by the ADB, an electronic version of the IEE will be placed in the official websites of ADB. Upon written request, any person seeking information can obtain a hard copy of the complete IEE document by paying for its photocopying cost. The PMU will issue notification on the disclosure mechanism in local newspapers, ahead of initiation of implementation of the subproject, providing information on the subproject, start dates, etc. The notice will be issued by the PMU in local newspapers 1 month ahead of the implementation works. This will create awareness of the subproject implementation among the public. In addition, any revisions to the IEE will be disclosed to the project stakeholders.

B. GRM Process

162. The affected person(s)/aggrieved party can give their grievance verbally or in written form to the local site office of FCT 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 with immediate effect which should be addressed within 7 days. If the matter cannot be resolved at the site level it will be referred to project coordinator of UOK PIU. In event that it is not solved

within 7 days by the PIU (Project Coordinator), it will be brought to the Grievance Redress Committee (GRC) which will be appointed by the PMU of the MHECA. The GRC will comprise of State Secretary of MHECA, Project Director, religious leader from village, Grama Niladari, and community leader from village. Complaints shall be submitted to the Project Director to be presented at GRC.

163. The GRC will take up any issues during its monthly meeting and provide a solution within two weeks. If the matter is not resolved by GRC at PMU level within stipulated time, it shall be referred to Land Use Committee of the region. 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.

164. Any aggrieved party may access the country's legal system at any stage. Legal redress can run parallel to the GRM and is not dependent on the negative outcome of the GRM.

165. **Registering complaints.** The PIU and 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-subproject site. The complaint will be registered by the aggrieved party by duly filling the form provided, (refer Annex 12) PIU established a public response centre (PRC) helpline specifically addresses the issues arising out of subproject implementation. Complainant can be registered via any of the following means: Through Public Response Center Help Line.

Land Line Number:

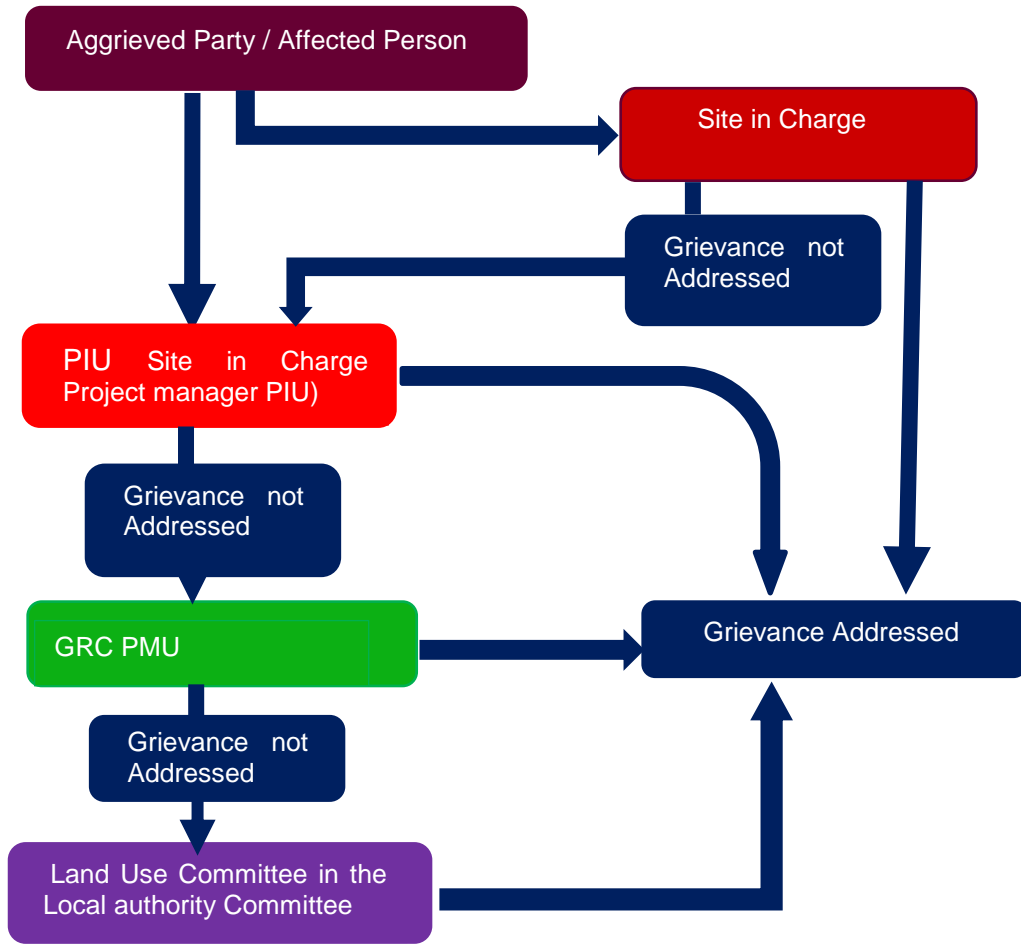
Mobile No:

WhatsApp:

E-mail:

166. In the event that the complainant is illiterate, the complaint will be recorded with the assistance of site in charge. The cost for functioning of GRC will be accounted for by PMU of MHECA. The GRC mechanism may need further review once the implementation sets in. Figure 20 show the GRM implementation structure.

Figure 20: Grievance Redress Mechanism of UOK



IX. ENVIRONMENTAL MANAGEMENT PLAN

A. Environmental Management Plan

167. An environmental management plan (EMP) has been developed to provide mitigation measures to reduce all negative impacts to acceptable levels (refer Part III). The EMP will guide the environmentally-sound construction of the subproject and ensure efficient lines of communication between MHECA, project management unit (PMU), project implementing unit (PIU), consultants and contractors. The EMP will (i) ensure that the activities are undertaken in a responsible non-detrimental manner; (ii) provide a pro-active, feasible and practical working tool to enable the measurement and monitoring of environmental performance on site; (iii) guide and control the implementation of findings and recommendations of the environmental assessment conducted for the subproject; (iv) detail specific actions deemed necessary to assist in mitigating the environmental impact of the subproject; and (v) ensure that safety recommendations are complied with. The EMP 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.

168. 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 EMP; (iii) monitoring program as per SEP; and (iv) budget for SEP implementation. No work will commence prior to approval of SEP. A copy of the EMP/approved SEP will be kept at the site during the construction period at all times. The EMP 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.

169. 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. The Environmental consultant will carry out quarterly reviews against the EMP. The contractor shall allocate budget for compliance with these SEP measures, requirements and actions.

B. Implementing Arrangement

170. MHECA of Government of Sri Lanka will be the Executing Agency for the Project, responsible for management, coordination and execution of all activities funded under the loan. A central Project Management Unit (PMU) attached to MHECA will be responsible for implementing the Science and Technology Human Resource Development Project. The PMU will be supported by Program Implementation Units (PIUs) such as UOK with flexibility to re-deploy depending upon the implementation requirements. The PMU and PIUs will be supported by several teams of Design Consultants in preparation of preliminary engineering designs.

171. Project Management Consultant (PMC) centrally located at PMU and with field teams located in PIUs shall be responsible for implementation of the Project. All infrastructure contract will be procured through performance-based contracts (PBCs) and including the DBO (design-build-operate). The preparation, review, and approval of subproject design and due diligence studies including bidding process is centralized at the PMU. PIU of UOK will provide necessary support to PMU in preparation and will play main role in supervising the construction process.

172. The PMU does not have capacity to manage the associated environmental impacts. Therefore, they will need to recruit an environmental safeguards consultant to carry out the reporting and monitoring process. The terms of reference (TOR) of the environmental safeguard consultant is drafted and enclosed as Annex 13. This will ensure that MHECA will comply with the requirements of the Government and ADB. PMU will prepare a draft TOR for environmental safeguard consultant and send it to ADB for comments before loan negotiations.

173. The PMU will continue to monitor and measure the progress of EMP implementation. The monitoring activities will be corresponding with the subproject's risks and impacts identified in the IEEs for the subprojects. The PMU and PIU will continue to undertake site inspections, document review to verify compliance with the EMP and progress toward the final outcome and recording information of the work, deviation of work components from original scope. PMU will submit environmental safeguard reports to ADB. PMU and PIU will review the environmental safeguard reports and take necessary action to mitigate issues.

174. Safeguards consultant will submit quarterly monitoring and implementation reports to the project director at PMU during the construction phase which will be sent to ADB on a bi-annual basis. For operational phase, the reporting requirement to ADB will be annual. Regular monitoring will have to be carried out by the PIU to ensure the compliance with the EMP. The PMU will submit semi-annual monitoring reports to ADB according to a suggested monitoring report format agreed by ADB for subprojects.

175. EMP budgets will reflect the costs of monitoring and reporting requirements. Monitoring reports will be posted in a location accessible to the public. The executing agency will document monitoring results, identify the necessary corrective actions, and reflect them in a corrective action plan. The MHECA, will study the compliance with the action plan developed in the previous review. Compliance with loan covenants will be screened by the executing agency.

176. ADB will review project performance against the MHECA's commitments as agreed in the legal documents. The extent of ADB's monitoring and supervision activities will be commensurate with the project's risks and impacts. Monitoring and supervising of social and environmental safeguards will be integrated into the project performance management system. ADB will monitor projects on an ongoing basis until a project completion report is issued. Any changes on the IEE based on the detailed design and/or due to any change in design, location, unanticipated impacts identified during the project implementation will be subject to ADB review and disclosure on ADB website. ADB will carry out the following monitoring actions to supervise project implementation:

- Conduct periodic site visits for projects with adverse environmental or social impact
- Conduct supervision missions with detailed review by ADB's safeguard specialists/officers or consultants for projects with significant adverse social or environmental impact
- Review the periodic monitoring reports submitted by executing agency to ensure that adverse impacts and risks are mitigated as planned and as agreed with ADB
- Work with executing agency to rectify to the extent possible any failures to comply with their safeguard commitments, as covenanted in the legal agreements, and exercise remedies to re-establish compliance as appropriate
- Prepare a project completion report that assesses whether the objective and desired outcomes of the safeguard plans have been achieved, taking into account the baseline conditions and the results of monitoring.

177. The costs for environmental safeguard activities which are responsibilities of the PMU and PIU are included in respective consultant packages. The cost of mitigation measures during construction stage will be incorporated into the contractor's costs. Thus, remaining costs related to environmental safeguards cover the following activities.

- Preparing and submitting reports and public consultation and disclosure
- EPL applications
- Conduct of environmental monitoring for baseline data and long-term evaluation of the infrastructure
- Replacement and maintenance of trees, as necessary
- Conduct of environmental capacity-building lectures and workshop for improving awareness.

178. The budgetary provision for the implementation of the EMP of the subproject can be categorized in to two types and is presented below.

- Environmental Management Plan Works to be implemented by the contractor under civil works contracts
- Environmental Management Plan Works to be implemented by the FCT.

179. A capital cost provision of about US\$12500 has been kept towards implementation of environmental management plan. Summary of environmental budget is presented in Table 21.

Table 21: Summary of Environmental Budget

Item	Quantity	Unit Cost (US\$)	Sub total Cost (US\$)	Source of Funds
Administrative Cost				
Public Consultations	Bi annually	1000	4000	Project Cost - PMU Costs (to be paid under incremental administration cost)
Environmental Monitoring			4500	
Design Stage to establish baseline environmental data	Air, water and noise monitoring	1500		Project Cost - PMU Costs (to be done under the guidance of PMC / by PIU staff and accounted under incremental

				administration cost
Construction Phase	Air, water and noise monitoring	1500		Civil Works Contractor Costs
O & M	Air, water and noise monitoring	1500		Pradeshaya saba cost
Landscaping and tree-planting		2500	2500	
Capacity Building Expenses		1500	1500	On job training is done by PIU Any other workshops and/or sessions on these will be under Project Cost -PMU Costs and accounted under Capacity Building expenditure
Total Cost			12500	

Table 22: Monitoring Plan for FCT for Preconstruction, Construction, and Operation Phases

SI No	Field environment attribute	Phase	Parameters to be monitored	Location	Frequency a	Responsibility
	Air quality	During preconstruction phase	IFC-WB EHS standards in chapter 6	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	IFC-WB EHS and SLSI standards in chapter 6	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	IFC-WB EHS standards in chapter 6	FCT or UOK construction site	Once in the preconstruction phase to establish baselin	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	

X. CONCLUSION AND RECOMMENDATIONS

A. Conclusion

180. 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 EMP provide appropriate guidance for suitable environmental and social safeguards. Accordingly, the proposed subproject can be recommended for implementation with strict adherence to EMP and GRM provided in this IEE.

181. Most of the adverse impacts of FCT 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 subproject design and the EMP has been prepared to minimize the overall impacts on the environment during the proposed subproject civil works. Since the proposed subproject is likely to battle with flood risk issues, careful building designs should be adopted to adapt to the existing situation and not exacerbate the flood risk to in the area of subproject influence.

182. As per the Government of Sri Lanka regulation, environmental assessment is not required for the proposed subproject under the National Environmental Act. However, environmental

clearance and EPL from CEA is required in addition to clearances from SLLRDC, Kelaniya Pradeshiya Saba and UDA.

B. Recommendations

183. The EMP has been prepared incorporating various technologies and guidelines to reduce the environmental impacts of subproject constructions to make it a Green building. Therefore, it is recommended to follow the EMP and associated Guidelines during construction and operation phases of the subproject. The main recommendations of the IEE stud are provide below.

184. **Solid waste transfer site:** The solid waste transfer station in Colombo located 547.58m away from the site which occupies 18ha will impact the surrounding 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 operated²⁰. Currently the Kelaniya Pradeshiya Saba operated open waste disposal site is located 80m from the site, the piled-up waste will impact the FCT 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 site develop a green belt as per the recommended list of flora on the rapid biodiversity assessment should be established.

185. **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 subproject area

186. With the information that is presently available there is no confidence that the subproject associated canal system will be properly maintained. Subproject 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 Saba²¹. It is recommended that the project proponent should consult Deputy General Manager (SLLRDC) & 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.

187. Though it was recommended in the Flood Risk Assessment that the project site should be filled at least up to 2.75 m MSL by keeping minimum freeboard, it was re-evaluated with further consultations with SLLRDC and design consultants. Especially since the flood risk assessment has not evaluated impact of flooding scenarios on the subproject area of influence. Alternatives have been suggested by SLLRDC at a subsequent meeting (meeting on the 24th of May 2018 with the design consultants appointed by ADB). At this meeting at the ADB office in Sri Lanka. UOK was advised by design review consultants, SLLRDC, State Engineering Corporation. SLLRDC advised that filling the project site by another 1.25 m would be counterproductive and not practical. SLLRD had suggested not to fill it under the current condition but to construct the buildings on pillars and facilitate the drainage on the site by filling another 0.3 - 0.5 m to create necessary slopes and construct storm water drains strategically to drain the excess water to the

²⁰ Metro Colombo Solid Waste Management Project Ministry of Megapolis and Western Development September 2017.

²¹ Flood risk assessment February 2018.

adjoining canals. This mechanism would mitigate the flood related impacts associated with the project. Hence in the detail 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.

188. **Subproject access road:** Additionally, the site and the access road need 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.

189. **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 (f_u) can be taken as 140kN/m^2 which is less than that recommended in the ICTAD guidelines (ICTAD/DEV/15)²². It is of utmost importance that an expert authority be engaged to carry out detailed designs of this subproject.

190. **Provision of water supply:** The ground water quality of the site is more towards an acidic pH value of 6.66²³. 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.

191. **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 subproject as included in the EMP. Degradable solid waste can be composted while spoil material and other debris should be disposed at approved identified dump site.

192. **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 throughout 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 EMP has been prepared incorporating various modern technologies and guidelines to reduce the environmental impacts of waste generated from the subproject. Sewage should be regularly removed by a gully bower to avoid soil contamination.

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

194. **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 spreading of invasive species, encroachment, unregulated waste disposal to the ground as well as to water and changes in the hydrology as a

²² Geotechnical investigation for proposed building for faculty of computing and technology, university of Kelaniya. April 2018

²³ idbid

result of flood management. Therefore, several measures could be adopted to improve the habitat around the 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.

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

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

197. **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. This will reduce 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).

**ANNEX 1: SITE REPORT
NEW COMPUTING AND TECHNOLOGY FACULTY DEVELOPMENT PROJECT BRIEF SITE
INSPECTION REPORT I
(16 FEBRUARY 2016)**

Site description:

The establishment of a new computing and technology faculty is to train undergraduate and graduate students in computing skills and technology. The site that is identified for development is located in Mohandiramwala, Dawatagahakubura which has been re-surveyed and situated at Wedamulla, Hibutuwelgoda, Badalgoda Villages within the Pradeshiyasabha limits of Kelaniya in the Adikaripattu of Siyane Korrale in the District of Gampaha, Western Province. See Plate 1.

The proposed site is a newly filled marshland where the soil has not properly settled. At the time of our visit we observed areas of water stagnation following recent rains. Therefore, looking at the close proximity to the canal and the fact that it is a marsh (previously wetland) the water table could be high. High tension electricity wires cut across the property at the frontage (Plate 02).

Figure 1: High tension electricity wires cut across the property



The proposed development land consists of 3 plots (3, 4 and 5 as given in the site survey plan). The land is bounded on the northern side by the Mudun Ela and the canal reservation of 6.5m. Eastern boundary is along a canal and a 6.5m reservation. The Western boundary is adjacent to Lot 2. The southern boundary adjoins other filled land plots within the larger area. The Maga Concrete batching plant, SLRDC sand storage site, Shantha viharaya and plastic waste recycling plant are located close to the site with some residences. Therefore, the area surrounding the site can be categorized as urban and mixed development. The land extent is approximately 2-acre 1 route 35.46 perches and is relatively even. The site is a filled wetland adjoining the Mudun Ella that is flooded during heavy rains. The Mudun Ella was covered with the wetland invasive water hyacinth. Plot 2 was partly filled with water logged area that is inhabited with small fish.

Considering the location of the land and compactness of the soil, it will require further filling with soil. This is especially important as water will be drained to this area as it is low lying area with respect to the surrounding lands in the area such as the Colombo Kandy highway. As the identified site **is partly reclaimed land**, there is a settlement time of the soil and we observed that proper compaction of soil has not been carried out. A proper estimation and assessment on the ground stability is an essential requirement prior to commencement of designing of the faculty.

We were informed by the dean of the faculty of Computing and Technology of University of Kelaniya that the proposed facility would include facilities such as lecture rooms (capacity for approximately 800 students) and an auditorium of 43,800 sq ft. The new buildings 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. All the lab facilities would cover an area of 16,000 sq. ft. It will also include two computer labs that will train 150 students at a time with other technology labs such as multi media lab, network and security lab, language lab, software development lab etc. This include a cafeteria with a capacity for 200 students and with an office area of 9000 sq. ft.

Since the land falls under the Kelaniya Urban Council limits, University of Kelaniya will be required to obtain a letter of approval from the Local Authority before commencement of any work. At the time of the site inspection, no onsite work was initiated other than site clearance and partial filling. The University of Kelaniya will be required to obtain a soil report immediately prior to designing the facility. Since this is a wetland and an abandoned paddy field it would be best to also obtain a letter of approval from the Ministry of Megapolis and Western Development Sri Lanka Land Development Cooperation.

We recommend that an IEE be carried out for this site as government approval has been granted to build on this site. However, once the development plan is prepared approvals will have to be sought from the relevant local authorities including the CEA clearance. It is recommended that the IEE give special attention to the following:

- a. Review environmental recommendations provided under megapolis for development in this region.
- b. Review any modelling carried out by SLRDC on water drainage in the area to ensure that filling of wetlands in this area will not contribute to future flood issues.
- c. Review any other work related to water drainage and flood risk in this area.
- d. Provision of adequate reservation for proposed expansion of the canal and the high-tension line
- e. Maintenance of canals
- f. Soil stability and suitable design
- g. Review of building design and layout to ensure conformity with environmental and social requirements.
- h. Management of various categories of waste

Recommendations to the University of Kelaniya as preliminary activities:

- a. The land boundaries of the University of Kelaniya are clearly demarcated as it appears that some of the land may not be filled adequately.
- b. Soil testing be carried out.

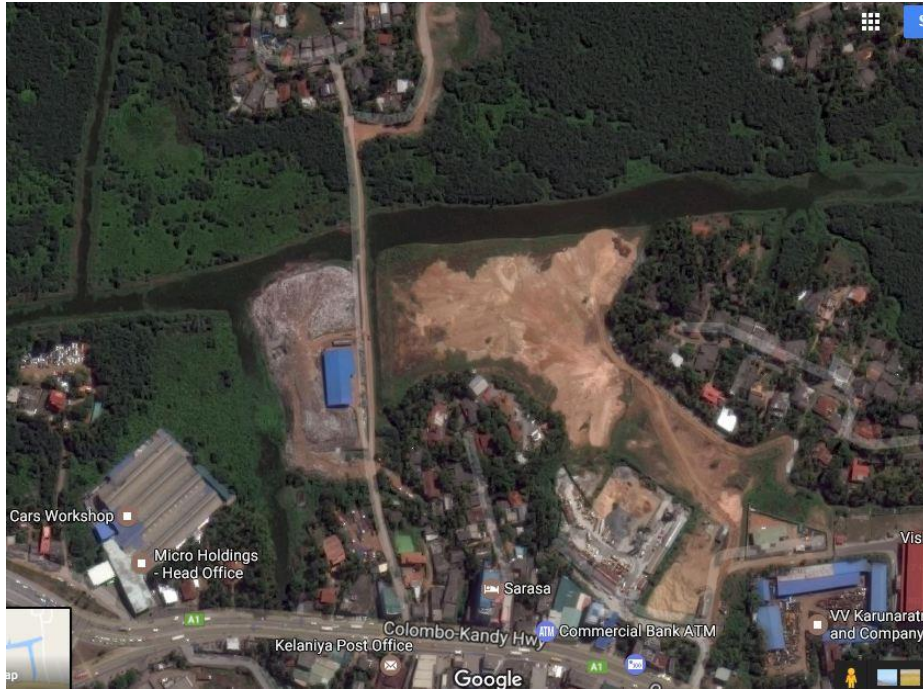


Plate 01



Plate 02

ANNEX 2: SURVEY PLAN

F. A. S. FERNANDO, Jnr
 Registered Licensed Surveyor & Leveller
 Sri Lanka Land Reclamation and Development Corporation
 No. 3, Sri Jayawardenepura Mawatha,
 Welisara, Kandywa.
 011 2867349

PLAN No. 11b

BEAN

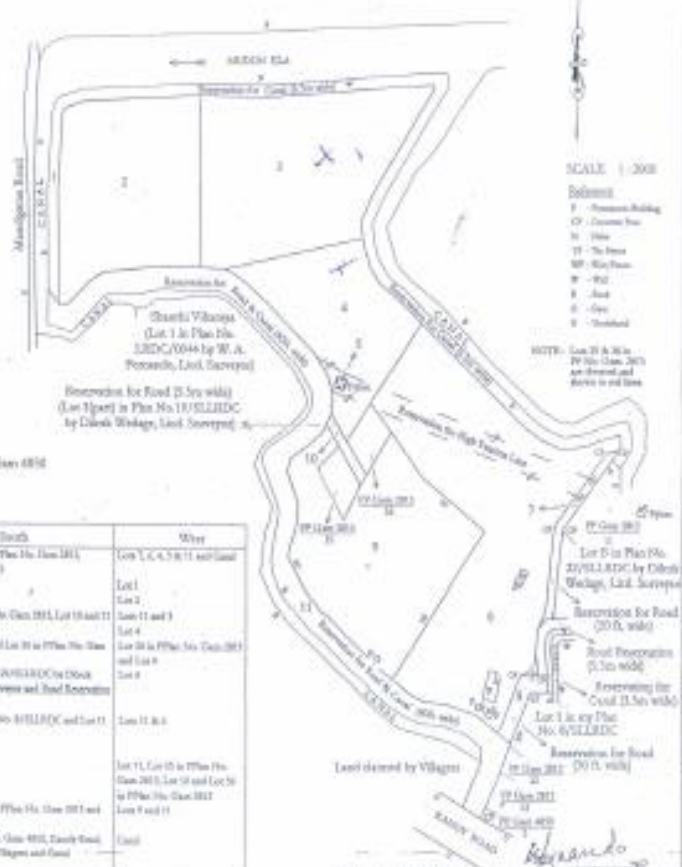
of Division (D) situated in land marked Lots 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 and 11 of the land called DAWATAGAHAKUMBURA, HILLAWAKUMBURA, MUHANDIRAMWALA, KADJUGAHAKUMBURA, WILLAYAGUMBURA, DANGAHAKUMBURA & DAMBAGAHAKUMBURA being a reserve depicted in Lots 2 & 3 in Plan No 15/SLEEDC dated 27th August 2000 made by Dinku Wadiga Licensed Surveyor & Leveller in map plan No 8/SLEEDC (amalgamated Lots 1, 3, 14-40 & 55 (poolies) in PP Gans 2813) and Lot 8 (portion) in PP Gans 2803 both Plans as constituted by the Surveyor General situated at WEDAMULLA, HENBUTUWELGODA and BADILOGODA Villages within the Panchaya Saha Lands of KENYA in the ADUNARI Tana of SYDNEY Kowari, in the District of G.A.M.P.A.H.A WESTERN PROVINCE

BOUNDARIES AS FOLLOWS:

North by: Madaha Ela & Canal
 East by: Canal, Lot 11 in PPlan No. Gans 2813, Lot 8 in Plan No 22/SLEEDC by Dinku Wadiga, Land Surveyor, Road Reservations (2.5m wide), Reservations for Canal (2.5m wide) Lot 1 in map Plan No. 6/SLEEDC, Lots 12 & 25 in P. Plan No. Gans 2813 and Lot 2 in P. Plan No. Gans 4856
 South by: Lot 2 in P. Plan No. Gans 4850, Kandy Road, Land claimed by Villagers and Canal
 West by: Canal

Lot No.	Area (Acres)	North	East	South	West
1	0.1438	Madaha Ela & Canal	Canal	Canal, Lot 11 in PPlan No. Gans 2813, Lot 7, 8, 9, 10 and 11	Lot 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 and 11
2	0.8204	Lot 1	Lot 3	Lot 2	Lot 1
3	0.2800	Lot 1	Lot 1 and 4	Lot 2 and 11	Lot 2
4	0.1925	Lot 1 & 11	Lot 1 & 6, Lot 10 in PPlan No. Gans 2813	Lot 3 in PPlan No. Gans 2813, Lot 8 and 11	Lot 1 and 3
5	0.2804	Lot 4	Lot 4	Lot 4, 11 & 7 and Lot 10 in PPlan No. Gans 2813	Lot 4
6	0.2872	Lot 4 and 11	Lot 7 & 5, Road Reservations (2.5m wide) and Lot 4	Lot 8 in PPlan No. 22/SLEEDC by Dinku Wadiga, Land Surveyor and Road Reservations (2.5m wide)	Lot 2 in PPlan No. Gans 2813 and Lot 9
7	0.0000	Lot 4	Lot 1, Lot 11 & PPlan No. Gans 2813 and Lot 5 in Plan No 22/SLEEDC by Dinku Wadiga, Land Surveyor	Lot 1 in map Plan No. 6/SLEEDC and Lot 11	Lot 11 & 6
8	0.0000	Lot 11 & Road Reservations (2.5m wide)	Road Reservations (2.5m wide), Reservations for Canal (2.5m wide) and Lot 1 in map Plan No. 6/SLEEDC	Lot 1 in map Plan No. 6/SLEEDC and Lot 11	Lot 11 & 6
9	0.2877	Lots 11 & 12, Lot 15 in PPlan No. Gans 2813, Lot 16, Lot 20 in PPlan No. Gans 2813 and Lot 9	Lot 10 in PPlan No. Gans 2813, Lot 15, Lot 20 in PPlan No. Gans 2813 and Lot 6	Lot 1 and 11	Lot 11, Lot 10 in PPlan No. Gans 2813, Lot 16 and Lot 20 in PPlan No. Gans 2813
10	0.2877	Lot 11 and Lot 16 in PPlan No. Gans 2813	Lot 10 in PPlan No. Gans 2813 and Lot 6	Lot 4 & Lot 10 in PPlan No. Gans 2813 and Lot 10	Lot 11 and Lot 16
11	0.0000	Lot 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 and 11	Lot 1 in map Plan No. 6/SLEEDC, Lot 11 & 12 in PPlan No. Gans 2813 and Lot 1 in PPlan No. Gans 4856	Lot 2 in PPlan No. Gans 4850, Kandy Road, Land claimed by Villagers and Canal	Canal

TOTAL 1.6228 11 22 2440
 Resurveyed as Permitted by the Director
 Surveyed on 20th August 2013




F. A. S. FERNANDO, Jnr
 Registered Licensed Surveyor & Leveller
 Sri Lanka Land Reclamation and Development Corporation
 No. 3, Sri Jayawardenepura Mawatha,
 Welisara, Kandywa.
 011 2867349

ANNEX 3: SLLRDC LAND TRANSFERRING LETTER

D-65

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 இலங்கை அரசின் மேட்டூர் மற்றும்
 அபிவிருத்தித் துறை அமைச்சர்



**MINISTRY OF MEGAPOLIS &
 WESTERN DEVELOPMENT**
**SRI LANKA LAND RECLAMATION
 AND DEVELOPMENT CORPORATION**

ම.ව.ස.ව. 05, මු.ව. 05, 247 දෙවනදොර පාර, මහලංගර,
 Colombo 05, Sri Lanka.

ම.ව.ස.ව. 05, මු.ව. 05, 247 දෙවනදොර පාර,
 මහලංගර, ශ්‍රී ලංකාව.

P.O. Box 05, No. 25, Sri Jayawardenepura Mawatha,
 Wikkala, Colombo 05, Sri Lanka.

විගේ අංකය : එම්.ව.වි. 304
 2017.01.04

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උභය පාර්ශ්ව අදාළ අතරින් 2016.12.01 දිනැති මිලියට පැවරීමක් වශයෙනි.

ඒ අනුව සැලැස්ස අංක 116 එන්.වි.වි.පාර්සිවි සි ඇ අ 2.3 හා 4 දරණ ඉඩම් කොටස් විකිණීමක් සඳහා දීම සඳහා අදාළ ගාස්තු මගින් රු.431,745,867.86 හා මුදලක් කෙටීමේ මිලියටවල් අනුමැතියක් වන අතර ඒ සඳහා ගිණුම් අංකය අද අංක RK 00041853 දරණ 2016.12.23 දිනැති රිසිට්ලය මේ සමඟ අමුණා ඔබ වෙත එමි.

විකිණීමේ විස්තර පිළියෙල කිරීම සඳහා අදාළ මිලි ගිණුම මෙම සංස්ථාවේ විශ් අංශය වෙත පොදුකර ඇති අතර ඒ මිලියටවල් විමසීම සඳහා දුරකථන අංක 011-2874565 මගින් හුවමාරු කිරීමේ විධි විධානවලට අමතරව කෙසේද පැවරීමක් දැනට කිරීම.

මෙයට - විශ්වාසී,

[Signature]

අතිරේක සාමාන්‍යාධිකාරී (ක්‍රියාකාරීකර්ම)

ශ්‍රී ලංකා ඉඩම් නොවැඩිවීමේ හා සංවර්ධන කිරීමේ සංස්ථාව

⑤ FETHI / PL AL
 with 07/1/17

① R / FAH PL

③ GA/01
 1. Please follow up
 to Dean / PL
 2. Copy to
 Head of
 2017/01/04

② SAR/01A
 SAR/01A
 F. N. AL
 17/01/2017

④
 2017/01/04

දුරකථන } 2667389, 2669485
 දුරකථන/මුද් } 2667105, 2669486
 Telephone } 2667538, 2669487

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 Chairman } 2669888

මුද් } 2662457
 අධ්‍යක්ෂ } 2669901
 E-mail } sllrdc@slrda.lk

වෙබ් : www.sllrdc.lk
 E-mail : sllrdc@slrda.lk



ORIGINAL

KELANAYA LAND RECLAMATION AND DEVELOPMENT CORPORATION
No. 11, Sri Jayawardenepura Mawatha, Wellisala, Rajagiriya
Telephone 2867353, 2867303

RECEIPT

R. No. 25-04-2011

UNIVERSITY OF KELANIYA Date:

Received from

Rs. 600,000.00 (Six hundred thousand rupees) and
Rs. 45,800.00 (Hundred forty-five thousand eight hundred
and eighty rupees) and cents eight-hundred and

Amount Received Rs

On Account of

UNIVERSITY OF KELANIYA
ALLOCATION OF LAND AT KELANIYA TO UNIVERSITY
OF KELANIYA

Sun of Rs. Payable no stamp duty is comprehended in this receipt.
Reg.No. 409010563-6001

PEOPLES
Payment Mode

0052167

Bank / Branch / Cheque No. / Rs. -

Subject to realization of cheques

0052167


Cashier



UNIVERSITY OF KELANIYA
DALUGAMA, KELANIYA, SRI LANKA

23rd May 2018

Chairman
Sri Lanka Land Reclamation and Development Corporation
No. 03, Sri Jayewardenepura Mawatha
Welikada
Rajagiriya

Dear Sir,

Construction of Proposed Building Complex for the Faculty of Computing and Technology, University of Kelaniya in the Land Purchased from the SLLRDC at Mudun-Ela, Kelaniya

This is with regard to the meeting you had with the representatives from the Faculty of Computing and Technology, University of Kelaniya on 23/05/2018 at your office.

I look forward your kind cooperation with regard to the following matters:

1. Develop the access road to the land purchased by the University of Kelaniya from the SLLRC.
2. Participation of a relevant officer from the SLLRDC at the meeting scheduled to be held on 24/05/2018 at 9:30 a.m. at the Asian Development Bank Resident Mission, No. 23, Independence Avenue, Colombo 7 pertaining to development of design specifications for the proposed building complex of the Faculty of Computing and Technology.
3. Nominate a relevant officer from your corporation to work with University in relation to this construction project.
4. Furnish a written document with regard to the proposed future development plans in the surrounding area of the Mudun-Ela land for submission to the ADB.

Your cooperation in this regard is highly appreciated.

Thank you,

Yours faithfully,

A handwritten signature in blue ink, appearing to be 'D.M. Semasinghe'.

Prof. D.M. Semasinghe
Vice-Chancellor

ANNEX 4: APPLICABLE ENVIRONMENTAL LEGISLATIONS

Applicable Environmental legislations

A. Environmental Impact Assessment

1. Sri Lankan Government recognizes Environmental Impact Assessment as an effective tool for the purpose of integrating environmental considerations with development planning. EIA/IEE considered as a means of ensuring that the likely effects of new development projects on the environment are understood before development is allowed to proceed.

2. The legal provision for EIA in Sri Lanka was first included in the Coast Conservation Act No. 57 of 1981 (see below). The broader legal framework for the EIA process in Sri Lanka was laid down by the amendments made to NEA in 1988 through National Environmental (Amendment) Act No. 56 of 1988. The provision relating to EIA is contained in Part IV C of the National Environmental Act. The procedure stipulated in the Act for the approval of projects provides for the submission of two types of reports Initial Environmental Examination (IEE) report and Environmental Impact Assessment (EIA) report. Such reports are required in respect of “prescribed projects” included in a Schedule in an Order published by the Minister of Environment in terms of section 23 Z of the act in the Gazette Extra Ordinary No. 772/22 dated 24th June 1993. This amendment makes EIA mandatory for whole of Sri Lanka and transformed Central Environment Authority (CEA) into enforcement and implementing agency.

3. Any developmental activity of any description whatsoever proposed to be established within one mile of the boundary of any National Reserve, should receive the prior written approval of the Director of Wildlife Conservation. EIA/IEE will be requires if the project is located near FFPO designated five categories of protected areas.

4. The EIA process is implemented through designated Project Approving Agencies (PAAs). PAA's are those organizations that are directly connected with such a prescribed project. At present, 23 state agencies have been recognized by the Minister as PAA's including Ceylon Tourist Board. A given organization cannot act both as the PAA as well as the project proponent. In such cases the CEA will designate an appropriate PAA. Similarly, when there are more than one PAA the CEA must determine the appropriate PAA. In the event of doubt or difficulty in identifying the appropriate PAA, CEA itself will function as the PAA. At present, there are 31 such PAAs to deal with review and approval of environmental plans.

5. In order for a project to be approved the project proponent should submit either an Initial Environmental Examination (IEE) report or an Environmental Impact Assessment (EIA) report. Once an EIA report has been submitted there is mandatory period of 30 days during which the public can inspect the document and comment on the report. Further, a public hearing may be held to provide an opportunity to any member of the public to voice their concerns. A decision whether to approve the project will be made only after public consultation is done and necessary major issues are resolved.

B. Environmental Protection License

6. The Environmental Protection License (EPL) is a regulatory/legal tool under the provisions of the National Environmental Act. The CEA issues Environmental Protection Licenses (EPL) to medium and high polluting industries under section 23(A) of the NEA. The regulations are gazette under Gazette Extraordinary No. 1533/16 dated January 25,2008, for a variety of sectors involving

in manufacturing, construction or services which need to obtain Environment Protection Licenses (EPL) The Environmental License (EPL) procedure for the control of pollution. Regulations pertaining to this process have been published in 1990 and are available with the CEA. The EPL issued to an industry or development activity and is legally binding and violation of conditions in the license is a punishable offence under the NEA. EPLs are issued by the CEA or a designated body which can be local authorities for low polluting industries, Board of Investment (BOI) for BOI industries. In the North Western Province, where a separate Provincial Environmental Authority exists, the EPLs are issued by the North Western Provincial Environmental Authority (NWPEA).

7. The EPL procedure has been introduced to prevent or minimize the release of discharges and emissions into the environment from industrial activities in compliance with national discharge and emission standards, to provide guidance on pollution control for polluting processes and to encourage the use of pollution abatement technology such as cleaner production, waste minimization etc. Here the industries are classified into three lists named A, B and C. List A comprise of 80 potentially high polluting industries, List B comprise of 33 medium polluting industries and List C comprise of 25 low polluting industrial activities. These projects will come under List B or List C.

8. EPL's for List A and List B industries are issued by the relevant Provincial/ District offices of the CEA while EPL; s for List C industries are issued by the relevant local authority. The EPL issued for List A industries are valid for a period of one year while List B and List C industries are valid for a period of three years, from the effective day of the issue of license.

9. For List A and List B industries the project proponent must submit a duly filled application (can be obtained from CEA headquarters, provincial and district offices or downloaded from www.cea.lk) for each prescribed activity to provincial or district office of CEA who will evaluate the application and determine the relevancy of issuing an EPL and the adequacy of the details furnished and determine and appropriate inspection fee. Then the project proponent must pay the prescribed fee to CEA headquarters, provincial or district office of CEA and submit the receipt to the relevant provincial or district office of the CEA. Then a team of officers will carry out an inspection and submit a report based on the site visit and the information provided. If the Issue of EPL is recommended the project proponent can obtain the EPL upon payment of license fee.

10. For List C industries issue of EPL is delegated to local authorities (Municipal councils, Urban councils or Pradeshiya Sabha). The procedure to be followed is the same except the Local Authority will appoint a Technical Evaluation Committee (TEC) that will make the final decision regarding the issue of EPL based on the field assessment report and information furnished by the industrialist. The EPL can be renewed by submitting a renewal application three month prior to the date of expiry to the relevant authority who will conduct afield inspection and determine whether the EPL should be renewed.

C. Fauna and Flora Protection Ordinance (FFPO) Amended Act No. 49 of 1993

11. EIA provisions are also included in the Fauna and Flora (Amended) Act No. 49 of 1993. According to this Act, any development activity of any description what so ever proposed to be established within one mile from the boundary of any National Reserve, is required to be subjected to EIA/IEE, and written approval should be obtained from the Director General, Department of Wildlife Conservation prior to implementation of such projects. The EIA/IEE process under the FFPO is similar to that described in the NEA.

12. Under the FFPO five categories of protected areas are established viz, Strict nature reserve, National parks, Nature reserve, Jungle Corridors etc. According to the act any development activity of any description what so ever proposed to be established within a national reserve of within one mile of any boundary of any national reserve is required to be subjected to EIA/IEE and written approval should be obtained from the Director general Department of Wild life and Conservation prior to implementation of such projects. The FFPO follows a similar process as the NEA in conducting scoping, setting the TOR, preparation of EA, review of EA, public consultation and disclosure.

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

13. The Constitution of Sri Lanka contains several provisions relating to the environment such as Article 18 (“It is the duty of every person of Sri Lanka to protect nature and conserve its riches”) and Article 27 (14) (“ The state shall protect, preserve and improve the environment for the benefit of the community”). The 13th Amendment to the Constitution created new institution at the provincial level for environmental protection and management. Each provincial government under this Amendment has legislative and executive powers over environmental matters (Articles 154 (A), 9, 19 and (III) 17). Using such provincial legislative and executive powers, the North Western Provincial Council adopted the North Western Provincial Environmental Authority to supervise and monitor environmental activities in the North Western Province of Sri Lanka.

E. Pradeshiya Sabha Act No. 15 of 1987

14. Section 12 (2) of the Pradeshiya Sabha Act authorizes the appointment of a committee at the divisional level to advice on environmental matters. Section 105 of the Act prohibits polluting water or any streams, while Section 106 refers to pollution caused by industry and related offences. The Pradeshiya Sabha grants permission for construction activities within its jurisdiction. Such construction will have to comply with environmental requirements stipulated with permits. It also ensures that public health issues are efficiently dealt with and solid waste collection and disposal are appropriately done under this Act.

F. State Land Ordinance, Act No. 13 of 1949

15. The State Land Ordinance provides guidelines for:

- (i) The protection of natural water springs, reservoirs, lakes, ponds, lagoons, creeks, canals, and aqueducts.
- (ii) The protection of the source, course and bed of public streams.
- (iii) The construction or protection of roads, paths, railways, and other means of internal communication systems.
- (iv) The prevention of soil erosion.
- (v) The preservation of water supply sources.

16. Section 75 of the Ordinance highlights riparian proprietors’ rights and duties. The occupier of land on the banks of any public lake or public stream has the right to use water in that water body for domestic purpose, but cannot diverted water through a channel, drain or pipe or by any other mechanical device.

G. Sri Lanka Land Reclamation and Development Corporation Act No 15 of 1968

17. The act provides for the establishment of Sri Lanka Land Reclamation and Development Corporation for the development and reclamation of land according to the National policy relating to land Reclamation and Development. It has powers to prohibit the reclamation of development areas. Has powers to declare a wetland to a low line area if it is identified as significant in terms of ecology or environmentally. As per the recent amendment to the act, by act no. 35 of 2006 the corporation will be empowered to take legal action against unauthorized reclamation activities and pollution of inland water bodies as well.

H. Mines and Minerals Act No. 33 of 1992

18. Under this Act, mining falls within the purview of the Geological Survey and Mines Bureau (GSMB). Mining of minerals including sand must be done with a license issued by the GSMB. Mining is not permitted within archaeological reserves or within specified distances from such monuments. New mining licenses are subject to the EIA process, if the type and extent of mining is listed under the EIA regulations. Additionally, GSMB has the power to stipulate conditions including cash deposits and insurance policy for the protection of environment. Regulations made by GSMB under the Act cover a variety of environmental stipulations, criteria and conditions for licensing and operating mines. This also covers the disposal of mine wastes. The Act also deals with the health, safety and welfare of miners. Mining rights on public and private land are subject to licensing by GSMB, and all minerals wherever situated belonging to the State. The right to mine public land parcels are subjected to the EA procedures.

I. Disaster Management Act No. 13 of 2005

19. Comes into force in case of a national or regional level disaster. This is relevant due to the flood risk in the area

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

20. The National Water Supply and Drainage Board (NWSDB) is the principle water supply and sanitation agency in Sri Lanka. It was established in January 1975 under the Law No. 2 of 1974. NWSDB develops, provides, operates and controls water supply and distributes water for public, domestic and industrial purpose.

K. Prevention of Mosquito Breeding, Act No. 11 of 2007

21. This Act was enacted to prevent and eradicate mosquito-borne diseases such as dengue. Under this Act, it shall be the duty of every owner or occupier of any premises to remove and destroy open tins, bottles, boxes, coconut shells, split coconuts, used tires, or any other article or receptacle found in such premises, and to maintain water wells in such premises to prevent breeding of mosquitoes. People are also bound to empty any artificial pond or pools at least once in a week. Shrubs, undergrowth and all other types of vegetation other than ornamental vegetation and food plants are to be removed.

L. The Urban Development Authority, Law, No 41 of 1978

22. The Urban Development Authority (UDA) promotes integrated planning and implementation of social, economic and physical development of areas which are declared as urban development areas under the UDA Act. UDA provides technical support to local councils who require assistance in developing plans. It has the authority to develop plans when local

authorities fail to do. The UDA monitors urban areas, including 1 km. inland from the coasts in all areas of the coastal zone, and develops land use policies for designated development areas.

M. Land Acquisition Act No. 09 in 1950 and subsequent amendments in 1983 and 1986

23. Land Acquisition act No 9 of 1950 provides a detailed procedure for acquiring land and sets out a process with inbuilt safeguards. The Act makes provision for the acquisition of land for public purpose. The actual public purpose can result from development programs initiated by various government Departments and agencies from a multitude of sectors. Under the Act land could be acquired either through a normal procedure or expedited process. In terms of regular process there is provision for the calling of objections from the public prior to proceeding with the acquisition. Land Acquisition Act provides limited grievance mechanism. The Act provides compensation based on market value. It also provides a mechanism through which objections to an acquisition of land can be made. A limited grievance mechanism is available relating to the quantum of compensation to be received.

N. Land Acquisition Regulations, 2008

24. These regulations may be cited as the Land Acquisition Regulations, 2008. The basis of assessing the market value of any land or the compensation for any injurious affection caused by the acquisition of any land under this Act.

25. These Regulations establish the basis for assessing the market value of any land or the compensation for any injurious affection caused by the acquisition of land. Market Value should be assessed as follows: in case part of a land is acquired and when its value as a separate entity deems to realize a value proportionately lower than the Market Value of the main land the compensation should be proportionate to the value of the main land. When the date of intention to acquire was published, the building is used or is intended to be used for occupation and or business purposes, the difference between the cost of re-construction and the value of building, based for determination of Market Value under Section 1.1, should be paid as an additional compensation. Value based on development potential could be considered for paddy lands acquired where permission to fill such lands have been granted by the Agrarian Services Commissioner General. When an acquired building is occupied by a tenant/statutory tenant protected under the provisions of the Rent Act, No. 7 of 1972 (as amended thereafter) the compensation should be ascertained in proportion having regard to the provisions of Rent (Amendment) Act, No. 26 of 2006.

O. Flood Protection Ordinance, Act No. 22 of 1955

26. This ordinance provides necessary provisions to acquire land or buildings or part of any land or building for the purpose of flood protection.

P. Ceylon Electricity Board Act (No. 17 of 1969),

27. An Act to provide for the establishment of an electricity board for the development and co-ordination of the generation, supply and distribution of electrical energy; for the transfer to such board of the government electrical undertakings, and, in certain circumstances, of the electrical undertakings of local authorities; for the employment by the board of employees of the department of government electrical undertakings; for the entering into joint schemes by such board with any

government department or approved body for the generation of electrical energy, the irrigation of lands, the control of floods or other like objects; and to make provision for all matters.

28. There are five parts in the act as follows:

- Part 1:- Constitution, Powers and Duties of the Ceylon Electricity Board
- Part 2:- Transfer to the Board of the Government Electrical Undertakings
- Part 3:- Staff of the Board
- Part 4:- Finance, Auditing and Annual Report

ANNEX 5: GREEN BUILDING APPLICATION

කාර්යාලීය ප්‍රයෝජනය සඳහා
ලියාපදිංචි අංකය :
සංක්‍රම අංකය :
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ජාතික සංවර්ධන අධිකාරිය
හරිත ගොඩනැගිලි සඳහා අයදුම්පත්‍රය

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ජාතික සංවර්ධන අධිකාරිය.

01. ඉල්ලුම්කරුගේ තොරතුරු :-

ඉදිකිරීමට යෝජිත ගොඩනැගිල්ල අයත් ආයතනය :.....
 ලිපිනය:.....
 ආයතනය අයත් අවිනිශ්චිතය :.....
 ඉදිකිරීමට යෝජිත ගොඩනැගිල්ල සම්බන්ධ වනකීම් දරණ නිලධාරියාගේ
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 දුරකථනය අංකය :.....

02. ගොඩනැගිල්ල ඉදිකිරීමට යෝජිත ස්ථානය පිළිබඳ තොරතුරු :-

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 සමුඛ සැලක ආයතනය :.....
 ලිපිනය :.....
 යෝජිත භූමියට පිවිසිය හැකි පාර්තය පැහැදිලි සටහනකින් දක්වන්න :

03. ඉඩමේ විස්තරය :-

ඉඩමේ ප්‍රමාණය:.....
 ඉඩමේ මුල් / වර්තමාන භාවිතය:.....
 යෝජිත ගොඩනැගිල්ලේ ස්වභාවය:.....

➤ ඉහත සඳහන් කර ඇති තොරතුරු වලට අනුව ඉදිකරනු ලබන ගොඩනැගිල්ල හරිත ගොඩනැගිලි සංකල්පයට අනුව ඉදිකිරීමට සලාසපාලනයක්වූ වන පැවිත් ඒ සඳහා අවශ්‍ය ලාභදායී හා විනාශකාරීම් ලබා දෙන පමණ ඉල්ලා සිටිමි.

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ANNEX 6: BIQ

Application No.



Central Environmental Authority
BASIC INFORMATION QUESTIONNAIRE
**Essential information to determine the environmental approval
requirement of projects**

(Note: Use separate sheets as and when required)

1. BACKGROUND INFORMATION

- 1.1. Project Title: Proposed building for Faculty of Computing and Technology University of Kelaniya
- 1.2. Name of the Project Proponent: University of Kelaniya
(Company/Firm/Individual)
- 1.3. Details of the Project Proponent:

Postal Address: University of Kelaniya, Dalugama, Kelaniya 11600.

Phone No:

Fax No:

E-mail Address:

- 1.4. Details of the Contact Person:

Name: Dr Chamli Pushpakumara

Designation: Head of the Department, Department of Applied Computing. Faculty of Computing and Technology

Phone No: 071 5147879

Fax No:

E-mail Address: chamli@kln.ac.lk

2. PROJECT LOCATION DETAILS

- 2.1. Location of the project:
 - Province/s: Western Province
 - District/s: Gampaha District
 - Divisional Secretariat Division/s: Kelaniya
 - Local Authority/s: Kelaniya Pradeshiya Saba

(Provide location in 1:50,000 scale Toposheet)

2.2. Physical scale or the extent of the project site (in ha): 1.0002209619 ha
(Provide Survey plan)

2.3. Does the project wholly or partly fall within any area specified below?

Area	Yes	No	Remarks
100m from the boundaries of or within any area declared under the National Heritage Wilderness Act No.4 of 1988		✓	
100m from the boundaries of or within any area declared under the Forest Ordinance (Chapter451)		✓	
Coastal Zone as defined in the Coast Conservation Act. No.57 of1981		✓	
Any erodible area declared under the Soil Conservation Act(Chapter450)		✓	
Any flood area declared under the Flood Protection Ordinance (Chapter449)		✓	
Any flood protection area declared under the Sri Lanka Land Reclamation and Development Corporation Act No.15 of 1968 as amended by Act No.52 of1982	✓		The areas are surrounded with flood retention area
60meters from the bank of a public stream as defined in the Crown Lands Ordinance (Chapter 454) and having width of more than 25 meters at any point of its course.		✓	
Any reservation beyond the full supply level of a reservoir.		✓	
Any archaeological reserve, ancient or protected monuments as defined or declared under the Antiques Ordinance (Chapter188)		✓	
Any area declared under the Botanic Gardens Ordinance (Chapter446)		✓	
Within 100meters from the boundaries of or within, any area declared as a Sanctuary under the Fauna and Flora Protection Ordinance (Chapter469)		✓	
Within 100meters from the high flood level contour of or within a public lake as defined in the Crowns Lands Ordinance (Chapter 454) including those declared under section 71 of the said Ordinance		✓	
Within a distance of one mile of the boundary of a National Reserve declared under the Fauna and Flora Protection Ordinance		✓	

2.4. Present ownership of the project site:

State	Private	Other (Specify)
✓		

(If state owned, please submit a letter of consent of the release of land from the state agency)

2.5 Present land use type of the project site (approximate % of the total project site):

Land use type	%	Land use type	%
Marsh/mangrove	25	Bare land	
Water bodies	5	Paddy	
Dense forest		Tea	
Sparse forest		Rubber	
Scrub forest		Coconut	
Grass land		Built-up area	70
Home gardens		Any other (Specify)	

3. **PROJECT DETAILS**

3.1. Objective/s of the project:

This project aims to increase the technology-oriented work force which will contribute to transform Sri Lankans growing economy. Under this Project the University of Kelaniya (UOK) will build a new Faculty of Computing and Technology (FCT) in Kelaniya. It will be geared to fill job in 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.

3.2. Present stage of the project in the project cycle:

(i)	Pre-feasibility	✓
(ii)	Feasibility	Done
(iii)	Design	Completed
(iv)	Other (specify)	Not yet

3.3. Type of the project (Please tick the relevant cage/s):

Land development/clearing	✓	Hotels /Recreational Facilities	
Timber extraction/tree felling		Housing and building	
Reclamation of Land/wetland	✓	Resettlement	
Conversion of forests into non-forest uses		Laying of gas and liquid (excluding water) transferring pipe lines	
Urban development	✓	Mining	
Portand Harbour Development		Tunneling	
Transportation system		Fisheries and aquaculture	
River basin development/Irrigation		Disposal of solid/liquid/hazardous wastes	
Power generation and transmission		Salterns	
Surface/ground water extraction		Any other (Specify)	
Industry/Industrial Estates and Parks			

3.4. Physical scale or the magnitude of the project:

The extent of the building is:

Phase I of the project will involve the construction of the 10-story academic building (1600sqm²), 5 storied administration building (500sqm²), apartment building (600 sqm²) building for student centers, location for service building, transformers, waste water treatment, solar panel system, rain water treatment plant, garbage collection / recycling plant.

Phase II include 5 storied academic building (1000sqm²) for staff accommodation and provide lodging for exchange students, 10 storied center units (1000 sqm²) this will include center units such as industry interaction center and business center (3000 sq ft). e- learning center (5000 sq ft), nano technology center (16200 sq ft), cyber security and computer forensic center (2000 sq ft), center for data and science (2000 sq ft), business incubator (1000 sq ft).

First phase– 2700 sqm²
 Second phase– 31000 sqm²
 Total - 33700 sqm²

3.5. Major components of the project:

The proposed FCT 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

3.6. Project layout plan (Conceptual): Attached

3.7. Project process/s interms of:

Inputs including resources such as raw materials, water, and energy used in construction/operational phases of the project and source of such resources

Outputs (including products and by-products)

Major types of equipment/technology to be used

Please contact contractor of the project & detailed desing enginers and the PIU for details and fill in

3.8. Does the project involve any of the following activities other than the major project activities?

	Activity	Yes	No	If yes please quantify
(i)	Reclamation of land/wetland	✓		
(ii)	Conversion of forests into non-forest uses		✓	
(iii)	Clearing of lands	✓		

(iv)	Extraction of timber		✓	
(v)	Mining and mineral extraction		✓	
(vi)	Laying of pipelines	✓		
(vii)	Tunneling		✓	
(viii)	Power generation & transmission		✓	
(ix)	Resettlement		✓	
(x)	Extraction of surface/groundwater	✓		
(xi)	Disposal of wastes(solid/liquid/hazardous)	✓		

3.9. Amount of capital investment:

Foreign: (ADB loan)	24,995,550 USD
Local:	2,698,480 USD

3.10. Proposed timing and schedule including phased development: 24 months

3.11. Details of availability of following services/infrastructure facilities:

- (i) Roads/access(Specify): Colombo Kandy A1 Road and Kelaniya pradeshiya saba road from the SLLRDC sand deposit area
- (ii) Water (Specify): liters per day
- (iii) Power(Specify): CEB grid and generator
- (iv) Telecommunication(Specify): Sri Lanka Telecom
- (v) Common waste water treatment facilities (To be filled by UOK): Waste water will be directed to a waste water treatment plants and the sludge will be removed in determined intervals. Sewage will be emptied with emptied in gully bowsers with the assistance of the Kelaniya Pradeshiya Saba
- (vi) Common solid waste management facilities(Specify): Develop a solid waste management plan for FCT and temporarily come to an agreement with the Kelaniya Pradeshiya saba
- (vii) Any other (Specify): Flood risk assessment. Development of proper water daiange network of the project site, clean and maintain the canal system associated with the project

3.12. Will the development result in displacement of people or property: (Quantify)? No

3.13. Will the development result in change of way of life of local people? Yes. Project associated community could provide lodging and other services such as catering for students and provision of telecommunication facilities and photocopying.

3.14. Will the project have plans for future expansion with/without land/space: demands?

Yes. The land would be fully utilized for development during the two phases of construction of FCT.

3.15. Information on likely impacts of the project (Please tick the relevant category/s):

Impact/s	Yes	No	Short term	Medium term	Long term
● Impacts on people & human health	✓		✓		
● Impacts on fauna/flora/sensitive habitats	✓		✓		
● Impacts on soils and land use	✓		✓		
● Impacts on water quality (surface and ground)	✓			✓	✓
● Impacts on drainage/hydrology	✓			✓	✓
● Impacts on air quality	✓		✓	✓	
● Generation of excessive noise and vibration	✓		✓	✓	
● Impacts on landscape/visual environment	✓				✓
● Impacts on historical and cultural resources		✓	-		
● Presence and aggravation of hazards		✓	-		
● Any other (Specify)					

3.16. Information and measures being considered to mitigate likely impacts of the project cited under: with the supervision of the consultant appointed for this project-Building department

3.17. Relationship with other existing /planned: developments:

The FCT graduates will be able to gain industrial training in the Biyagam and katunayakey export processing zones. Therefore, the project is located in environment that is easily accessible for training.

3.18. Details of any other permits required for the project:

- Environment Clearance –EPL for the three canteen that will provide food for over 600 students

- Consent from relevant government agencies –Kelaniya Pradesiya Saba approval on the desng plans and the proposed drainage system for flood water
- SLLRDC: approval on development of the land and site preparation and cannal maintenance
- Green building certificate- UDA

4. OTHER

Provide any other information that may be relevant

I..... certify that the information provided above is true and correct to the best of my knowledge. I am aware that this information will be utilized indecision making.

Name:Designation:

Signature: Date:

For Office Only

1. Date of receipt of the application:
2. Payment of EIA administration fee: Date of payment:
Amount: Receipt No: Code No:
3. Site inspection information: Date of inspection:

Name/s of the officers:

Special comments regarding significant environmental concerns (based on the site inspection:

4. Required approval under Part IVC of NEA:

Yes	No

5. If need to go through the EIA process appropriate PAA:
6. Other remarks:

ANNEX 7: FLOOD RISK ASSESSMENT

FLOOD RISK ASSESSMENT REPORT FOR PROPOSED SCIENCE AND TECHNOLOGY SITE AT DALUGAMA - KELANIYA FOR KELANIYA UNIVERSITY



Prepared by:

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Consulting Engineer/ Hydrologist

For:

TMS Company (Pvt)Ltd
110/A/1-1/2
Sunethradevi Road
Kohuwala, Nugegoda

Executive Summary

1. The project area is located within the downstream of the Mudun ela basin. 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 in the west as shown in figure 1.1. This can be identified under 3 catchment sub sectors as follows.

- i. Peliyagoda
- ii. Dalugama - Telengapatha
- iii. Naramminiya- East of Kandy Road

2. Drainage into Kelani River is through three culverts cum flood gates. (two at Oliyamulla close to Wattala and other one at Pethiyagoda). The internal main drainage system is managed by Sri Lanka Land reclamation and Development Corporation.

3. The observed flood levels of Kelani River at Nagalagama Street which is very close to the proposed project area, has been recorded as follows.

- a. 3.87 m MSL in Year 1947
- b. 2.88 m MSL in Year 1989
- c. 2.29 m MSL in Year 2016

4. 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.

- a. The whole area has been provided with an improved storm water drainage system, main canals and lakes have been proposed to convey maximum discharge from respective areas to the outlet as shown in the figure: 1.2
- b. Three pumping stations cum regulators have been proposed by SLLDC & the Irrigation department. One is already constructed at Peliyagida and other two are proposed at Oliyamulla and Pethiyagoda as shown in the figure: 6.14

5. 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 gated structure and pumps associated with the flood protection defenses along the lower reaches of the Kelani river, provides a measure of protection to the proposed project location from Kelani floods. Average protection level is around 25-year return period.

6. A very detailed assessment has been completed to analyze the flood situation and flood mitigation approach, as given below.

Situation as at present:

- a. Existing average fill level of the project area: 1.50 m MSL
- b. Observed recent flood level in Year 2010: 2.10 m MSL
- c. 25-year return period flood level for existing condition: 2.40 m MSL
- d. 50-year return period flood level for existing condition: 2.50 m MSL
- e. 100-year return period flood level for existing condition: 2.70 m MSL

- f. DPC level of an unprotected house in the vicinity: 2.04 m MSL (already flooded in 2010)
- g. DPC level of a protected house in the vicinity: 3.35 m MSL

Situation after implementation of Proposed Drainage Proposals:

- Expected flood level after implementation of proposed pumping station and rehabilitation of drainage system.
- Expected 25-year flood level after drainage improvement: 1.50 m MSL
- Expected 50-year flood level after drainage improvement: 1.60 m MSL
- Expected 100-year flood level after drainage improvement: 1.70 m MSL

7. Conclusion. Detailed assessment of risk has been carried out taking into consideration of the catchment characteristics, location of the project site, Topography, proposed master plan, existing drainage network, degree of flood and historic observed data. Accordingly, the Model Studies provided the following results.

1. 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.
2. From the model results, it was observed that the expected flood level after implementation of proposed pumping station and rehabilitation of drainage system are as given below:
 - Expected 25-year flood level after drainage improvement: 1.50 m MSL
 - Expected 50-year flood level after drainage improvement :1.60 m MSL
 - Expected 100-year flood level after drainage improvement: 1.70 m MSL

This shows that 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. It is to be mentioned that the required level of the reclamation site depends on two factors.

- a. Protection level of the proposed infrastructures
 - b. Maintenance of the sewerage system during floods.
3. From the photos and also due to reasons given below it is not possible to have much confidence that maintenance aspect of the drainage system would function satisfactorily.
- a. Main canal system with pumping station is being maintained by SLLR&DC.
 - b. Regular maintenance of the downstream main peripheral drain and culvert across the Colombo – Katunayake expressway are being maintained by Road Development Authority.
 - c. Local drainage is being maintained by the Peliyagoda Urban council.

Taking into consideration the above facts it can be concluded that there is no risk of flooding during extreme (25 year and 50 year and 100-year floods) on the project site which are 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.

A. Introduction

Proposed project is located within the Mudun ela scheme which had been reclaimed so as to meet the needs of urban expansion. The total extent of low-lying marshy land originally available for development in the Mdun ela watershed was 322 ha, having an elevation that ranges from -1.00 m MSL to 4.00 m MSL. This is bounded by Wattala in the north, Kelaniya in the East, Kelani river flood bund in the south and Colombo - Negombo road in the west (See Fig:1.1). Original project proposal prepared by SLLRDC is shown on the attached map (see figure:1.2).

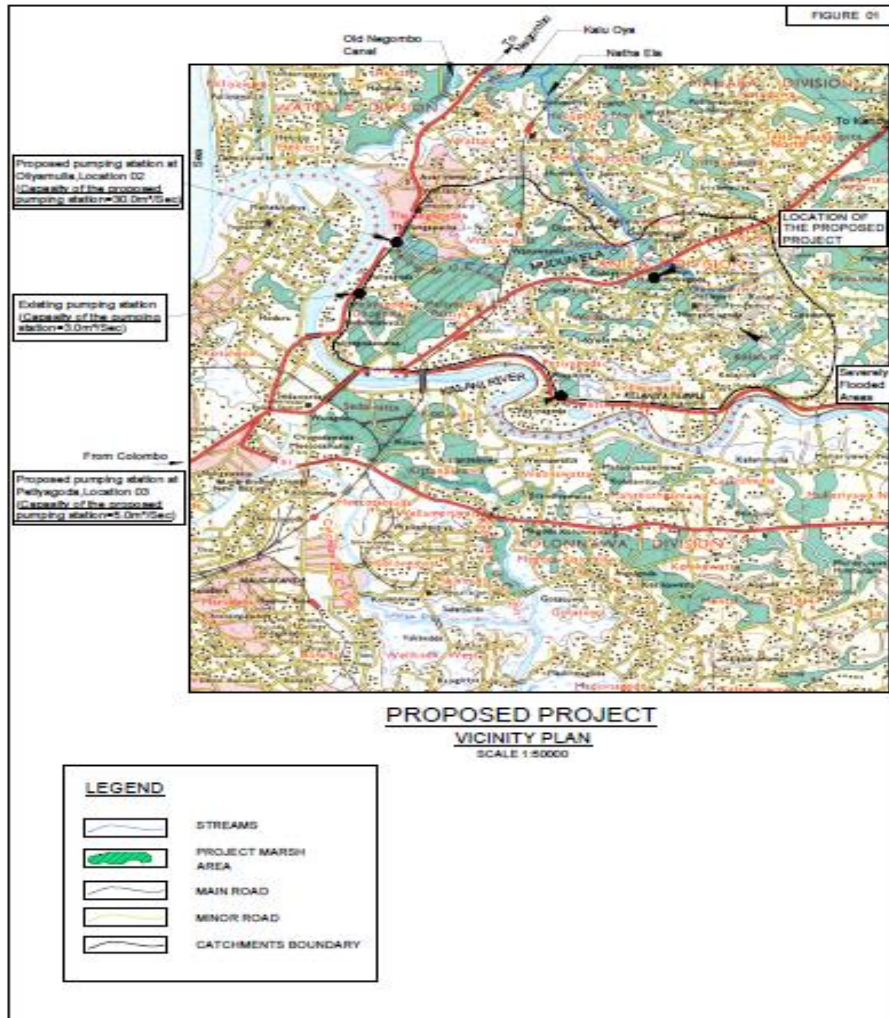


Figure 1 – 1 Mudun ela Watershed showing Project area

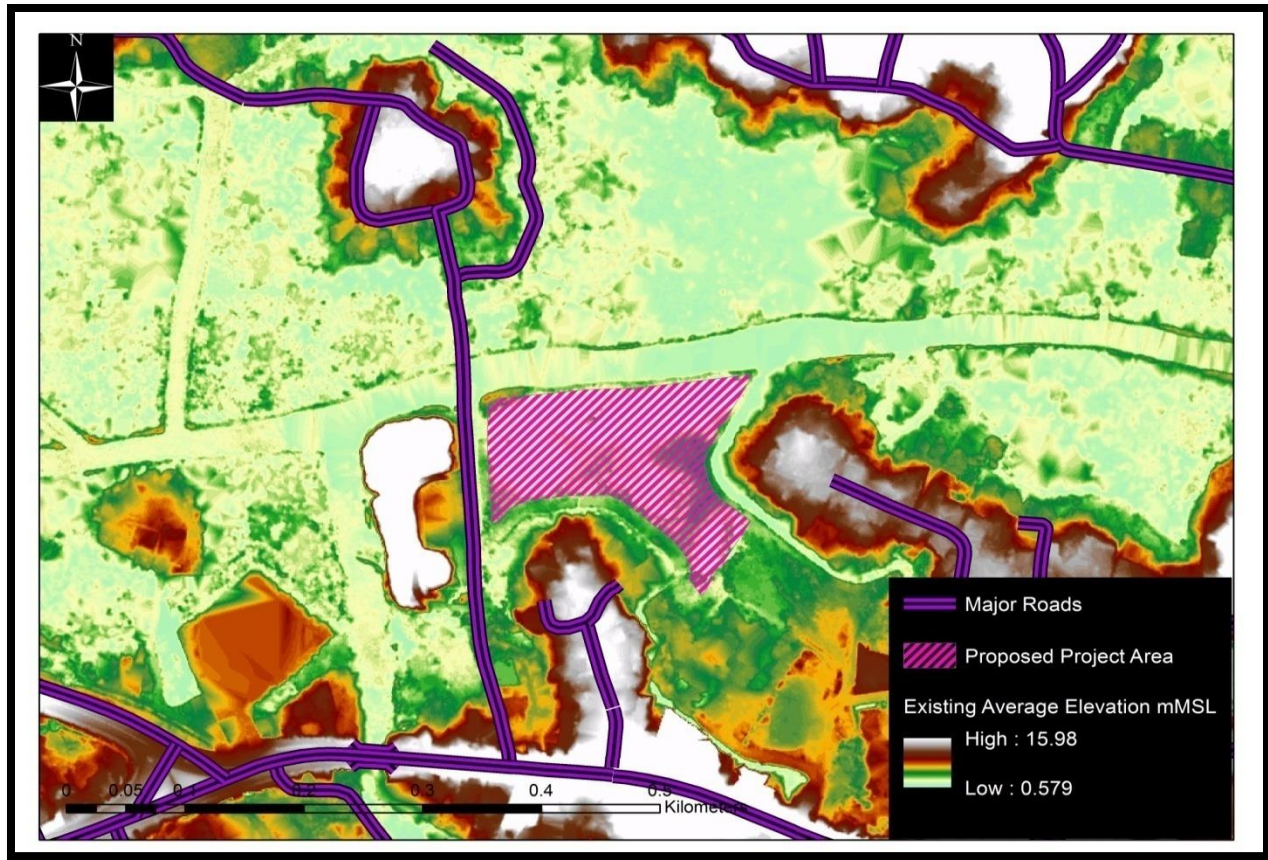


Figure 2 -1 Location of the Project shown on Google Image

In view of rapid development of low land areas, resulting in depletion of retention areas it is necessary to examine periodically the feasibility of carrying out projects of this nature. (see figure 2.1)

This watershed consists of many streams finally flowing into Kelani river through Oliyamura, Peliyagoda and Petihyagoda outfalls (See figure 6.14). Existing gates at these outfalls are being closed during high flood in the Kelani river. This is the most severe boundary condition to the proposed project site.

C. Tasks to be Carried

- (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

D. Data Collection

The following set of data and maps have been collected from relevant stake holders.

1. Topographic maps to a scale 1:50,000 and 1: 10,000 from survey department.

2. Rainfall data for Katunayake and Colombo rainfall stations from Meteorological Department.
3. Contour survey maps, cross sections of the drains prepared by licensed surveyors.
4. Relevant information collected from Sri Lanka Land Reclamation Development Corporation, Irrigation department, Road development authority, data gathered from people in the vicinity and flood levels already marked at site. Recorded water levels inside Mudun Ela watershed from previous projects. Data used in previous studies.

Colombo – Katunayake expressway Study in August 2002 and May 2001.

Data used in storm water drainage plan for the Colombo metropolitan region in March 2003 and latest studies carried out by SLLRDC.

E. Atmospheric Analysis

The study area is situated in the western province of Sri Lanka, where the mean annual values of atmospheric parameters in the range temperatures 25 - 27.5°C, rainfall 1,500-2,000mm, wind speed 5-20km/hr and pressure 1008-1010 hecto Pascal. Seasonal and monthly variations of atmospheric parameters were analyzed by using the data obtained from Metrological Department. Average annual rainfall specially for Colombo and Katunayake are 2,325mm and 2,125mm respectively.

Rainfall Intensity Analysis

The catchment areas of the individual plots in the project under consideration for effective drainage Sub basins are comparatively small (See figure 5.1).

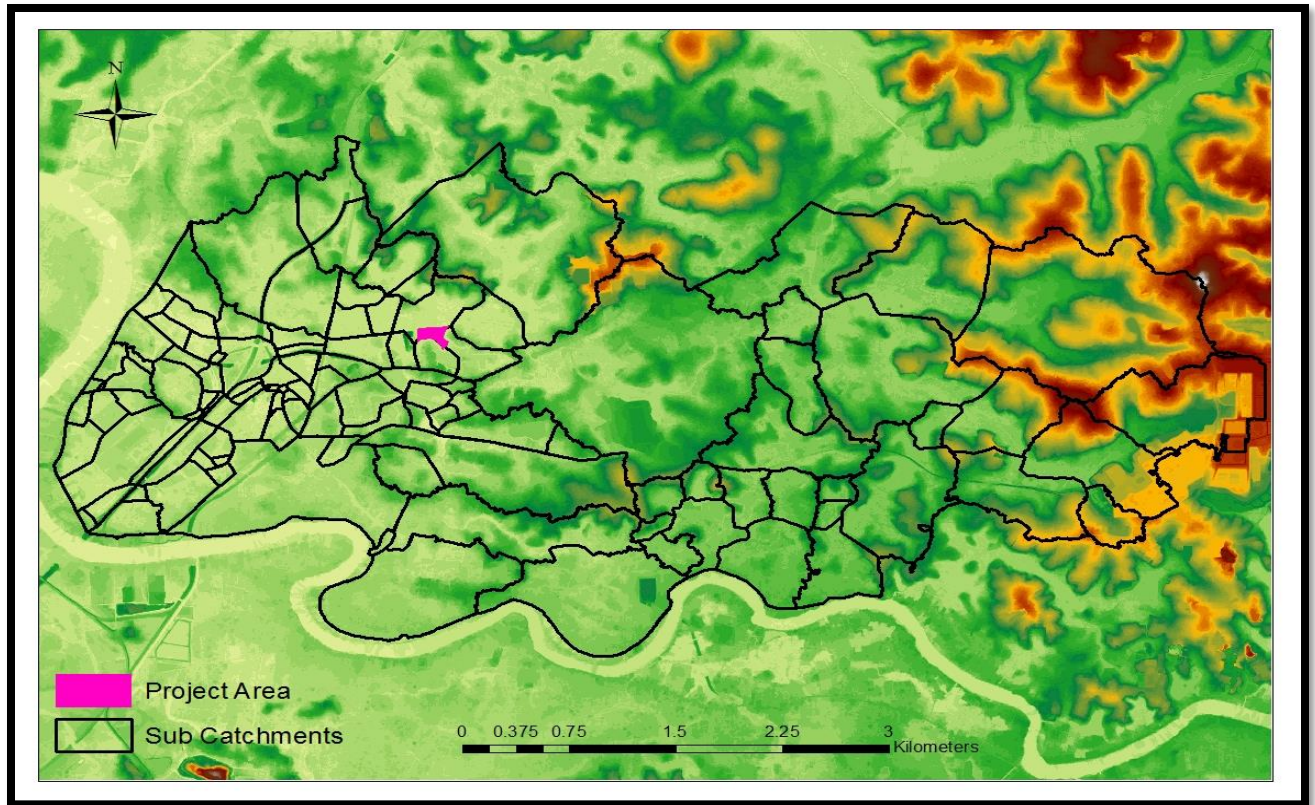


Figure 5.1: Effective Sub Catchment of the project area

Therefore, time of concentration (TC) as defined in surface hydrology is very short. Therefore, development of intensity duration frequency curves for Katunayaka and Colombo Metrological stations have been comprehensively studied and presented in thereport. IDF curves at Colombo rainfall station has been used for the analysis due to higher Intensity values as shown in the table5.1,5.2,5.3,5.45.5,5.6,5.7,5.8 and Figure 5.2,5.3 5.4 &5.5.

Year	Maximum rainfall (mm/day)	Year	Maximum rainfall (mm/day)
1981	153.3	1996	124.7
1982	154.7	1997	117.2
1983	194.1	1998	137.2
1984	109.8	1999	284.6
1985	135.7	2000	141.7
1986	100.2	2001	94.1
1987	151.2	2002	132.4
1988	151.2	2003	110.5
1989	114.2	2004	96.5
1990	110.3	2005	270.1
1991	77.1	2006	163.9
1992	493.7	2007	131.6
1993	158.4	2008	111.0
1994	94.1	2009	207.0
1995	126.3	2010	440.2

Table 5.1: Annual Maximum Rainfall for Colombo(mm/day)

Duration in Hours	Return period in years					
	2	5	10	25	50	100
0.25	38.87	45.54	50.74	58.97	63.78	68.33
0.5	58.91	68.01	74.45	83.95	89.17	93.48
1	79.46	91.77	100.63	114.69	123.79	132.47
2	96.48	113.94	128.08	152.86	171.24	190.58
3	104.07	125.76	144.72	179.58	206.85	236.61
4	108.40	133.64	156.92	200.96	236.48	276.12
5	111.25	139.55	166.65	219.05	262.30	311.40
6	113.22	144.24	174.84	234.96	285.48	343.62
12	118.92	161.52	208.08	306.00	393.72	500.04
18	121.14	171.36	229.50	356.58	475.02	623.16
24	122.40	178.56	245.52	397.44	542.88	728.64

Table 5.2: Depth Duration Frequency values for Colombo

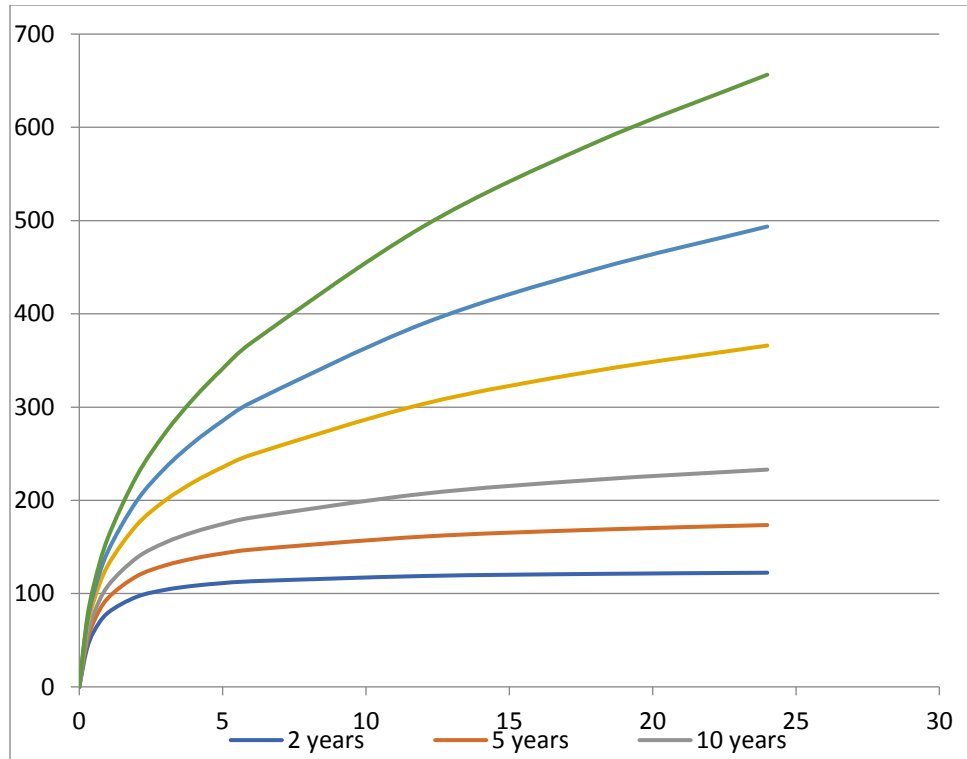


Figure 5.2: Depth -Duration Frequency Curve for Colombo

Duration in Hours	Return period in years					
	2	5	10	25	50	100
0.25	155.49	182.14	202.96	235.86	255.11	273.32
0.5	117.81	136.01	148.9	167.89	178.33	186.96
1	79.46	91.77	100.63	114.69	123.79	132.47
2	48.24	56.97	64.04	76.43	85.62	95.29
3	34.69	41.92	48.24	59.86	68.95	78.87
4	27.1	33.41	39.23	50.24	59.12	69.03
5	22.25	27.91	33.33	43.81	52.46	62.28
6	18.87	24.04	29.14	39.16	47.58	57.27
12	9.91	13.46	17.34	25.5	32.81	41.67
18	6.73	9.52	12.75	19.81	26.39	34.62
24	5.1	7.44	10.23	16.56	22.62	30.36

Table 5.3: Intensity Duration frequency values for Colombo

Return Period (in Years)	Equation (Intensity I = mm/ hr, T in minutes)
2	$I = 6871.16(T + 31.3)^{-0.988}$
5	$I = 5891.17(T + 28.9)^{-0.919}$
10	$I = 4837.53(T + 26.4)^{-0.852}$
25	$I = 3492.79(T + 22.2)^{-0.746}$
50	$I = 2733.50(T + 19.1)^{-0.671}$
100	$I = 2138.46(T + 16.1)^{-0.598}$

Table 5.4: IDF Equations for different return period at Colombo

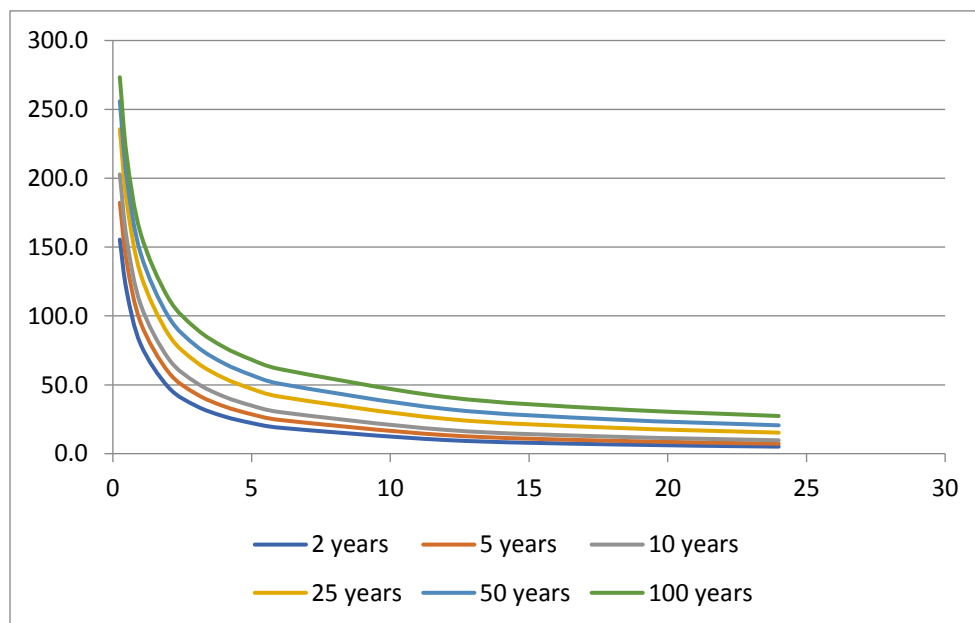


Figure 5.3: Intensity Depth Duration Frequency Curves for Colombo rainfall stations

Observed 24 hrs Maximum Rainfall				2 nd Highest 24 hrs Rainfall				3 rd Highest 24 hrs Rainfall			
No	Year	Month & date	Rain fall	No	Year	Month & date	Rain fall	No	Year	Month & date	3 rd Max
1	1998	18-Jul	213.3	1	1998	15-May	151.3	1	1998	8-Nov	122.2
2	1999	20-Apr	266.8	2	1999	12-Oct	195.6	2	1999	13-Oct	191.1
3	2000	8-Jan	181.8	3	2000	30-Sep	178.7	3	2000	7-Nov	91.1
4	2001	2-Jun	127.4	4	2001	26-Oct	75.4	4	2001	7-May	71.4
5	2002	19-Oct	164.9	5	2002	16-Oct	130.9	5	2002	8-Apr	56.5
6	2003	7-Mar	100.2	6	2003	28-Apr	93.0	6	2003	29-Sep	92.0
7	2004	14-Dec	71.8	7	2004	26-Sep	71.4	7	2004	12-Dec	60.0
8	2005	21-Nov	222.5	8	2005	8-Oct	150.6	8	2005	22-Nov	82.6
9	2006	27-Oct	166.7	9	2006	18-Nov	118.6	9	2006	25-Oct	69.9
10	2007	3-May	129.2	10	2007	22-Oct	104.5	10	2007	18-Dec	78.0
11	2008	15-Mar	128.2	11	2008	9-Mar	120.3	11	2008	19-Oct	117.5
12	2009	27-Jan	88.3	12	2009	21-Nov	63.1	12	2009	9-Apr	62.2
13	2010	18-May	177.5	13	2010	10-Nov	160.6	13	2010	12-May	111.9
14	2011	14-Oct	75.6	14	2011	30-Oct	64.1	14	2011	9-Dec	57.9
15	2012	16-Oct	105.8	15	2012	14-Feb	100.4	15	2012	29-Nov	84.5
16	2013	3-May	261.3	16	2013	12-Sep	114.4	16	2013	5-May	72.2

Table 5.5: Observed 24 hr maximum rainfall events at Katunayake

Duration in Hours	Return period in years					
	2	5	10	25	50	100
0.25	36.85	42.02	45.93	51.11	55.02	58.93
0.5	55.82	65.91	73.54	83.64	91.27	98.91
1	76.63	93.35	105.99	122.72	135.37	148.01
2	101.79	132.00	154.85	185.08	207.94	230.79
3	114.02	148.74	174.97	209.70	235.97	262.20
6	130.41	174.30	207.54	251.43	284.67	317.90
12	140.99	188.54	224.45	272.00	308.07	343.98
24	189.58	262.61	317.75	390.78	445.93	501.07
48	242.64	339.22	412.54	509.12	582.45	655.78
72	273.64	379.16	458.75	564.27	643.85	723.44

Table 5.6: Depth Duration Frequency Values for Katunayake

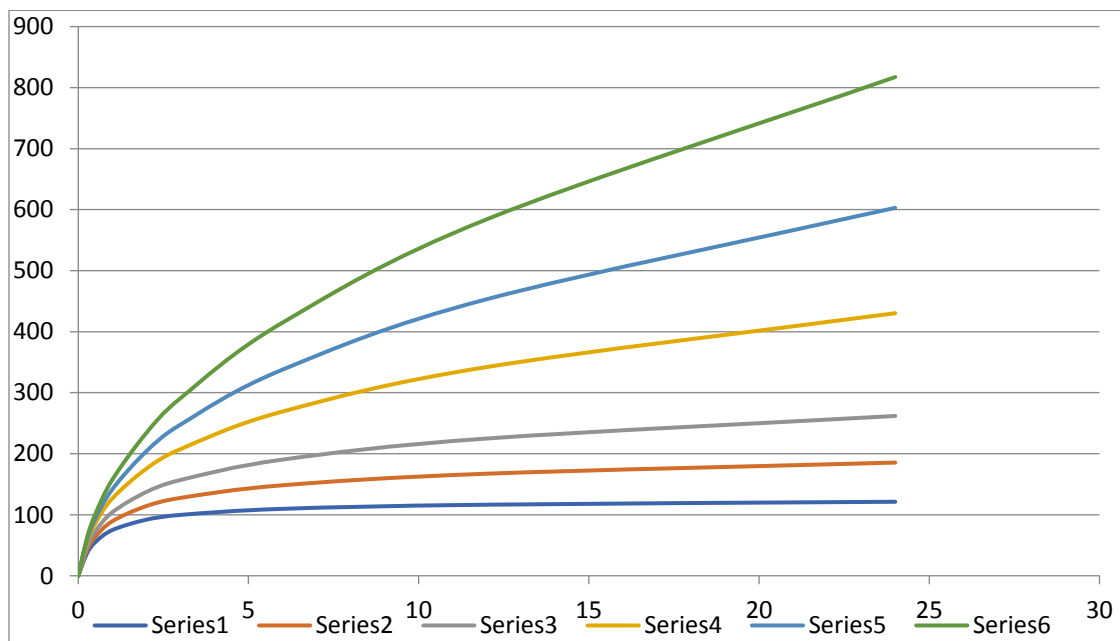


Figure 5.4: Depth Duration Frequency Curves for Katunayake

Duration in Hours	Return period in years					
	2	5	10	25	50	100
0.25	144.37	164.31	184.42	213.13	228.28	244.70
0.5	109.93	124.61	139.43	157.97	168.20	177.46
1	74.32	84.96	96.11	110.76	120.90	130.55
2	47.30	57.82	68.59	84.60	97.38	110.39
3	34.05	42.51	51.44	65.83	77.92	90.63
6	17.99	24.04	30.64	42.66	53.43	65.45
12	8.87	12.57	16.81	25.49	33.72	43.43
24	5.39	8.47	12.13	20.47	28.87	39.42

Table5.7: Intensity Duration Frequency Values for Katunayake

Return Period (in Years)	Equation (Intensity I = mm/ hr, T in minutes)
2	$I = 6042.878(T + 31.7)^{-0.972}$
5	$I = 4601.597(T + 29.9)^{-0.876}$
10	$I = 3798.453 (T + 28.4)^{-0.803}$
25	$I = 2659.96 (T + 24.6)^{-0.686}$
50	$I = 2012.0 (T + 22.3)^{-0.601}$
100	$I = 1566.503 (T + 19.2)^{-0.526}$

Table 5.8: IDF Equations for different return period at Katunayake

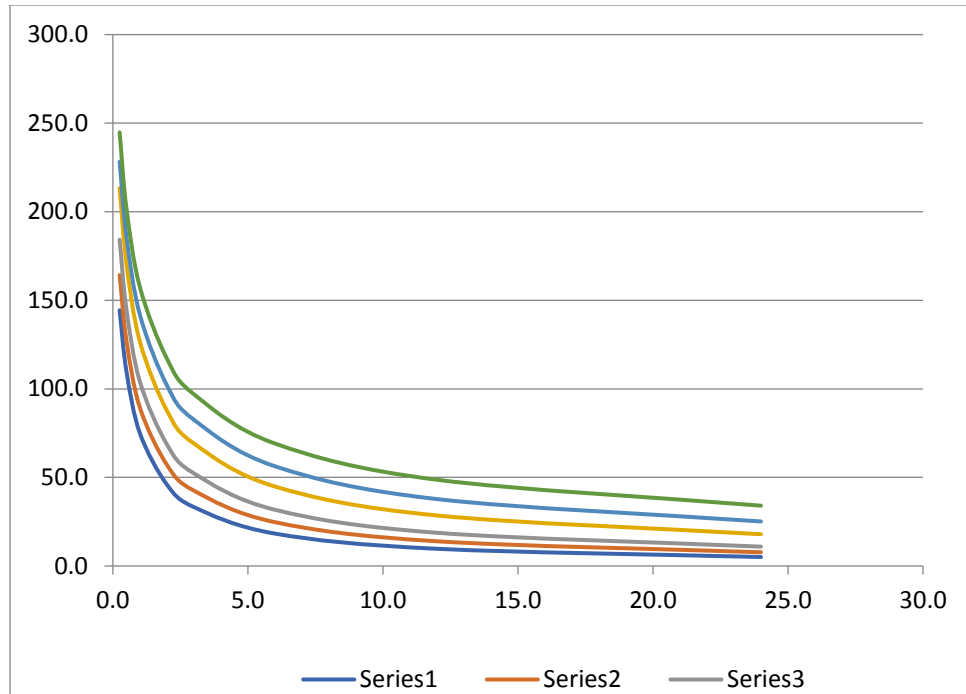


Figure 5.5: Intensity Depth Duration Frequency Curves for Katunayake rainfall stations

By considering the long term continuous rain, 12hr design storms was developed for the model analysis for the different return period based on the rainfall analysis. Design event was derived for 15-minute intervals so that the quick response for small catchment taken into account. Long term continuous rain (12hr) has to be selected due to vast scenario has occurred when the downstream water level is high due to heavy rain storm in the rain water sheds.

The alternative block method was applied for the development of the design storm and the peak rainfall was placed at the middle. Since this a 12-hour event, the depression storage may be filled within the initial few hours and the infiltration model also sufficiently saturated when the peak rainfall arrives and thereby this may be regarded as a possible worst scenario and sufficient degree of factor of safety is achieved

The calculation procedure of deriving the design rainfall is given in Table 5.9,5.10,5.11,5.12 and a graphical interpretation of the event is given in Figure 5.6,5.7,5.8, and 5.9.

Development of Design Rainfall for (25 ARI) $I = 3492.79 (T + 22.2)^{-0.746}$

	Duration (hrs)	Duration (minutes)	Intensity (mm/hr)	Depth (mm)	Incremental Depth (mm)	Ranking	
1	0.25	15	235.26	58.81491185	58.81491185	6.291852712	11
2	0.5	30	182.72	91.36088209	32.54597024	7.597632078	9
3	0.75	45	151.34	113.5053313	22.14444921	9.666205646	7
4	1.00	60	130.22	130.2201224	16.71479105	13.42254276	5
5	1.25	75	114.91	143.6426651	13.42254276	22.14444921	3
6	1.50	90	103.25	154.8706292	11.22796408	58.81491185	1
7	1.75	105	94.02	164.5368348	9.666205646	32.54597024	2
8	2.00	120	86.52	173.0371573	8.500322437	16.71479105	4
9	2.25	135	80.28	180.6347894	7.597632078	11.22796408	6
10	2.50	150	75.01	187.5131614	6.878372035	8.500322437	8
11	2.75	165	70.47	193.8050141	6.291852712	6.878372035	10
12	3.00	180	66.54	199.6094007	5.804386652	5.804386652	12

Table 5.9: Values for 25yr Design Event

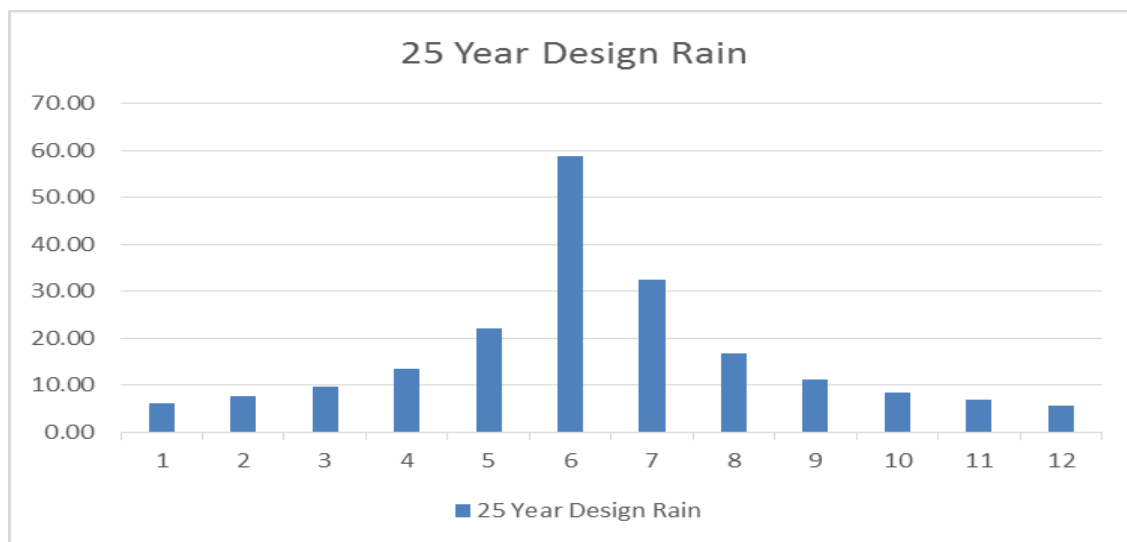


Figure 5.6: Design Hydrograph for 25yr Return Period

Development of Design Rainfall for (50ARI) - = $2733.50 (T + 19.1)^{-0.671}$							
	Duration (hrs)	Duration (minutes)	Intensity (mm/hr)	Depth (mm)	Incremental Depth (mm)	Ranking	
1	0.25	15	256.00	64.00013626	64.00013626	8.52936069	11
2	0.50	30	200.45	100.2243853	36.22424906	10.02450453	9
3	0.75	45	167.62	125.7125407	25.48815541	12.32743153	7
4	1.00	60	145.56	145.5602047	19.84766403	16.37842268	5
5	1.25	75	129.55	161.9386274	16.37842268	25.48815541	3
6	1.50	90	117.31	175.9664731	14.02784571	64.00013626	1
7	1.75	105	107.60	188.2939047	12.32743153	36.22424906	2
8	2.00	120	99.67	199.3317913	11.03788668	19.84766403	4
9	2.25	135	93.05	209.3562959	10.02450453	14.02784571	6
10	2.50	150	87.42	218.5620353	9.205739391	11.03788668	8
11	2.75	165	82.58	227.091396	8.52936069	9.205739391	10
12	3.00	180	78.35	235.0517654	7.960369489	7.960369489	12

Table 5.10: Values for 50yr Design Event

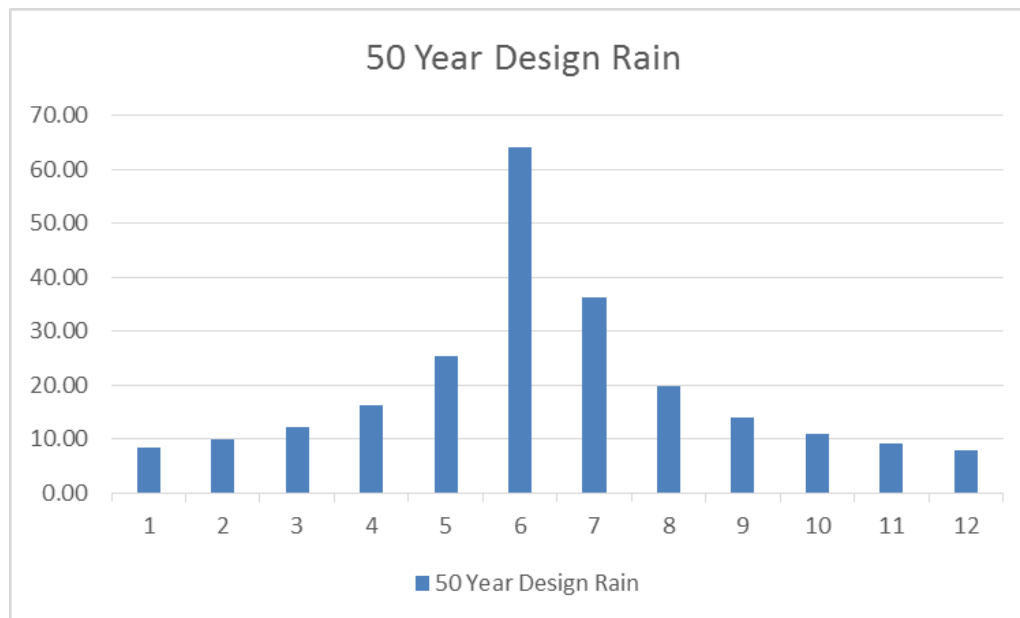


Figure 5.7: Design Hydrograph for 50yr Return Period

Variation of Sea Water Levels

The variation of sea water level during high tide and low tide is important as the excess storm water from all basins eventually discharge to Kelani river and sub sequently to the sea as an emergency outlet. Record of high tidal level at Colombo harbor in April to June 2002. (See table 5.11)

Date(Time)		Tidal Level (above MSL)
Apr. 12	2002(15:00)	0.51m
Apr. 13	2002(15:00)	0.53m
Apr. 14	2002(15:00)	0.53m
Apr. 26	2002(15:00)	0.54m
Apr. 27	2002(15:00)	0.64m
Apr.28	2002(16:00)	0.66m
Apr.29	2002(16:00)	0.63m
Apr.30	2002(16:00)	0.52m
Jun.12	2002(15:00)	0.51m
Jun.13	2002(16:00)	0.54m

Table 5.11: High tide level at Colombo Harbor April to June 2002

Considering the situation above, the assumption that high tide level of over 0.60m above MSL occurs during a flood event is reasonable. Source: Sri Lanka Ports Authority.

F. Study Approach

Mathematical Model

Theoretical background of HEC HMS and HEC RAS Model

HEC HMS and HEC RAS model requires a range of input data to simulate the water levels and flow in the selected area. The HEC HMS RR model describes the run off in terms of surface flow in catchments and HEC RAS HD model presents the flow in main canal and cross drains.

Input data required for HEC HMS RR model:

Rainfall data, Catchment data, Area, Length, Slope, Land use data, Soil data

Input data required for HEC RAS HD model: Network data, Main canal, cross drains, Bridges, culverts, and other hydraulic structures

Boundary conditions in terms of water levels

HEC HMS RR Model

The Unit Hydrograph Method (UHM) estimates the runoff for single storm events. This method divides the storm rainfall into excess rainfall (runoff) and water loss (infiltration).

The SCS loss model uses a curve number that characterises the catchment in terms of soil type and land use characteristics. The model operates with three different levels of the antecedent moisture conditions.

Excess rainfall from basins and transformation to runoff is determined using the US Soil Conservation Service (SCS) Curve Number method, based on SCS unit hydrograph.

Antecedent Moisture Condition (AMC) defines the level of moisture in the ground before rain starts. Level I specifies dry conditions, level II specifies average moisture condition, while level III specifies wet condition. In the present study AMC III was used in HEC HMSmodel since it gives the maximum discharge values compared to other AMC conditions

HEC RAS HD Model

As HEC RAS HD Model is a physically based system, data related to the detailed physical characteristics of the model must be available as inputs if realistic model results are to be expected. With the help of these data, HEC RAS solves 'Saint Venant' equations, consists of continuity and conservation of momentum equations, based on some assumptions to obtain the time series of water level and discharge along the river profile.

Data Required

The basic data requirement for the HEC RAS HD model is as follows;

(i) Geometric and Topographic data

These data are necessary to provide an adequate geometrical and topographical description of the river network, off-stream storage areas, and all important hydraulic structures.

The layout of the river system is determined from suitable bathymetric maps or aerial photographs. The location of the main channel confluences and bifurcations, areas subject to inundation, and the network of discharge exchange between storage areas must be identified.

Cross sections are required at approximately regular intervals along the main channel and these data should ideally extend on either bank up to high flood levels. The cross section spacing should sufficiently be close to adequately describe the longitudinal variation in channel geometry.

Areas adjacent to the river subjected to inundation are also needed to be identified, and their storage capacities at various flood stages need to be determined.

(ii) Hydrometric data

Hydrometric data is required at the model boundaries for the operation of the model and is also necessary to enable the model to calibrate and verify against the actual events. The main types of hydrometric data required are:

Water Levels:

These are required for model operation at all specified water level boundaries, or at discharge boundaries where a rating curve is available for conversion to discharges. Water levels are also required at internal points for model calibration purposes.

Discharges:

These are required for model operation at all points specified as discharge points

HEC HMS Model

HEC HMS

The Hydrologic Modeling System (HMS), developed by US Army is designed to simulate the complete hydrologic processes of dendritic watershed systems. The software includes many traditional hydrologic analysis procedures such as event infiltration, unit hydrographs, and hydrologic routing. HEC-HMS also includes procedures necessary for continuous simulation including Evapo-transpiration, and soil moisture accounting. In addition to the above HMS is capable of hydrologic routing of systems comprises of hydrologic elements such as sub basins, reservoirs, spillways, dam breaks etc.

Idealization of the Basin

The idealization of this network in to the HEC HMS Model is shown in Figure 6.1.

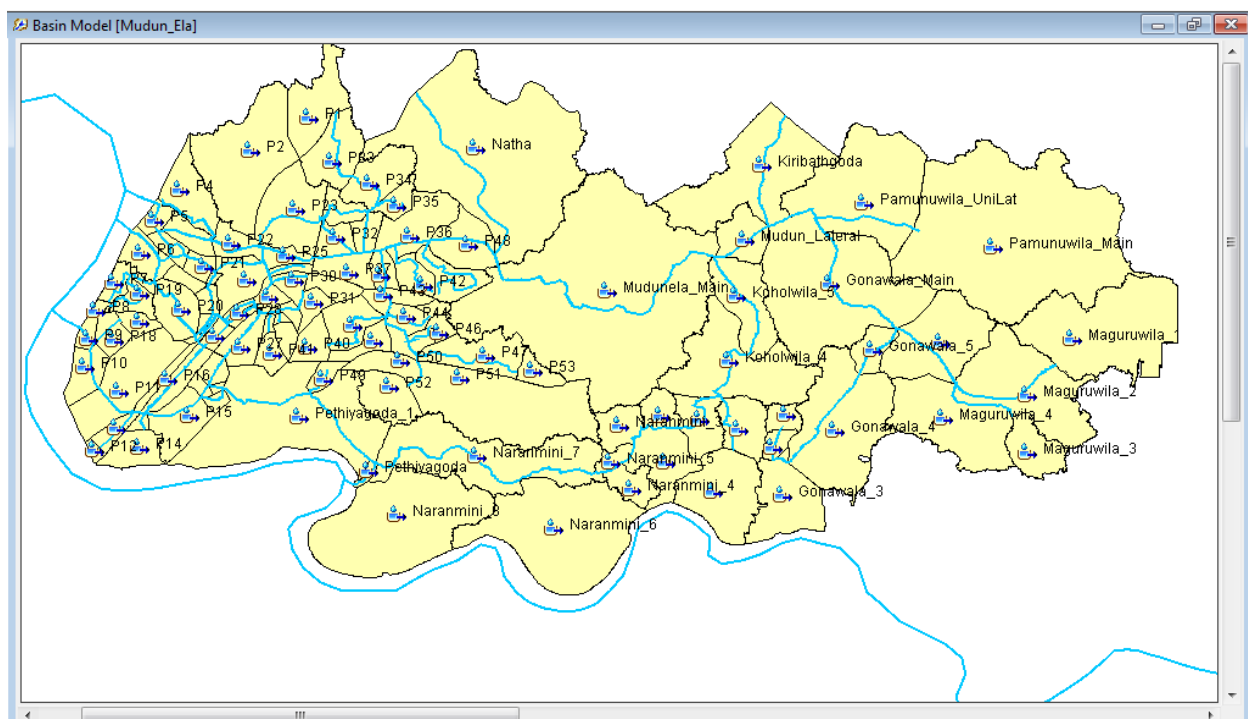


Figure 6.1- HEC HMS Sub Basin Model

Loss Method

There are many loss methods are available within HMS depending on the purpose. Since this is an event modeling, SCS curve number method was used.

The general equation for the SCS curve number method is as follows:

Considering the nature of land use, the CN value was used as 60 for this study after evaluating CN values used for other projects.

Sample hydrograph for specific sub basin from HEC HMS Model is shown in Figure

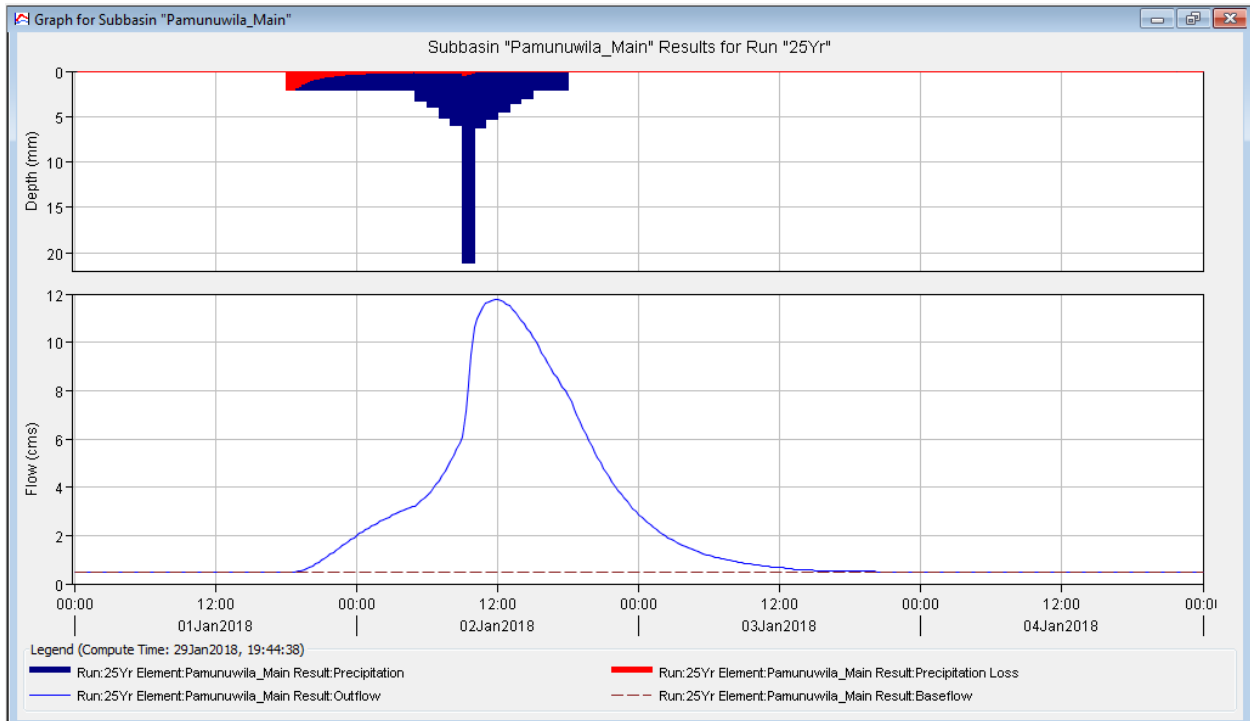


Figure 6.2 - 25 Year Flood Hydrograph for Specific Sub Basin

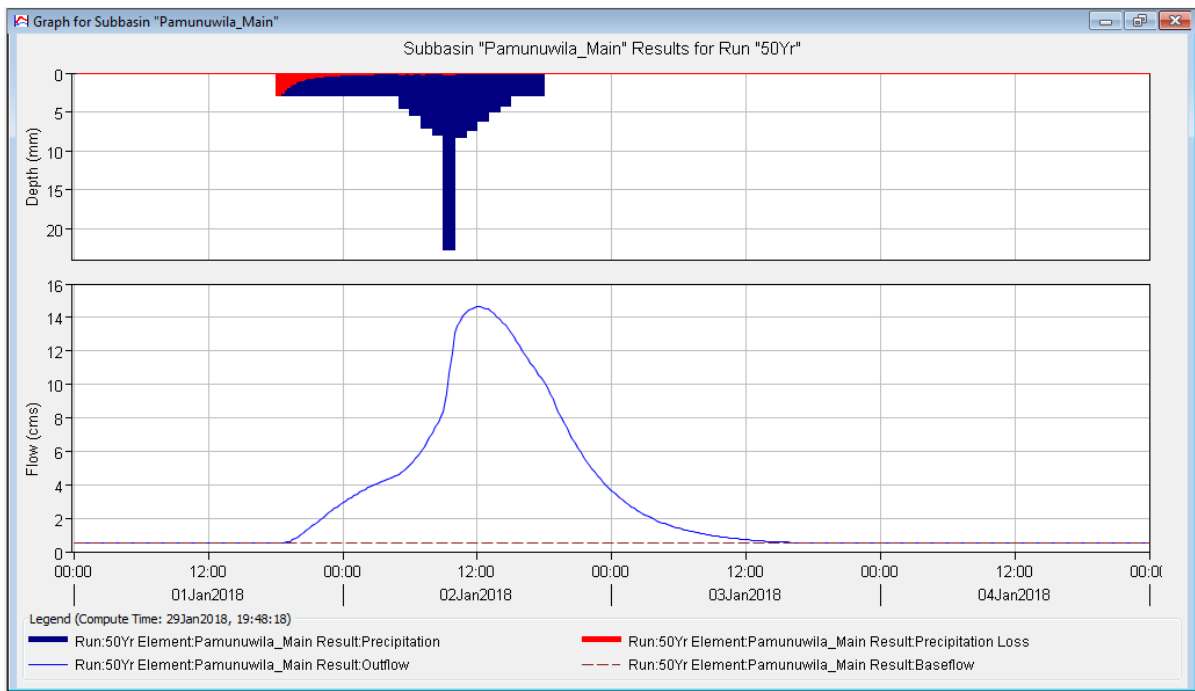


Figure 6.3 - 50-year Flood Hydrograph for Specific Sub Basin

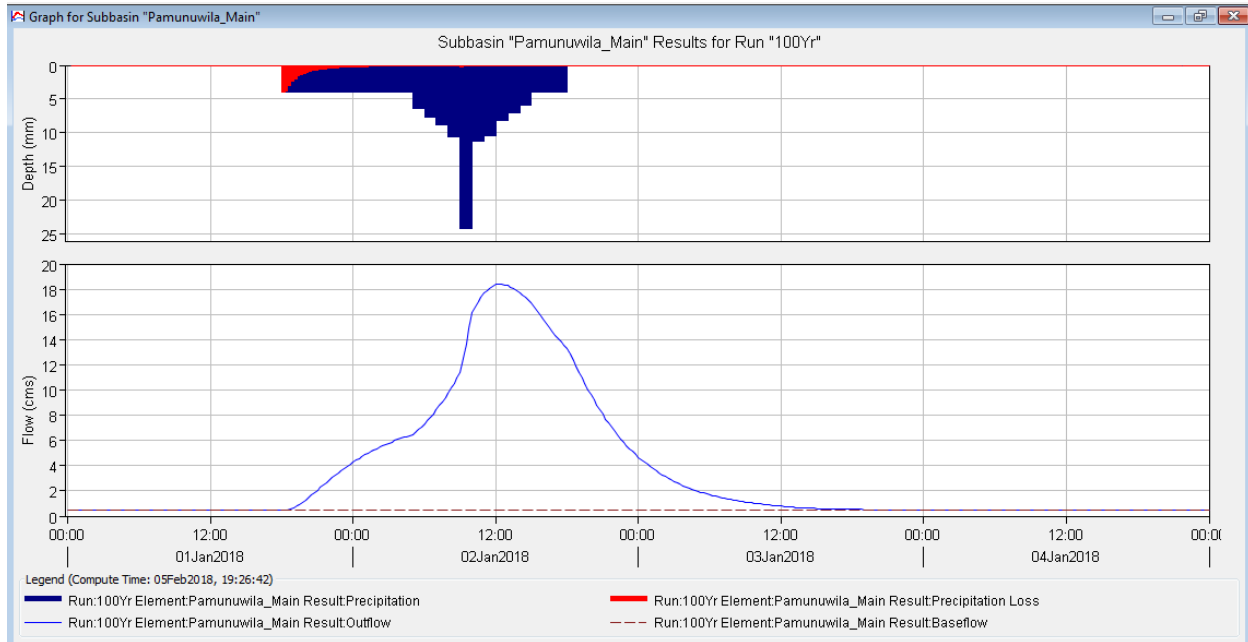


Figure 6.4: 100 Year Flood Hydrograph for Specific Sub Basin

Hydraulic Modeling

The hydraulic modeling will simulate the process after the runoff enters to canal network while hydrologic model described above simulates the runoff from rainfall. The output of hydrologic model would be the input for the hydraulic model. HEC RAS Model software was used for the hydraulic modeling of this study.

HEC RAS 2D modeling

HEC RAS is now capable of 2D modeling subject to availability of a good digital elevation model. The combined digital elevation models obtained as above were used for the 2D modeling of the macro area. The grid interval was taken as 20m. HEC RAS Model set up is shown in Figure 6.4.

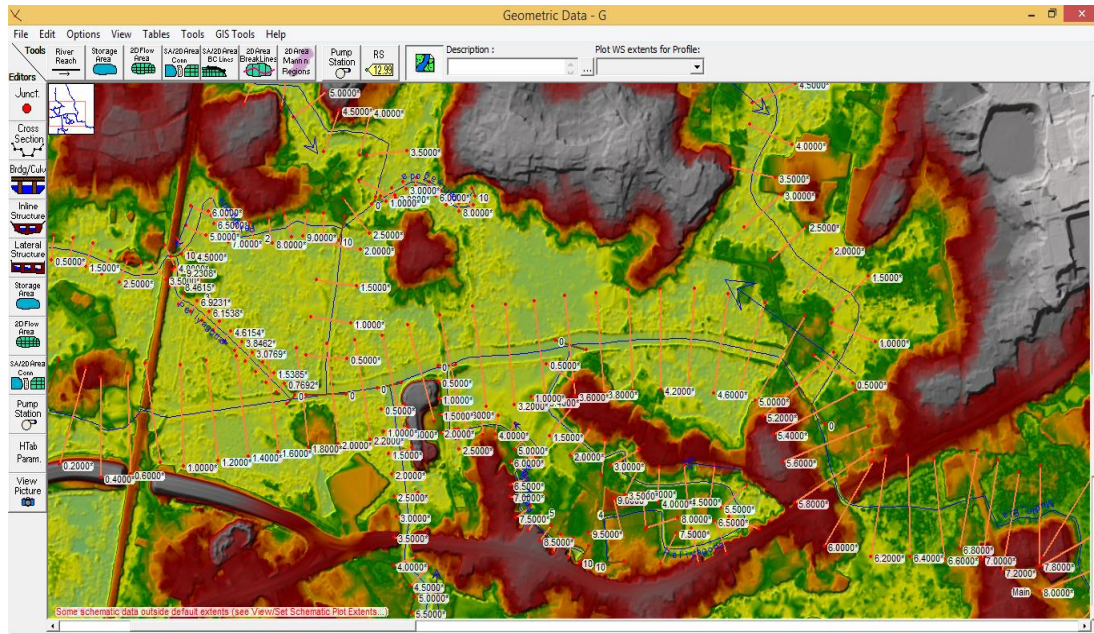


Figure 6.5 - HEC RAS 2D Model Net Work

Model Calibration & Verification details are shown in following maps and figures.



(Figures 6.5, 6.6, 6.7, 6.8 & table 6.1)

Figure 6.6- Nearest Rainfall Station of The Project

	Colombo	Angoda	Welisara
13-May-16	2.6	8.2	22.3
14-May-16	76.4	28.5	77.2
15-May-16	256.9	261.5	197.5
16-May-16	26	20.2	5.7
17-May-16	19.5	18	13.2
18-May-16	0.9	8.5	34.2
19-May-16	9.8	15.2	39.3
20-May-16	0.8	10.5	2
21-May-16	1.8	8.5	0

Table 6.1 Rainfall Event in May 2016

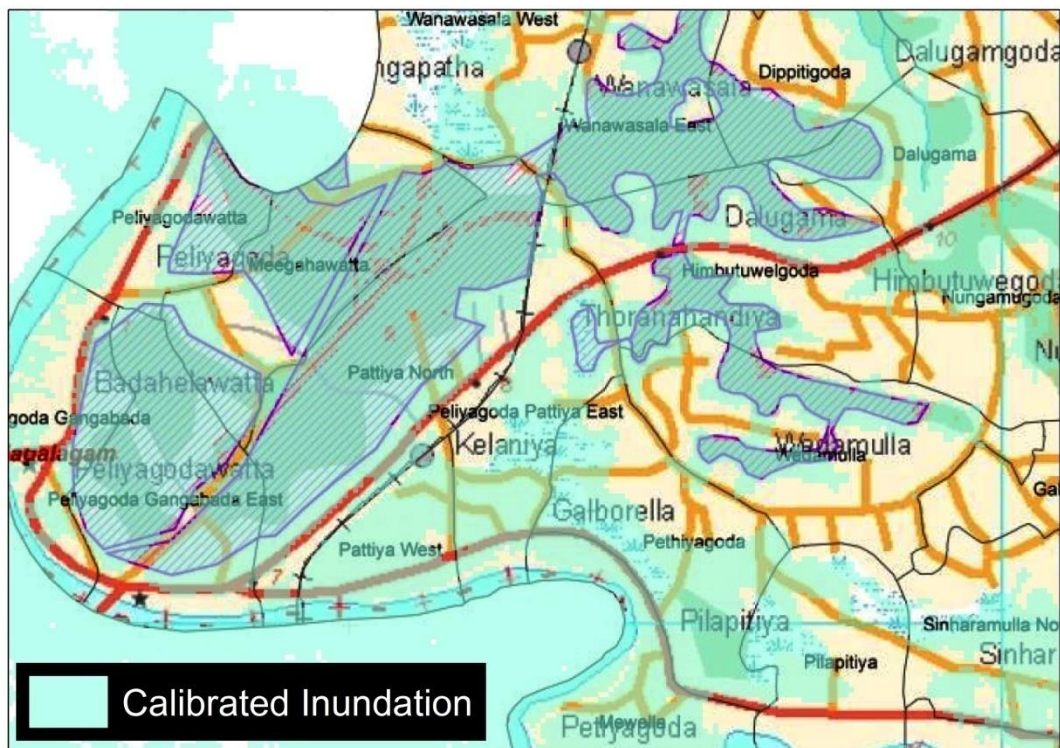


Figure 6.7 - Calibrated Inundation

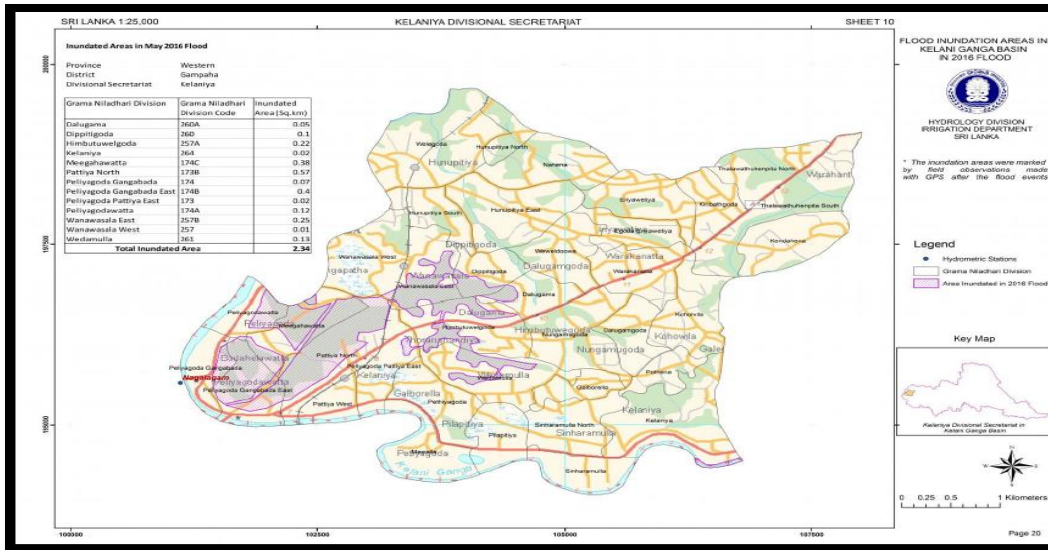


Figure 6.8 - Verification Inundation



Figure 6.9 - Observed flood in year 2010. Flood in the vicinity of the Project:2.10mMSL

Flood Inundation

Flood inundations can be obtained in the form of raster GIS data sets as indicated in Figure 6.9, 6.10 & 6.11, 6.12 for 25 & 50-year return period at existing and proposed conditions.

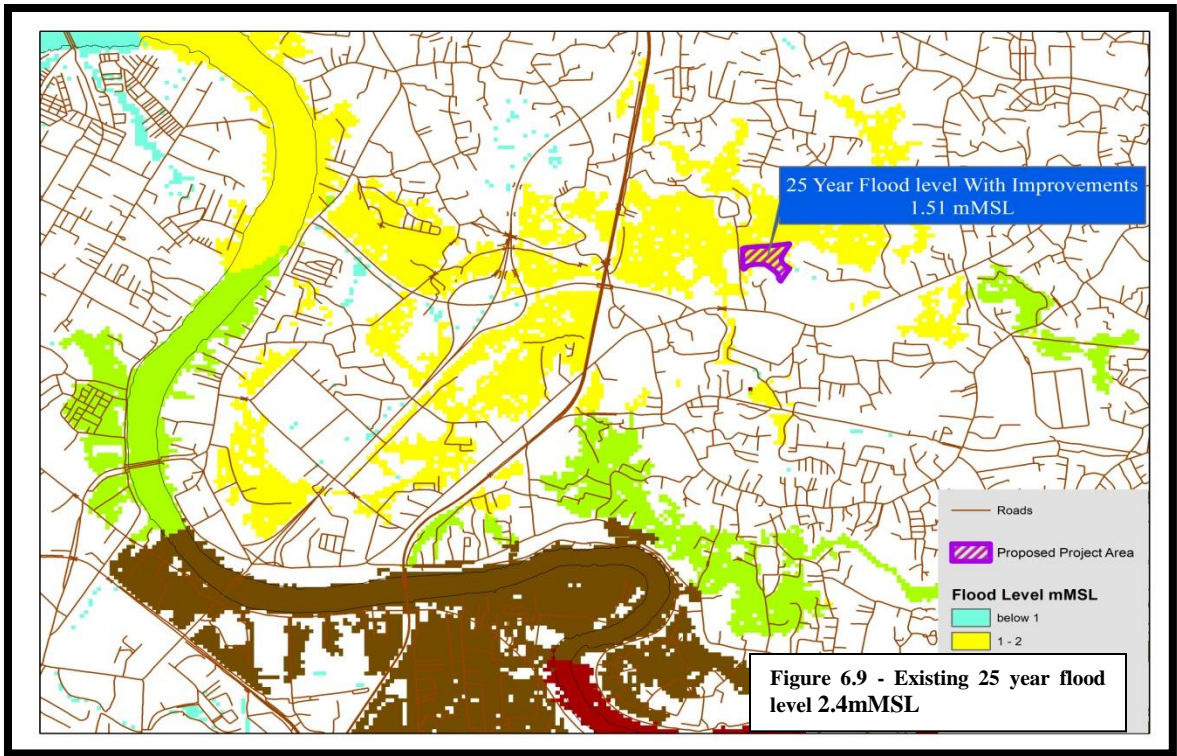


Figure 6.10 - Existing 25-year flood level 2.4mMSL

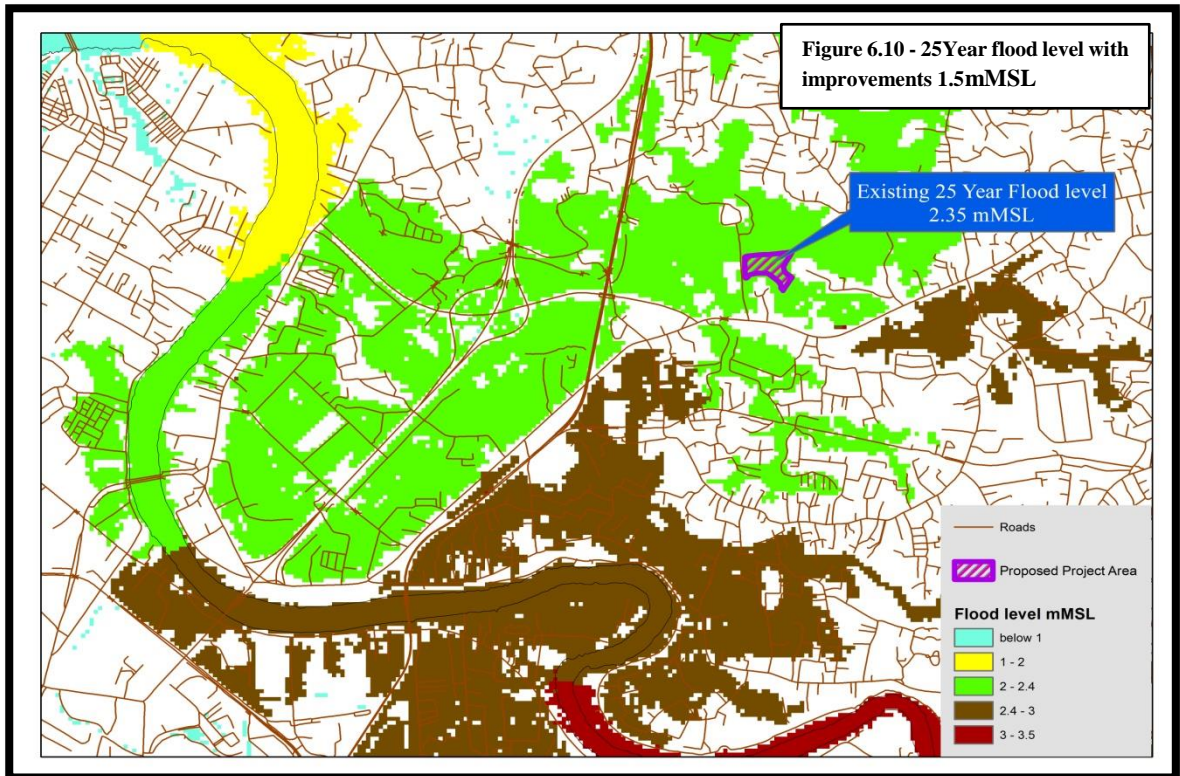


Figure 6.11 - 25Year flood level with drainage improvements 1.5mMSL

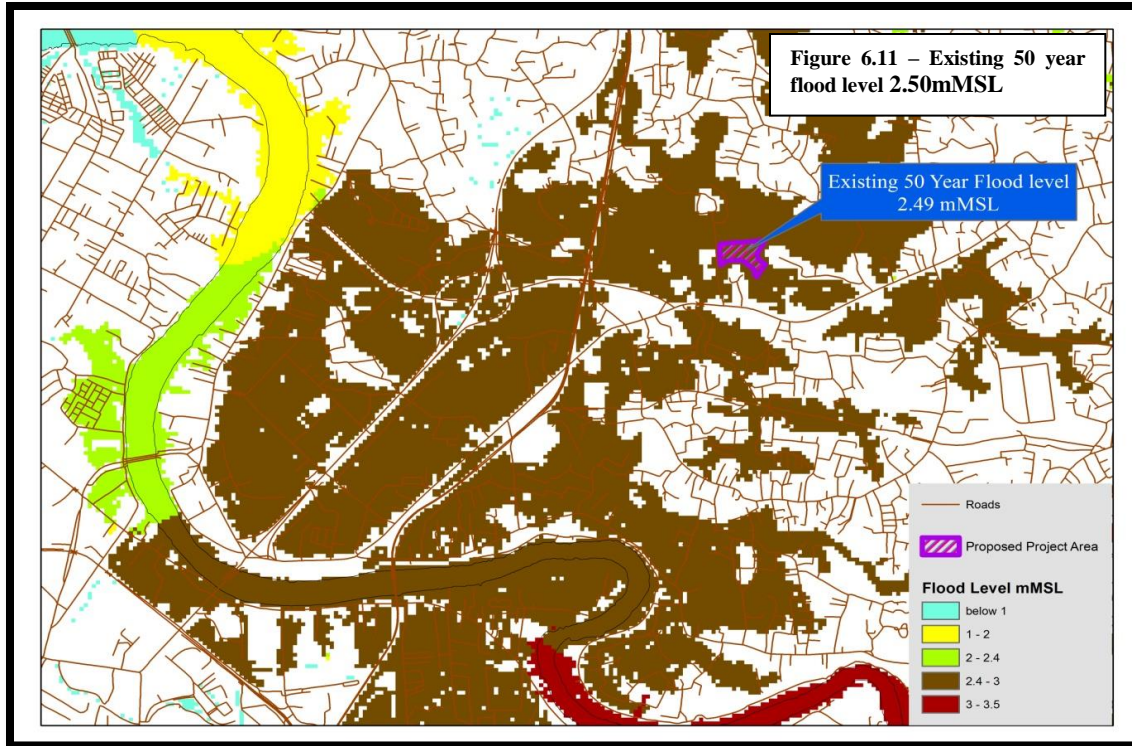


Figure 6.12 – Existing 50-year flood level 2.50mMSL

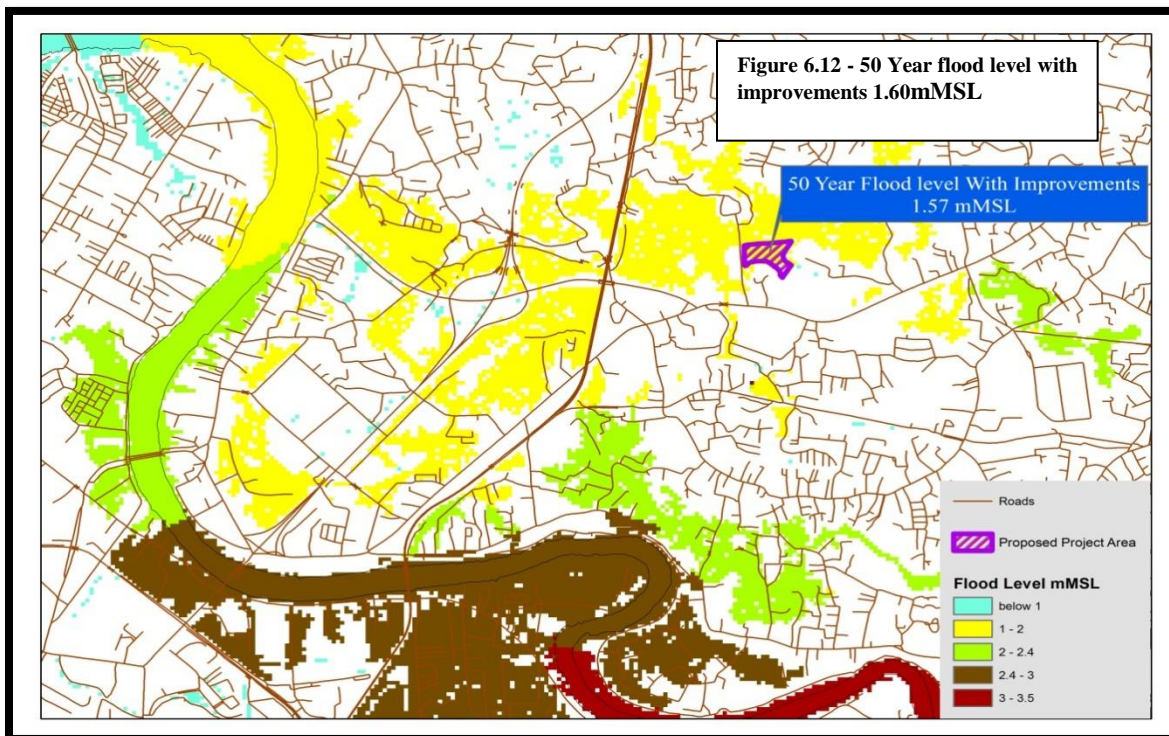


Figure 6.13 - 50 Year flood level with drainage improvements 1.60mMSL

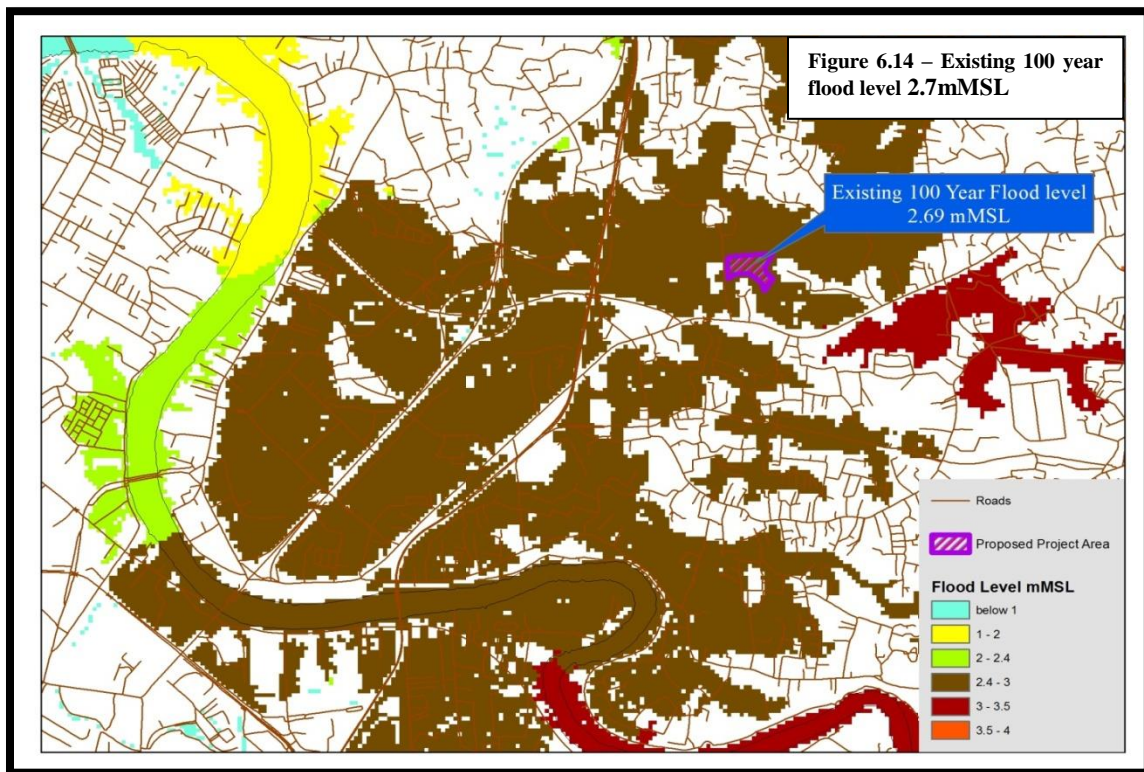


Figure 6.14 - Existing 100 Year flood level 2.70 m MSL

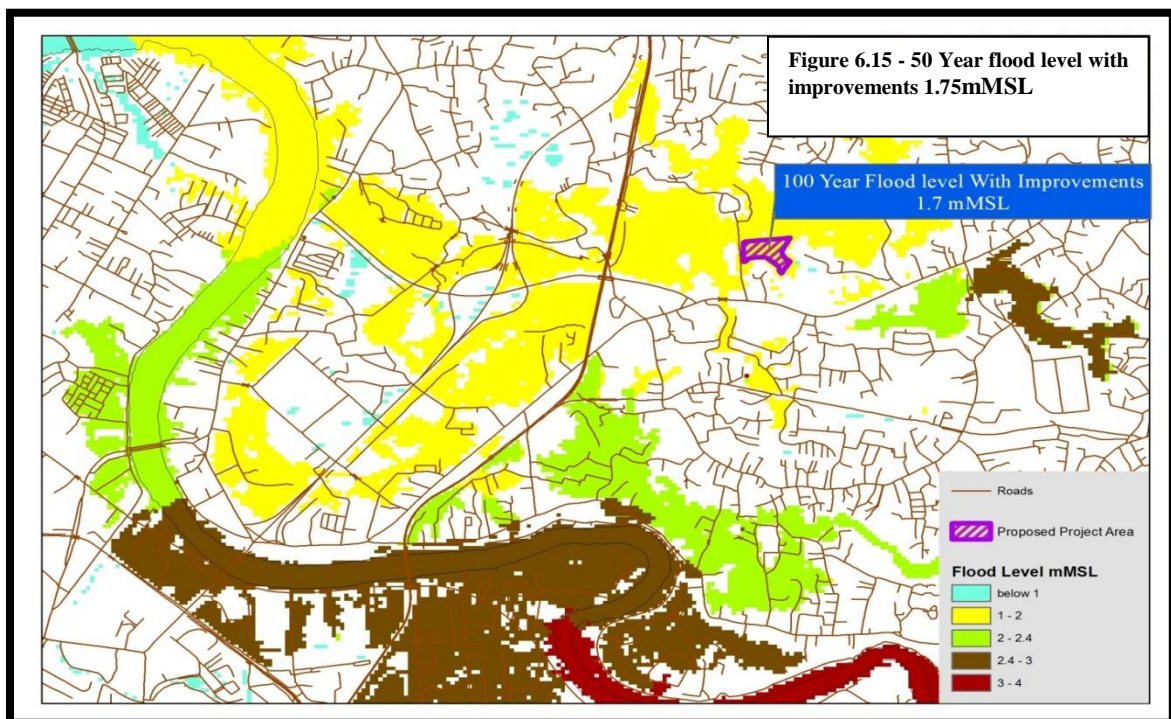


Figure 6.15 - 100 Year flood level with drainage improvement 1.75 m MSL

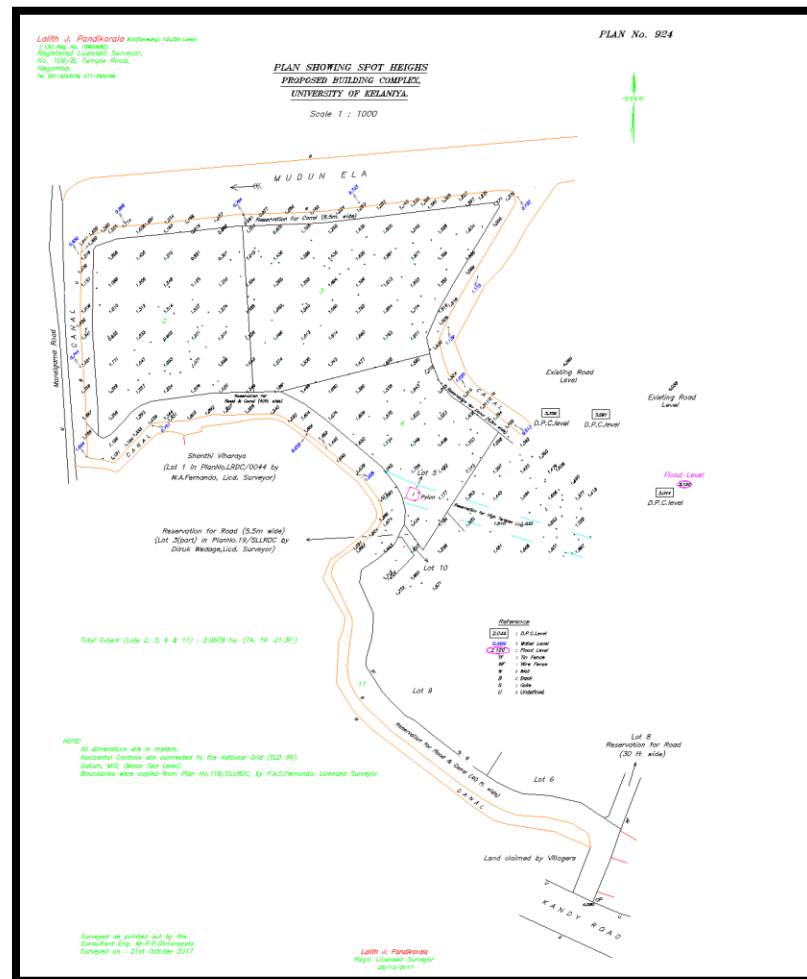


Figure 6.16: Project area with Spot levels with respect to m MSL

Flood Mapping

Flood Mapping is important to identify the area under flooding during a storm and depth of flooding. In order to 100% accurate flood mapping, a 02D hydraulic modeling exercise is needed.

Creation of Digital Elevation Model (DEM)

The spot levels of the area were available from the spot heights. Analysis software such as “Surfer” and “ArcGIS” were used to creation of DEM from the spot heights. The created sample of DEM is shown in Figure5.11.

Flood Mapping

The total amount of flooded water volume can be taken from the nodal flooding output of HEC RAS Model. Thereafter, ArcGIS software was used to put this water volume in to DEM and observe the extent of flooding and the depth of flooding. This combination of Model results and ArcGIS was used to obtain flooded water volume, flood level, flood extent and flood depth. Latest updated drainage proposals are shown in Figure 6.14.

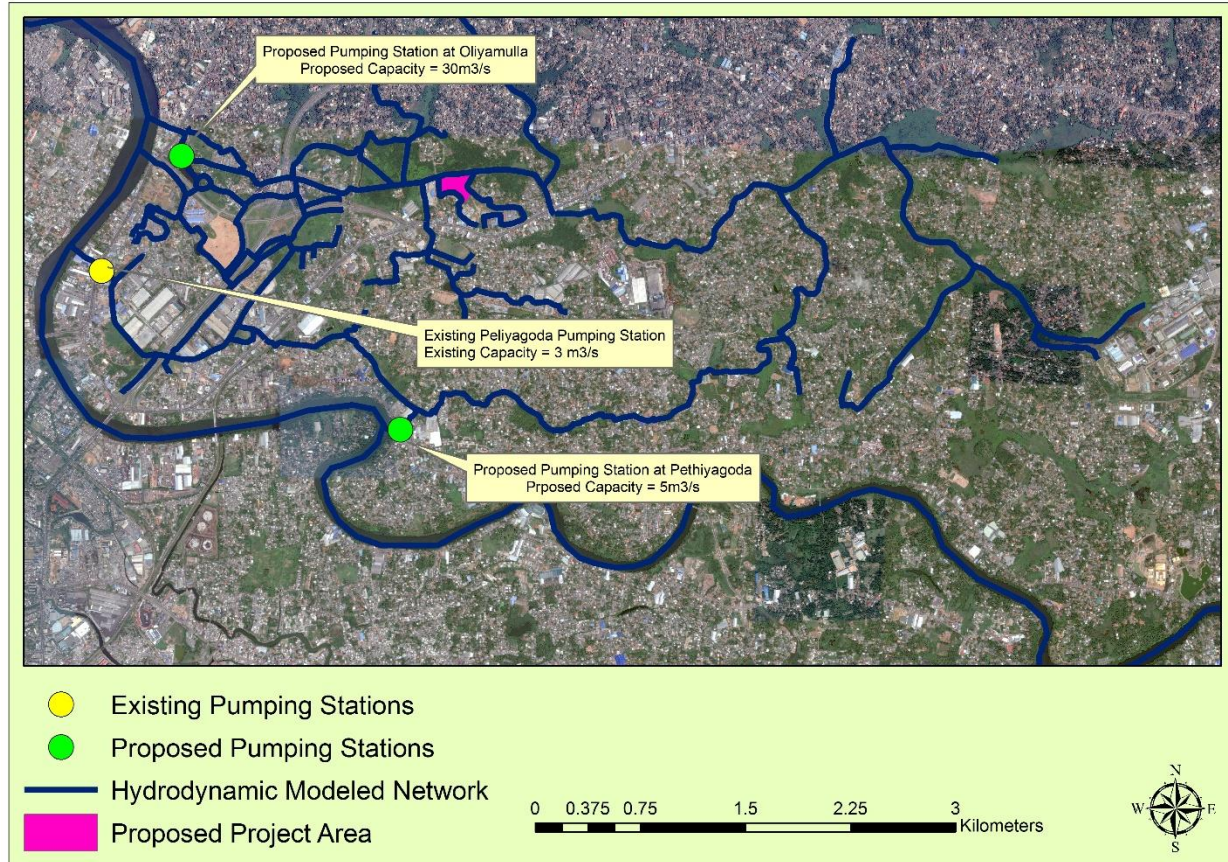


Figure 6.17: Future proposal to reduce flooding in the Mudun ela basin

G. Recommendation

A very detailed assessment has been completed to analyze the flood situation and flood mitigation approach, as given below.

Situation as at present:

- Existing average fill level of the project area: 1.50 m MSL
- Observed recent flood level in Year 2010: 2.10 m MSL
- 25-year return period flood level for existing condition: 2.35 m MSL
- 50-year return period flood level for existing condition: 2.49 m MSL
- DPC level of an unprotected house in the vicinity: 2.04 m MSL (already flooded in 2010)
- DPC level of a protected house in the vicinity: 3.35 m MSL

Situation after implementation of Proposed Drainage Proposals:

- Expected flood level after implementation of proposed pumping station and rehabilitation of drainage system.
- Expected 25-year flood level after drainage improvement: 1.50 m MSL
- Expected 50-year flood level after drainage improvement: 1.60 m MSL
- Expected 100-year flood level after drainage improvement: 1.70 m MSL

H. Conclusion

Detailed assessment of risk has been carried out taking into consideration of the catchment characteristics, location of the project site, Topography, proposed master plan, existing drainage network, degree of flood and historic observed data. Accordingly, the Model Studies provided the following results.

1. 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.
2. From the model results, it was observed that the expected flood level after implementation of proposed pumping station and rehabilitation of drainage system are as given below:
 - Expected 25-year flood level after drainage improvement: 1.50 m MSL
 - Expected 50-year flood level after drainage improvement: 1.60 m MSL
 - Expected 100-year flood level after drainage improvement: 1.70 m MSL

This shows that 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.

It is to be mentioned that the required level of the reclamation site depends on following factors.

- a. Protection level of the proposed infrastructures
 - b. Maintenance of the sewerage system during floods.
 - c. Surface drainage system within the project area for future development
3. From the photos taken in the vicinity of the site and also due to reasons given below it is not possible to have much confidence that maintenance aspect of the drainage system would function satisfactorily.
 - a. Main canal system with pumping station is being maintained by SLLR&DC.
 - b. Regular maintenance of the downstream main peripheral drain and culvert across the Colombo – Katunayake expressway are being maintained by Road Development Authority.
 - c. Local drainage is being maintained by the Peliyagoda Urban council.

Taking into consideration the above facts it can be concluded that there is no risk of flooding during extreme (25 year and 50-year floods) on the project site which are 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 buildings should be 0.50 m above the recommended fill level.

DPC level of the proposed building should be 3.25 m MSL.

PLEASE NOTE

On **23rd of May 2018: PIU members UOK** has met with the chariman SLLRDC and request his assistance in developing access road, canal system and to assign an official from SLLRDC to advise on the flood mitigation detailed engineering designs. Details of the meeting is enclosed in section 9.3 bullet number 241 of the main IEE report. Subsequent to the a request letter that was sent is included in Annex 14.

Subsequently there was another meeting on the 24th of May 2018 with the design consultants. At this meeting at the ADB office in Sri Lanka. UOK was advised by the participation of design review consultants, SLLRDC, State Engineering Corporation. I was pointed out by SLLRDC that filling the project site by another 1.25 m would be counterproductive and not practical. SLLRD suggested not to fill under the current condition but to construct on pillars and facilitate the drainage on the site by filling another 0.3 - 0.5 m to create necessary slopes and construction of storm water drains strategically to drain the excess water to the adjoining canals. All the consultants were in agreement that this mechanism would mitigate the flood related impact on the project.



**Existing View of the Downstream of the Pipe Culvert Across the Main canal
(Opening is not adequate) - 30 m span bridge**



Existing View of the Downstream Main Canal



**Existing View of the Upstream of the Pipe Culvert Across the Main canal
(Opening is not adequate) - Minimum requirement is 30 m span bridge**



**Existing View of the Proposed Project Area (1.0 m above the normal water level)
Existing average fill level is 1.50 m MSL**



Existing View of the Downstream Garbage Dumping Project



Existing View of the Retention area located by the side of the Project



Existing View of the protected houses Adjoining to the Project - DPC level of the house is 3.35 m MSL

ANNEX 8: TERMS OF REFERENCE FOR BIO DIVERSITY ASSESSMENT IN UNIVERSITY OF KELANIYA

1. Introduction

The biodiversity study for the faculty of Technology in university of Kelaniya was carried in february, 2018. The RAP biodiversity survey reported here was undertaken as part of a long-term commitment by Asian Development Bank (ADB) to assist with the establishment of a FT for University of Kelaniya under the Science and Technology and Human Resource Development Project (STHRDP). TMS would play a lead role in developing the project related IEE. The project location and the surrounding land scape is on wetland even terrain (see [Map](#)).

Rapid biodiversity assessment is required as a component of the initial environmental assessment as the wetlandt is likely to be affected by the project. Project activities which have a potentially adverse impacts on biodiversity include: loss of habitat, fragmentation, and isolation through changes to land use or land cover, and land disturbance, introduction of invasive species etc.

2 Scope of the study

The objectives of biodiversity assessment are to:

- (i) Identify and quantify the potential project impacts;
- (ii) Design measures to avoid, minimize, or mitigate potentially adverse impacts and, as a last resort, propose compensatory measures to achieve no net loss, or preferably a net gain, of biodiversity; and
- (iii) Identify the project's likely residual impacts. The principle of no net loss of biodiversity involves achieving measurable conservation outcomes that can reasonably be expected to result in no net loss of biodiversity
- (iv) The proposed study needs to be carried out to identify and quantify existing biodiversity status, to assess potential biodiversity loss and design an offset recommendation, in a project with likely significant residual adverse impacts on biodiversity.

3 List of content and the information in the report

During this assessment following elements need to be recorded and analyzed: Other requirement to be full filled by the consultants engaged in the Rapid Biodiversity Assessment for UOK is listed below

1. The GPS co-ordinates and altitude were recorded for each of the sample plots. Summarize the GPS coordinates for the sample plots
2. Include plates on the sample plots
3. The project's proximity to areas containing important biodiversity. Examples of red flags that indicate potential major biodiversity issues are: project sites within, partly within, adjoining
4. The data collected on the number of individuals present for each species, for both flora and fauna, should be subjected to further analysis
5. Estimated values of Shannon's diversity and the Simpson index for flora and fauna need to be found for the study plot if possible.
6. In all the tables that you have provided for the flora and the fauna please indicate the importance according to IUCN categorization

7. Consulting with DWCL and local communities is important at this stage to help identify key biodiversity impacts, including those linked to social issues and local livelihoods
8. Include plates on the threatened and engendered spies of flora and fauna at the study site
9. Please fill out the information for the floral species according to the following table

SI No	Scientific Name	Common Name	IUCN category
Avi fauna			
1			
2			
Butterflies			
3			
Mollusacans			
4			
Freshwater Fish			
5			
Amphibians			
Reptiles			
Birds			
Mammals			

10. Please follow the outline should be present in the RBA

Content	Sub topics
1. Introduction <ul style="list-style-type: none"> • Objective and scope • Environmental condition surrounding the project • Community dependence and interlinkages of wetland ecosystem services • Extend and scope of clearing • Methodology of sampling • Impact on the biodiversity as result of project activities • Conclusion • Recommendation to improve the habitat 	Background
	Include the objective and the scope of the study (given in the TOR)
	Existing site condition
	Site location and geological features
	Assessment of fauna eg: bird, mammals, butterflies, dragonflies, fish and reptiles
	Assessment of flora and fauna classification in respect to Sri Lankan red list
	Interaction of stakeholders with the wetland patch
Proposed development projects	
Provide details on the extent of land that will be cleared,	

	the number of tress approximately removed Recommended spices list for habitat enrichment
--	---

11. Mammals need to be studied during the day and once during the night. All faunal sampling will have to be repeated about 2 weeks later. Scoping demine the project's proximity to areas containing important biodiversity.
12. Scoping session with the government officials, conservation organizations and local communities is important at this stage to help identify key biodiversity impacts, including those linked to social issues and local livelihoods.
13. Impact analysis should determine their nature, scale, reversibility, magnitude, likelihood, extent and effect. Determine the significance of impacts involves considering: the importance of resources at local level; whether the area is subject to formal or informal protection; the ecological values of potentially affected species and habitats and the value of the ecosystems as resource of food or livelihood for local communities.
14. Habitat adjoining the project site may have to be surveyed to determine the connectivity with habitat on the project site and to assess the likely edge effect of the project on this adjoining area. Make an assessment on this and please provide a justification. Also propose mitigation to compensate the loss of the biodiversity. (mitigate potentially adverse impacts and, as a last resort, propose compensatory measures to achieve no net loss, or preferably a net gain, of biodiversity)

1.2 Methodology of Sampling

15. Micro habitat types existing within the alternate study site will be identified by an initial field visit. Sampling priorities, sampling transects, sampling methods and sampling intensities will be determined according to these micro habitat types and their extent of occurrence. A literature survey will be done to check whether there are any probable threated or range restricted species found in the area to pay special attention on them during the field studies. Detailed field studies will be carried out by an ecological team according to the methodologies suitable for each taxonomic group. These field surveys cover both terrestrial and aquatic flora and fauna. Studies will be carried out during the whole day time, with special attention on relevant taxa in relevant time periods. Indirect observations will be recorded for nocturnal taxa, especially for mammals. During the field surveys, both the native and naturalized exotic species will be recorded.
16. All vertebrate fauna as well as some indicator invertebrates such as butterflies and dragonflies will be studied (Since this is a water logging habitat, dragonfly diversity indicates the quality of the habitat). Flora studies will be conducted for all the families of flowering plants (Angiosperms) while primitive plants were not considered. Sampling methods used for each group are presented follow.

1.1.2 Fauna sampling methodology

17. Line transects survey, variable circular plots survey and opportunistic observations will be used to determine the status of terrestrial fauna. Field surveys will be carried out for two different days for all the taxa, to increase the possibility to find more species. This field survey is scheduled to conduct during the migratory seasons of birds, hence the migratory inhabitants will be recorded. Two types of hand nets will be used to capture and identify fish species and nymphs of dragonflies, while gill nets are not required since there are no

any deep-water pools. Visual observation through the water surface also used to identify fish species as well as other aquatic fauna. Villagers will be interviewed for the fish that are used by them as a food, which are being captured from the local water bodies.

Techniques used for each taxonomic group are listed in the following table.

Group	Technique
Birds	Variable circular plots in selected locations in different times of the day with more attention on early morning and late evening Selected line transects observations (both direct observations and indirect observations such as calls, feathers, nests will be used for identification)
Mammals	Opportunistic observations along the study transects (both direct and indirect observations such as calls, scar, foot prints will be used for identification) <ul style="list-style-type: none"> traps will not be used for identification of small mammals
Reptiles	Opportunistic observations (direct observations only) plot clearing (during day time)
Amphibians	Opportunistic observations with special attention in wet places such as stream banks, water holes, under growths
Fish	Hand netting (2 types) in selected locations Opportunistic observations by surface viewing
Butterflies	Line transects and opportunistic observations (both adult stage and larval stage will be identified)
Dragonflies	Opportunistic observation (only the adult stage) with special attention at water bodies. Hand netting (for early stages)

18. Observed species will be identified using most recent field guides which are given follow.

- Birds – Kotagama & Rathnaweera (2010), Warakagoda *et. al.* (2012)
- Mammals – Phillips (1935), Yapa & Rathnaweera (2013)
- Reptiles – Das & de Silva (2005), Somaweera (2006), Somaweera & Somaweera (2009)
- Amphibians – Manamendra-Arachchi & Pethiyagoda (2006)
- Fish – de Silva *et. al.* (2015), Goonathilake (2007)
- Butterflies – d’Abrera (1998), Jayasinghe (2015), Jayasinghe *et. al.* (2012)
- Dragonflies – Bedjanic *et. al.* (2007), Bedjanic *et. al.* (2014), Sumanapala (2017)

1.1.3 Flora sampling methodology

19. Plots of 100 m x 10 m will be selected within the study site to conduct the terrestrial flora survey. Apart from that, surveys will be carried out into more expanded sections, if a special micro habitat or a different type of micro habitat is found. Floating and emerged aquatic plants will be identified by direct visual observations. Plants that are unable to identify in the field will be photographed in a detailed manner by a DSLR camera fitted to a macro lens, and later identify them by referring guide books and comparing them with herbarium sheets which are available online and deposited at national herbarium, Peradeniya. Vlas & Vlas (2014), Vlas & Vlas (2008), Dassanayake & Fosberg (1980 – 1991), Dassanayake, Fosberg & Clayton (1994 – 1995), Dassanayake & Clayton (1996 – 2000) and Dassanayake, Clayton & Shaffer-Fehre (2006) will be used for identification of species.

20. Nomenclature for both flora and fauna that will be using in this document is mainly in accordance with the National Red Data List 2012 of Sri Lanka. Conservation status of the Flora and Fauna (MoE, 2012) unless they are updated by above given publications, recent research papers and the plant list - Angiosperms Phylogeny Group ver. III (2015). Conservation status that will be using in this document is in accordance with the aforementioned National Red Data List.

ANNEX 9: BIO DIVERSITY ASSESSMENT

**REPORT ON THE PRESENT ECOLOGICAL STATUS OF THE PROPOSED TECHNOLOGY
FACULTY BUILDING SITE OF UNIVERSITY OF KELANIYA AND ITS SURROUNDING
WETLAND HABITAT**

March 2018

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Contents

1. Introduction
2. Methodology
 - 2a. Study Area
 - 2b. Period of field survey, sampling frequency and time
 - 2c. Sampling methods
3. Study findings
 - 3a. Habitats
 - 3b. species
4. Conclusions & recommendations
5. References
6. Annex 1: Species List
7. Figures

2. Methodology

2a. Study Area: The study area is a flat marshy land located in the low country wet zone. It belongs to the WL3 agro ecological zone and floristic region 1 (coastal and marine belt). The area receives an annual average rainfall of 2000-2500mm and an average annual temperature is around 27°C. Elevation in the study site is less than 10 m above mean sea level.

2b. Period of field survey, sampling frequency and time: The survey was carried out in January and February, 2018. Initially, the whole study site was rapidly surveyed to identify different micro habitat types available as well as to identify accessible routes to the study area. 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. Mostly transects were along the canal embankments, roads and along other higher ground since it was difficult to walk on muddy reed beds and to cross the canals with polluted water. Circular point transects were used to observe birds in certain locations. Fishes were sampled only at accessible locations to canals where less-slopy embankments are available. All the sampled sites were accessed by foot but no boats were used. The field survey team comprised of five persons with expertise on flowering plants, terrestrial fauna and ichthyofauna. The same sampling points and transects were used for the flowering plants and terrestrial fauna while different sampling points were selected to sample the fish. Faunal sampling was repeated twice in two months in the same plots & transects. The surveyed time period was well within the migratory bird season and was good for seasonal faunal groups such as dragonflies and butterflies since it had rains in December. Floral sampling was done only once since there is no any considerable changes within two months in the vegetation. The study site is shown in map 1.



Map 1: The location map of study area.

Boundary of the study site is marked in red.

Boundary of the proposed developing site is marked in yellow.

Sampling points of fishes are marked in blue.

Boundary of the adjacent garbage dump is marked in rose.

All vertebrate fauna as well as some indicator groups of invertebrates such as butterflies, dragonflies and mollusacans were studied. Floral study focused on all the families of flowering plants (Angiosperms) while non- flowering plants were not considered. Sampling method used for each group is as follows.

2c. Sampling methods:

Fauna: Line transects survey, variable circular plots survey and opportunistic observations were used to determine the status of terrestrial fauna. Either direct or indirect evidence were used to record the existence of the species. An 8 x 42 binocular was used to aid in the sampling of birds, butterflies and dragonflies. Fish and dragonfly larvae samples were collected in selected locations covering major aquatic habitats (Map 1) using long stalked hand nets (10 random casts/site) and hand traps. Further information was collected from neighbouring community on the local names of fish found in the canals.

Flora: Plots of 10 m width and variable lengths were selected within line transects marked along accessible routes to conduct the terrestrial flora survey. At places where the walking is restricted, circular plots were used. Floating and emergent aquatic plants were identified by direct visual observations. Submerged plants were identified by observing through water surface, when the water is clear enough to see the bottom. Plants that could not be identified in the field were photographed in detail using a DSLR camera fitted with a macro lens, and later identified using literature.

Techniques used for each taxonomic group are listed in the following table.

Taxonomic Group	Technique
Birds	Variable circular plots in selected locations in different times of the day, Line transect observations at accessible routes (both direct observations and indirect observations such as calls, feathers were used for identification)
Mammals	Opportunistic observations in the study area (both direct and indirect observations such as scat and foot prints were used for identification) Traps were not used for the study of small mammals due to limited time available
Reptiles	Opportunistic observations (direct observations only), plot clearing in selected locations
Amphibians	Opportunistic observations with special attention in wet places such as canals, ponds and undergrowth. Log turning was also done in terrestrial habitats.
Fish	Hand nets (10 random casts/site), hand traps in selected locations, Opportunistic observations by surface viewing.
Butterflies	Line transects and opportunistic observations (both adult stage and larval stage were identified)
Dragonflies	Opportunistic observation (both adult stage and larval stage were identified) with special attention at water bodies.

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

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

Sampling locations of the terrestrial flora & fauna

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

Observed species were identified using most recent field guide books which are given follow.

Flora: Vlas & Vlas (2014), Vlas & Vlas (2008), Dassanayake & Fosberg (1980 – 1991), Dassanayake, Fosberg & Clayton (1994 – 1995), Dassanayake & Clayton (1996 – 2000) and Dassanayake, Clayton & Shaffer-Fehre (2006)

Birds: Kotagama & Ratnavira (2017), Warakagoda *et. al.* (2012), Harrison (2011)

Mammals: Phillips (1935), Yapa & Rathnaweera (2013), Kotagama and Goonatilake (2013)

Reptiles: Somaweera (2006), Somaweera & Somaweera (2009)

Amphibians: Manamendra-Arachchi & Pethiyagoda (2006)

Fish: de Silva *et. al.* (2015), Goonathilake (2007)

Butterflies: Jayasinghe (2015), Jayasinghe *et. al.* (2016)

Dragonflies: Bedjanič *et. al.* (2007), Bedjanič *et. al.* (2014), Sumanapala (2017)

Nomenclature for fauna used in this document are mainly in accordance with the National Red list 2012 of Sri Lanka, with some minor changes according to recent scientific updates. The plant list is according to the - Angiosperms Phylogeny Group ver. III (2015). Conservation status of the Flora and Fauna are also according to the National Red list 2012 (MoE, 2012). Note that the conservation status was not provided for the introduced fish, introduced plants and migratory birds as introduced species and migratory species was not assessed during the national redlisting process.

3. Study Findings

3a. Habitats

The study area belongs to the Chilaw to Hikkaduwa bio-region (region 12) where coastal marshes and lagoons, pocketed mangrove habitats, sandstone rocky habitats and sandstone reefs are the main ecosystem types. Further, the study area belongs to the floristic region 1 (the coastal and marine belt) and agro ecological region WL3 that receives the lowest rainfall in the western province with a relatively dry period from January to mid March. The study site is managed by Sri Lanka Land Reclamation and Development Co-orporation and is maintained largely as a wetland which gather local flood of the high ground where settlements are abundant. Water of this wetland drains in to the Kelani River which is at about 2 km in direct distance to the wetland. Further about in two more kilometers, Kelani river drains in to the sea. Although the canals of the study area are large enough to capture the local flood, drainages are poor due to the bottle necks in the downstream parts of the canal. This reason increases the pollutant contamination in the water. Since the wetland is surrounded by urbanized areas, impact of anthropogenic activities are evident. At the moment following micro habitats can be found within the study area with ecotones.

1. Reed & grass dominated vegetation
2. Annona woodland
3. Disturbed scrubland
4. Land filled habitat
5. Aquatic habitats

Overview of the habitats

Reed and grass dominated vegetation

About 20% of the study area falls within this category and it is more evident towards the western side of the site. Dominant large sedge species of this vegetation are *Actinoscirpus grossus* and *Rhynchospora corymbosa*. Among these sedges some grasses and ferns are distributed. It is apperant that *Annona glabra* is gradually invading this micro habitat. This area has a deep sinking mud layer and therefore can retain lot of water even during the dry spells. However, a considerable amount of water drains into the main canals at present as they have been deepened and widened recently. Reed associated birds and some water birds are found in this habitat. This habitat provides a good micro habitat for male dragonflies by providing perching places and for otters by providng hiding habitat.

Annona woodland

Woodland consisting of *Annona glabra* covers about 50% of the study area. More than 90% of the vegetation in this habitat was made out of this invasive plant species. It grows densely so that it covers the canopy completely and prevents any sunlight penetrating in to the ground. This creates a highly shaded condition and very few plants can grow in the ground layer other than some fern species and lianas, which are usually species that grow in shaded forest conditions. Ground of this *Annona* woodland also consist of mud and its boundary is clearly demarcated when the mud meets laterite soil at the high ground. Although this type of *Annona* woodlands is being used as breeding colonies by water birds in some of the wetlands found in the Colombo district, breeding bird colonies were not observed among *Annona* woodlands in the study area. However, it should be noted that the study period does not fall within the general breeding period of birds which could also be a reason for this observation. It appears that this is a suitable hiding habitat for fishing cat, since pug marks of this species was regularly found on mud.

Disturbed Scrubland

About 5% of the total study area is subjected to illegal garbage dumping. This area is mainly consisting of sparse vegetation of exotic weeds and shrubs. This micro habitat is in a slightly higher elevation than the previous two vegetation types. Butterflies are quite common in this habitat since it provides open sunny condition as well as flowering plants for nectar and egg laying.

Land filled habitat

This is the area where the development is proposed and it is already filled up by laterite soil. The invasive grass species, *Panicum maximum* is growing in this habitat at an exponential rate. Other herbaceous weeds are growing in the places where the grass is still not invaded. No any tree cover is found in this habitat. A large group of Egrets, Black Headed Ibis and Painted Storks were observed feeding busily on fish in a water hole in this filled area. This water hole is not connected to any canal and it is evident that the land has been flooded at some time which permits the fishes to breed there.

Aquatic habitats

About 5% of the study area covers surface water bodies, which are mainly canals with stagnated water, since the flow rate is very low. Water quality of the canals looks not good since they had black colored water. Small canal along the eastern boundary of the proposed building site looks to have fairly unpolluted water, but it had more turbidity. Surface of many of the main canals are covered with invasive plant species *Eichhornia crassipes*, while its eastern end mostly had a free surface due to manual removal of the plant. Two *Nymphaea* species were found only at the western section of the canal, which seems to be planted. Only few dragonfly species and fish species found in the habitat.

3b. Species

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 & Malvaceae (08 species each). 26 families were represented by only a single species (Table 1). The detailed list of plant species observed in the study site is given in Annex 1 Table 1.

Table 1. Plant families that make up the vegetation observed in different micro ecosystems and number of species belonging to each family.

Family	No. of species	Family	No. of species
Fabaceae	19	Annonaceae	1
Convolvulaceae	8	Boraginaceae	1
Malvaceae	8	Combretaceae	1
Compositae	7	Hydrocharitaceae	1
Euphorbiaceae	7	Linderniaceae	1
Rubiaceae	7	Loganiaceae	1
Cyperaceae	6	Loranthaceae	1
Amaranthaceae	5	Lythraceae	1
Araceae	4	Melastomataceae	1
Poaceae	4	Menispermaceae	1
Verbenaceae	4	Molluginaceae	1
Moraceae	3	Muntingiaceae	1
Phyllanthaceae	3	Myristicaceae	1

Acanthaceae	2	Myrtaceae	1
Apocynaceae	2	Nyctaginaceae	1
Arecaceae	2	Pandanaceae	1
Cleomaceae	2	Plantaginaceae	1
Commelinaceae	2	Polygonaceae	1
Cucurbitaceae	2	Pontederiaceae	1
Lamiaceae	2	Rhizophoraceae	1
Nymphaeaceae	2	Sapindaceae	1
Onagraceae	2	Sapotaceae	1
Solanaceae	2	Symplocaceae	1
Alismataceae	1	Typhaceae	1
Anacardiaceae	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. No any endemic plant species were 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 4 species as 'Near threatened' in National Red Data List, 2012. Three species which belong to 'threatened' categories were recorded in the study site (Table 2).

Table 2. The threatened species recorded in the study site

Family	Species	Sinhala name	NCS	DS
Cucurbitaceae	<i>Gymnopetalum scabrum</i>		VU	Native
Cyperaceae	<i>Lepironia articulata</i>	weg mka	VU	Native
Rubiaceae	<i>Exallage auricularia</i>	.eg fld<	VU	Native

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

Although the typical habitat of *Gymnopetalum scabrum* is found in low country dry zone (Dassanayake, 1997), a densely grown mat of this liana was found here on a waste land, which is completely open for the direct sunlight. This area was highly disturbed due to unauthorized garbage dumping. Such growths of this species were also observed at a wetland near Rajagiriya and Muthurajawela recently. *Lepironia articulata* prefers saline swamps and back marshes along the coast and Muthurajawela is one of the few known localities for this species (Dassanayake, 1985). Due to its low elevation, occasional saline water intrusions to this area in severe drought periods makes a good habitat for the species. This species was found commonly in open marshy area of the study site and many dragonflies were observed occupying these plants as their perching places within their territory. *Exallage auricularia* is an herbaceous species that restricts its distribution to lower and lower montane wet zone of Sri Lanka (Dassanayake, 1998) which prefers shady and fairly wet conditions. It is commonly used as a green leaf vegetable by local people. This species was quite commonly found at the eastern border of the study site adjacent to home gardens.

Three species of aquatic plants were found in the canals. *Nymphaea pubescence* and recently confirmed *Nymphaea rubra* were growing together in a restricted area where the water quality looks to be good. The submerged aquatic species *Hydrilla verticillata* was abundantly found irrespective of the water quality. Apart from these aquatic species, there were several water-associated species in canal embankments i.e. *Commelina* spp., *Lindernia* spp. Western part of

the mud land covered with many sedges together with some ferns. Although this site is situated in close proximity to the sea, no any mangrove species were recorded.

High percentage of exotics in species composition (36.65 %) reveals that this site has undergone through lot of anthropogenic activities. This study site is already heavily invaded by many alien invasive species. During the study, 8 out of the 33-plant species listed as invasive alien species and 4 out of the 15 species listed as potentially invasive alien species were recorded within the study site (Table 3).

Table 3. Invasive alien species and potentially invasive alien species recorded in the study site.

Scientific Name	Common Name
Alien invasive species	
<i>Alstonia macrophylla</i>	භවරි නූග, යකඩමරන්, අට්ටෝනියා, ගිනිකූරු ගස්
<i>Typha angustifolia</i>	භම්බු පන්
<i>Annona glabra</i>	වෙල් අනෝදා, වෙල් ආන්තා
<i>Eichhornia crassipes</i>	ජපන් ජබර
<i>Mikania cordata</i>	.i mdz
<i>Lantana camara</i>	ගඳපාන, කටු හිඟුරු, රට හිඟුරු
<i>Pennisetum polystachion</i>	රිලා වල්ග
<i>Panicum maximum</i>	ගිණි තණ, රට තණ, ගිනිකීරැස්ස
Potential alien invasive species	
<i>Ludwigia peruviana</i>	බෙරු දියනිල්ල, වෙල් කරාබු
<i>Mimosa diplotricha</i>	je,a ksosl=iñd
<i>Muntingia calabura</i>	ජෑම්
<i>Acacia auriculiformis</i>	

Most abundant invasive species were *Annona glabra* and *Eichhornia crassipes*. Eastern side of the study area is completely covered with *Annona glabra* making no room for sedges and grasses which are the typical species of this kind of mud land. This species has completely altered the open grassland habitat in to a forested habitat. Its canopy refrains the sunlight coming down to the bottom which restricts the growth of native species. It has been observed that soil is heaping as mud mounds at the bases of *Annona* trees, making the inundating low ground in to a highland. Thousands of seedlings are coming up on these mounds. Many ripe fruits eaten by animals were found on the ground. However, the animals that feed on the fruits could not be ascertained. People working at the site claim that the fruits are eaten mainly by the terrapins that inhabit the canals.

Western side of the study area has only few of these trees, but there is a great potential to change the habitat type completely, if precautions are not get.

Eichhornia crassipes is widely spread in all the canals within the study site except for the sub canal along the eastern border. This canal has less polluted water. It was observed that SLLR&DC has recently removed the plants from some canals and put them on the embankments. But there is a potential for re-infesting since all the other adjacent canals consist of this species. This species a major problem in water logging in canals at Colombo as well as it changes the habitat

conditions of the water surface as well as canal bottom. Sunlight intrusion to the bottom is highly affected by *Eichhornia*, which eventually destroy the submerged aquatic plants. Lack of the submerged plants results in reduction of dissolved oxygen. Once a group of Murrells were observed breathing air bubbles through an opening on water surface surrounded by *E. crassipes*, probably due to low oxygen content in water.

Panicum maximum is coming up in the proposed building site, which is a filled wetland. Other species are found in low densities.

Fauna

The recorded fauna species of the study area comprised of 119 vertebrates and 60 invertebrate species (Table 4). Avifauna is the most diverse taxa observed with 67 species while butterflies are the second diverse group with 33 species. The detailed list of animal species observed in the study site is given in Annex 1, Tables 2-8.

Table 4. Summary of the Faunal Species Recorded During the Study.

Taxa	Species	Endemic s	Exotic ¹	Threatened			Total	NT
				CR	EN	VU		
Dragonflies	21	0	0	0	0	1	1	4
Butterflies	33	0	0	0	0	1	1	1
Molluscans	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

Most of the recorded species are common and widespread species with low conservation status. Only five species recorded are listed as threatened species in the 2012 National Red List of Sri Lanka. Two mammal species recorded were in the 'endangered' category. A troop of endemic species, Sri Lanka Purple-faced langur inhabits home gardens adjacent to study site where they reach the site at its boundaries when tall trees are available. They are not visiting the *Annona* forest, since its canopy is not high enough for these strictly arboreal species. This troop represent the western sub species. Fishing cat is the other species that is categorized in 'endangered' category. Although it is wide spread species in Sri Lanka, number of individuals are quite rare since it requires specific micro habitat as well as due to a carnivorous species who is at the top level of the food chain. Fishing cat is a nocturnal species searches for fish, which is its main food source. During the day time it requires a hiding place to sleep, where the *Annona* woodland in the study site provides a reasonable habitat. Otter is another mammal frequents in aquatic habitat, which need attention of conservation. Its food source and habitat requirements are same as the fishing cat and it is used to be only nocturnal in urban areas. Resident population of Blue-tailed Bee-eater – *Merops philippinus* is considered as a threatened species in the previous evaluation, however the population found in the study area is purely a migratory group. Migratory population is very common and not recognized as a threatened species.

Marsh Dancer - *Onychargia atrocyana* and Blue Glassy Tiger - *Ideopsis similis* are the two-invertebrate species in the study site which fall within threatened categories. The damselfly, Marsh dance prefers the shady habitats adjacent to open marshes. This micro habitat conditions are provided by the *Annona* woodland in eastern part of the study site. The butterfly Blue Glassy Tiger has a unique distribution mainly in the western coastal areas of the country. Although *Tylophora tenassima* - its larval food plant in these coastal marshes was not recorded during the survey, there is a possibility to exist the plant in adjacent areas.

Only 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 Common Lankaskink (*Lankascincus fallax*) and Sri Lanka Checkered Keelback (*Xenochrophis asperrimus*), one amphibian Common shrub frog (*Pseudophilautus popularis*) and one molluscan, *Acavus phoenix*. Out of these only the Purple-faced langur is recognized as a species with the risk of extinction at the national level while other four are widespread endemics.

Out of the 67 species of avifauna recorded 07 are migratory and arrive in Sri Lanka only during the North-South migratory period. None of these species are recognized as globally threatened migratory species thus they have a low conservation priority. However, the habitats in the area are important for many migrants that use the site as a feeding ground as well as a stopover site during their annual migration.

Only few fresh water fish species which can survive in hardy conditions were found in the canals due to its polluted water. Among the recorded species, four of them are exotics. Most common species in the canal was Sucker Mouth Catfish (*Pterygoplichthys multiradiatus*) which is followed by Nile Tilapia (*Oreochromis niloticus*) and Guppy (*Poecilia reticulata*) respectively. Out of these, Sucker Mouth Catfish is considered as a alien invasive species and the latter two as potential alien invasive species. These species are defenetely make a huge impact on remainig native fish species. Asian Groundling (*Brachythemis contaminata*) was the most abundant dragonfly species, which can survive in the contaminated water. All the vegetation in canal embankments were removed for free flow of water, an activity that destroy the breeding and hiding habitats of native fishes.

4 Conclusions and Recommendations

Based on the findings of the 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 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. Since the area of this wetland is very small, it is hard to sustain the eco system against the environmental pressure comes from the surrounding. Therefore, it is prudent to develop and maintain the selected site making minimum effect to the existing wetland.

Based on the findings of this study the following recommendations can be made.

1. Several species of invasive alien plants and animals have become established in terrestrial, semi-terrestrial and aquatic habitats. Spread of invasive species leads to reduction in species richness as well as endemic and threatened species due to deterioration of habitats. Therefore, invasive alien species that are detrimental to the ecosystem should be removed completely. Outright removal may not be an option in the

case of some of the species as they are providing necessary ecosystem functions. Thus, selective replacement of such exotic and alien invasive species with native species should be done.

- Native plant species are recommended for the garden of the proposed site. Following are some of the species that can be planted.

Family	Species	Sinhala name	Habit
Sapotaceae	<i>Mimusops elengi</i>	uQKu,	Tree
Calophyllaceae	<i>Calophyllum bracteatum</i>	j,q lSk	Tree
Myrtaceae	<i>Syzygium caryophyllatum</i>	ox	Shrub
Melastomataceae	<i>Melastoma malabathricum</i>	uy fndaúáhd	Shrub
Phyllanthaceae	<i>Glochidion zeylanicum</i>	yqKqIsrs,a,	Shrub
Phyllanthaceae	<i>Margaritaria cyanosperma</i>	lrö	Tree
Phyllanthaceae	<i>Bridelia moonii</i>	m;a lE,	Tree
Apocynaceae	<i>Wrightia antidysenterica</i>	boao	Shrub
Bignoniaceae	<i>Stereospermum tetragonum</i>	ÿKq u@,	Tree
Calophyllaceae	<i>Calophyllum inophyllum</i>	fodU	Tree
Combretaceae	<i>Terminalia bellirica</i>	nq^	Tree
Dilleniaceae	<i>Dillenia retusa</i>	f.dvmr	Tree
Elaeocarpaceae	<i>Elaeocarpus serratus</i>	fjr^	Tree
Euphorbiaceae	<i>Mallotus tetracoccus</i>	nQ lekao	Tree
Lamiaceae	<i>Clerodendrum infortunatum</i>	mskak	Shrub
Lauraceae	<i>Cinnamomum verum</i>	l=re÷	Tree
Lauraceae	<i>Litsea longifolia</i>	r;a lE,sh	Tree
Lecythidaceae	<i>Barringtonia racemosa</i>	osh ñfo,a,	Tree
Fabaceae	<i>Erythrina fusca</i>	hla trny	Tree
Lythraceae	<i>Lagerstroemia speciosa</i>	uqre;	Tree

- Natural vegetation and natural slope in canal embankments should be maintained within the canal reservation. Concrete walls or Gabion walls not recommended.
- 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.
- Wast water should not be released to the wetland without doing necessary treatments. Proper solid waste disposal method should be conducted ensuring the quality of the wetland.
- Large garbage dump adjacent to the developing site might cause health problems in students. It is recommended to take necessary actions on this matter.
- Illegal garbage dumping & firing including asbestos dust is going on in the wetland patch of study area. This is a great threat to neighboring houses at the moment and it will be a health issue to students of the new faculty building. It is recommended to take necessary actions on this matter together with SLLR&DC.
- Chemicals should not be released in to the water both during construction and operational stage of any activities that are carried out in the developing site. It is recommended to do a

flood risk assessment before proceeding in to the planning the building and priority should be taken to refrain from keeping the hazardous materials and chemicals that can be spread during a flood.

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Annex 1

Table 1. Detailed list of flowering plants observed at the study site

Abbreviations used: **DS** - Distribution Status; **NCS** - National Conservation Status_Red List 2012; **DD** - Data Deficient; **EN** - Endangered; **IAS** - Invasive Alien Species; **LC** - Least Concern; **NE** - Not Evaluated; **NT** - Near Threatened; **VU** - Vulnerable.

No.	Family	Species	Sinhala name	NCS	DS
1	Acanthaceae	<i>Asystasia gangetica</i>	mqrēla" rs,d mqrēla	LC	Native
2	Acanthaceae	<i>Hygrophila ringens</i>	ks,a mqrēla	LC	Native
3	Alismataceae	<i>Limnocharis flava</i>	osh f.dajd	NE	Exotic
4	Amaranthaceae	<i>Achyranthes aspera</i>	lr,a yen" .ia lr,a yen" lr,aiefnda	LC	Native
5	Amaranthaceae	<i>Aerva lanata</i>	fmd,al=vq m<d" fmd,a m<d	LC	Native
6	Amaranthaceae	<i>Alternanthera sessilis</i>	uql=Kqjekak" ó lka m,d	LC	Native
7	Amaranthaceae	<i>Amaranthus viridis</i>	l+r ;im,d" iqyl+r	LC	Native
8	Amaranthaceae	<i>Celosia argentea</i>	lsβ yekao" ly l=l=Æ lru,a" iqy je,sjekak	LC	Native
9	Anacardiaceae	<i>Lannea coromandelica</i>	ysla	LC	Native
10	Annonaceae	<i>Annona glabra</i>	fj,a wfkdaod" fj,a w;a;d	NE	Exotic
11	Apocynaceae	<i>Alstonia macrophylla</i>	yjrs kq." hlvrka" wÜfgdakshd" .sksl+re .ia	NE	Exotic
12	Apocynaceae	<i>Alstonia scholaris</i>	rela w;a;k" we;a uv" .ia rela w;a;k	LC	Native
13	Araceae	<i>Colocasia esculenta</i>	.y," foais w," lsβ w," we;a fyā," .reā" ynr," lÆ flā," fifj,a w,	LC	Native
14	Araceae	<i>Lasia spinosa</i>	fldys," weÜs,s fldys," uy fldys," fldfydú,	LC	Native
15	Araceae	<i>Pistia stratiotes</i>	Èh mræ,a" Èh mrke,a,	LC	Native
16	Araceae	<i>Pothos scandens</i>	fmdagd je,a	LC	Native
17	Arecaceae	<i>Areca catechu</i>	mqla	NE	Exotic
18	Arecaceae	<i>Caryota urens</i>	ls;=,a	LC	Native
19	Boraginaceae	<i>Heliotropium indicum</i>	osñ ih" we;a fydĒ" we;a ieáh" we;afidĒ	LC	Native
20	Cleomaceae	<i>Cleome rutidosperma</i>		NE	Exotic
21	Cleomaceae	<i>Cleome viscosa</i>	j,a wn" rka udksiai" nQ jÆ wn	LC	Native
22	Combretaceae	<i>Terminalia catappa</i>	fldÜgind" fldÜgka	NE	Exotic
23	Commelinaceae	<i>Commelina benghalensis</i>	osh fufkarsh	LC	Native
24	Commelinaceae	<i>Commelina diffusa</i>	.srd m<d" ;K m<d	LC	Native
25	Compositae	<i>Cyanthillium cinereum</i>	uÜq,a l=Uqrejekak" fudKrl=vqiih" j;= mdç	LC	Native
26	Compositae	<i>Eclipta prostrata</i>	lSlSβç" iqy lsβç" lní" lsi,ka	LC	Native

27	Compositae	<i>Mikania cordata</i>	.i mdž" flfy,a mdž" uy lsysôh" j;= mdž" fou< je,a	NE	Exotic
28	Compositae	<i>Struchium sparganophorum</i>		NE	Exotic
29	Compositae	<i>Synedrella nodiflora</i>		NE	Exotic
30	Compositae	<i>Tridax procumbens</i>	jiq iqo	NE	Exotic
31	Compositae	<i>Xanthium strumarium</i>	j,a rUqgka" W!re fliai" wjä	LC	Native
32	Convolvulaceae	<i>Aniseia martinicensis</i>	fmd;= m<d	NE	Exotic
33	Convolvulaceae	<i>Ipomoea aquatica</i>	lxl=x	LC	Native
34	Convolvulaceae	<i>Ipomoea asarifolia</i>	ii ;Uqre" r;= ii ;Uqre	NE	Exotic
35	Convolvulaceae	<i>Ipomoea carnea</i>		NE	Exotic
36	Convolvulaceae	<i>Ipomoea nil</i>	l,jk" l,urej" ;d,s	NE	Exotic
37	Convolvulaceae	<i>Merremia emarginata</i>	fld;=re neoao	NT	Native
38	Convolvulaceae	<i>Merremia umbellata</i>	lsrs uy" uy uy	LC	Native
39	Convolvulaceae	<i>Xenostegia tridentata</i>	yjrs uy" ySka uy	LC	Native
40	Cucurbitaceae	<i>Coccinia grandis</i>	fldajlald" fli lelsß	LC	Native
41	Cucurbitaceae	<i>Gymnopetalum scabrum</i>		VU	Native
42	Cyperaceae	<i>Actinoscirpus grossus</i>		LC	Native
43	Cyperaceae	<i>Cyperus procerus</i>		LC	Native
44	Cyperaceae	<i>Cyperus sphacelatus</i>		NE	Exotic
45	Cyperaceae	<i>Lepironia articulata</i>	weg mka	VU	Native
46	Cyperaceae	<i>Rhynchospora corymbosa</i>		LC	Native
47	Cyperaceae	<i>Scleria poiformis</i>	fmd;= fld<" fmd;= mka" fmd;=	LC	Native
48	Euphorbiaceae	<i>Acalypha indica</i>	l=mamfiksh	LC	Native
49	Euphorbiaceae	<i>Croton aromaticus</i>	je,a lemafamáhd	LC	Native
50	Euphorbiaceae	<i>Croton hirtus</i>	.x fjo" j,a ;smams,s	NE	Exotic
51	Euphorbiaceae	<i>Euphorbia heterophylla</i>		NE	Exotic
52	Euphorbiaceae	<i>Macaranga peltata</i>	lekao" m;a lekao	LC	Native
53	Euphorbiaceae	<i>Microstachys chamaelea</i>	r;a msgjlald	LC	Native
54	Euphorbiaceae	<i>Ricinus communis</i>	t@re" f;,a t@re	NE	Exotic
55	Hydrocharitaceae	<i>Hydrilla verticillata</i>	y,afmkaks	LC	Native
56	Lamiaceae	<i>Hyptis suaveolens</i>	w,s ;,	NE	Exotic
57	Lamiaceae	<i>Leucas zeylanica</i>	.eg ;=U	LC	Native
58	Fabaceae	<i>Acacia auriculiformis</i>		NE	Exotic
59	Fabaceae	<i>Aeschynomene americana</i>		NE	Exotic
60	Fabaceae	<i>Albizia saman</i>	msks udr" udr" mdfr udr" meKs lr,a" jeys .ia	NE	Exotic
61	Fabaceae	<i>Alysicarpus vaginalis</i>	wiajekak" r;= wiajekak	LC	Native
62	Fabaceae	<i>Calopogonium mucunoides</i>		NE	Exotic

63	Fabaceae	<i>Centrosema pubescens</i>		NE	Exotic
64	Fabaceae	<i>Desmodium heterocarpon</i>	we;a W÷msh,sh	LC	Native
65	Fabaceae	<i>Desmodium heterophyllum</i>	uy W÷msh,sh	LC	Native
66	Fabaceae	<i>Desmodium triflorum</i>	ySka W÷msh,sh" iqÿ .egÈh	LC	Native
67	Fabaceae	<i>Macroptilium atropurpureum</i>		NE	Exotic
68	Fabaceae	<i>Macroptilium lathyroides</i>		NE	Exotic
69	Fabaceae	<i>Mimosa diplotricha</i>	je,a ksosl=ind	NE	Exotic
70	Fabaceae	<i>Mimosa pudica</i>	ksÈl=ind" oeÈkakdre" ySka ksÈl=ind	NE	Exotic
71	Fabaceae	<i>Pueraria phaseoloides</i>		NE	Exotic
72	Fabaceae	<i>Senna alata</i>	nQ f;dar" rg f;dar" we;a f;dar" r;a f;dar	NE	Exotic
73	Fabaceae	<i>Senna occidentalis</i>	meKs f;dar" ysj,a f;dar	LC	Native
74	Fabaceae	<i>Sesbania bispinosa</i>		LC	Native
75	Fabaceae	<i>Tadehagi triquetrum</i>	ndf,d,shd	LC	Native
76	Fabaceae	<i>Vigna adenantha</i>	j,a uE	NE	Exotic
77	Linderniaceae	<i>Lindernia rotundifolia</i>		LC	Native
78	Loganiaceae	<i>Mitrasacme indica</i>		NT	Native
79	Loranthaceae	<i>Dendrophthoe falcata</i>	fo~i ms<s,	LC	Native
80	Lythraceae	<i>Lawsonia inermis</i>	urf;dKaä	LC	Native
81	Malvaceae	<i>Ceiba pentandra</i>	mq¿ka bUq,a" fldÜg" fldÜg mq¿Eka	LC	Native
82	Malvaceae	<i>Hibiscus rostellatus</i>		NE	Native
83	Malvaceae	<i>Melochia corchorifolia</i>	.ia l+r" .,a l+r" uy .,a l+r	LC	Native
84	Malvaceae	<i>Microcos paniculata</i>	fldyq lsrs,a,	LC	Native
85	Malvaceae	<i>Sida rhombifolia</i>	ySka nei,	LC	Native
86	Malvaceae	<i>Urena lobata</i>	mÜg wem," wem," ySka wem," mgq wem,	LC	Native
87	Malvaceae	<i>Urena sinuata</i>	mÜg wem," ySka wem,	LC	Native
88	Malvaceae	<i>Waltheria indica</i>	mqqakslals	LC	Native
89	Melastomataceae	<i>Melastoma malabathricum</i>	fndaúáhd" lgl¿ fndaúáhd" uy fndaúáhd" lgl¿jd	LC	Native
90	Menispermaceae	<i>Tinospora sinensis</i>	nQ ls " j,a ls " ri ls	DD	Native
91	Molluginaceae	<i>Mollugo pentaphylla</i>		LC	Native
92	Moraceae	<i>Ficus amplissima</i>	t< kq.	LC	Native
93	Moraceae	<i>Ficus benghalensis</i>	uy kq.	LC	Native
94	Moraceae	<i>Ficus racemosa</i>	wÜáld" ÈUq,a	LC	Native
95	Muntingiaceae	<i>Muntingia calabura</i>	cEi	NE	Exotic
96	Myristicaceae	<i>Horsfieldia irya</i>	brsh	LC	Native
97	Myrtaceae	<i>Syzygium caryophyllatum</i>	ox" ySka ox	LC	Native

98	Nyctaginaceae	<i>Boerhavia diffusa</i>	msg iqy m<d" msg iqy idrK	LC	Native
99	Nymphaeaceae	<i>Nymphaea pubescens</i>	we;a '¿" '¿	LC	Native
100	Nymphaeaceae	<i>Nymphaea rubra</i>		NE	Native
101	Onagraceae	<i>Ludwigia hyssopifolia</i>		LC	Native
102	Onagraceae	<i>Ludwigia peruviana</i>	fnre Èhks,a," fj,a lrdnq	NE	Exotic
103	Pandanaceae	<i>Pandanus kaida</i>	jegflhshd	LC	Native
104	Phyllanthaceae	<i>Glochidion zeylanicum</i>		LC	Native
105	Phyllanthaceae	<i>Phyllanthus amarus</i>	msgjlald	LC	Native
106	Phyllanthaceae	<i>Phyllanthus reticulatus</i>	je,a lhs," .ia yïue,a," lhs,	LC	Native
107	Plantaginaceae	<i>Scoparia dulcis</i>	j,a fld;a;u,a,s	NE	Exotic
108	Poaceae	<i>Axonopus compressus</i>	fmd;= ;K	NE	Exotic
109	Poaceae	<i>Bambusa vulgaris</i>	ly WK	NE	Exotic
110	Poaceae	<i>Panicum maximum</i>	.sKs ;K" rg ;K" .skslS/iai	NE	Exotic
111	Poaceae	<i>Pennisetum polystachion</i>		NE	Exotic
112	Polygonaceae	<i>Persicaria barbata</i>	r;= lsUq,a jekak	LC	Native
113	Pontederiaceae	<i>Eichhornia crassipes</i>	cmka cnr	NE	Exotic
114	Rhizophoraceae	<i>Carallia brachiata</i>	oig" Wifíßh	NT	Native
115	Rubiaceae	<i>Exallage auricularia</i>	.eg fld<	VU	Native
116	Rubiaceae	<i>Nauclea orientalis</i>	nla ó" rg nla ó" nlsks" u, nlsks" msh" msh,a	LC	Native
117	Rubiaceae	<i>Richardia brasiliensis</i>		NE	Exotic
118	Rubiaceae	<i>Spermacoce alata</i>		NE	Exotic
119	Rubiaceae	<i>Spermacoce ocymifolia</i>		NE	Exotic
120	Rubiaceae	<i>Spermacoce remota</i>		NE	Exotic
121	Rubiaceae	<i>Spermacoce verticillata</i>		NE	Exotic
122	Sapindaceae	<i>Cardiospermum halicacabum</i>	fmfk, je,a" je,a fmfk, uQKu,a" uQ.=K" uql=re" isxy flair	LC	Native
123	Sapotaceae	<i>Mimusops elengi</i>		NT	Native
124	Solanaceae	<i>Physalis angulata</i>		NE	Exotic
125	Solanaceae	<i>Solanum torvum</i>	f.dak ngq" ;sínq	LC	Native
126	Symplocaceae	<i>Symplocos cochinchinensis</i>	fndaUq	LC	Native
127	Typhaceae	<i>Typha angustifolia</i>	yinq mka	LC	Native
128	Verbenaceae	<i>Lantana camara</i>	. mdk" lgg ysÕ=re" rg ysÕ=re	NE	Exotic
129	Verbenaceae	<i>Phyla nodiflora</i>	ysrsuk oe;a;	LC	Native
130	Verbenaceae	<i>Stachytarpheta cayennensis</i>		NE	Exotic
131	Verbenaceae	<i>Stachytarpheta urticifolia</i>		NE	Exotic

Table 2: Detailed list of mammals observed at the study site

Abbreviations used: **DS** - Distribution Status; **NCS** - National Conservation Status_Red List 2012; **EN** - Endangered; **LC** - Least Concern; **NE** – Not Evaluated; **NT** - Near Threatened; **VU** - Vulnerable.

No.	Family	Scientific Name	English name	Sinhala name	NCS	DS
1	Pteropodidae	<i>Pteropus giganteus</i> (Brunnich, 1782)	Flying fox	ud-jjq,d	LC	Native
2	Vespertilionidae	<i>Pipistrellus tenuis</i> (Temminck, 1840)	Pigmy pipistrel	ySka fldia weg-jjq,d	LC	Native
3	Cercopithecidae	<i>Semnopithecus vetulus</i> (Erleben, 1777)	Sri Lanka Purple-faced langur	Y%S ,xld l¿-j÷rd	EN	Endemic
4	Felidae	<i>Prionailurus viverrinus</i> (Bennett, 1833)	Fishing cat	y=ka Éúhd	EN	Native
5	Herpestidae	<i>Herpestes brachyurus</i> Gray, 1837	Brown mongoose	fndr uq.áhd	LC	Native
6	Mustelidae	<i>Lutra lutra</i> (Linnaeus, 1758)	Otter	Éh-n,a,d	VU	Native
7	Viverridae	<i>Paradoxurus hermaphoditus</i> (Pallas, 1777)	Palm cat	W.=vqjd	LC	Native
8	Viverridae	<i>Viverricula indica</i> (Desmarest, 1817)	Ring-tailed civet	Wre,Ejd	LC	Native
9	Hystriidae	<i>Hystrix indica</i> (Kerr, 1792)	Porcupine	b;a;Ejd	LC	Native
10	Muridae	<i>Bandicota bengalensis</i> (Gray 1835)	Mole rat	ySka W!re-óhd	LC	Native
11	Muridae	<i>Bandicota indica</i> (Bechstein, 1800)	Malabar bandicoot	W!re-óhd	LC	Native
12	Muridae	<i>Rattus rattus</i> (Linnaeus, 1758)	Common rat	fmdÿ f.a óhd	LC	Native
13	Sciuridae	<i>Funambulus palmarum</i> (Linnaeus, 1766)	Palm squirrel	f,akd	LC	Native

Table 3: Detailed list of birds observed at the study site

Abbreviations used: **DS** - Distribution Status; **NCS** - National Conservation Status_Red List 2012; **EN** - Endangered; **LC** - Least Concern; **NE** – Not Evaluated; **NT** - Near Threatened; **VU** - Vulnerable.

No.	Family	Scientific Name	Common English name	Common Sinhala Name	NCS	DS
1	Anatidae	<i>Dendrocygna javanica</i> (Horsfield, 1821)	Lesser Whistling-duck	ySka ;U fiarejd	LC	Resident
2	Picidae	<i>Dinopium benghalense</i> (Linnaeus, 1758)	Black-rumped Flameback	.sksmg ms,s)IEr,d	LC	Resident
3	Pittidae	<i>Pitta brachyura</i> (Linnaeus, 1766)	Indian Pitta	wúÉÑhd	NE	Migrant
4	Ramphastidae	<i>Megalaima rubricapillus</i> PE (Gmelin, 1788)	Crimson-fronted Barbet	r;auQK;a fldÜfgdrejd	LC	Resident

5	Ramphastidae	<i>Megalaima zeylanica</i> (Gmelin, 1788)	Brown-headed Barbet	fmdf<dia fldÜfgdarejd	LC	Resident
6	Alcedinidae	<i>Alcedo atthis</i> (Linnaeus, 1758)	Common Kingfisher	u,a ms<syqvqjd	LC	Resident
7	Alcedinidae	<i>Ceryle rudis</i> (Linnaeus, 1758)	Pied Kingfisher	f.daur ms<syqvqjd	LC	Resident
8	Alcedinidae	<i>Halcyon smyrnensis</i> (Linnaeus, 1758)	White-Throated Kingfisher	f., iqÿ ueË- ms<syqvqjd	LC	Resident
9	Meropidae	<i>Merops philippinus</i> Linnaeus, 1766*	Blue-tailed Bee- eater	ks,a fm iÖ=yrhd	NE	Migrant
10	Cuculidae	<i>Centropus sinensis</i> (Stephens, 1815)	Greater Coucal	weál=l=<d	LC	Resident
11	Cuculidae	<i>Eudynamys scolopaceus</i> (Linnaeus, 1758)	Asian Koel	fldjq,d	LC	Resident
12	Psittacidae	<i>Psittacula krameri</i> (Scopoli, 1769)	Rose-ringed Parakeet	?k .srjd	LC	Resident
13	Apodidae	<i>Cypsiurus balasiensis</i> (Gray, 1829)	Asian Palm-swift	wdishd ;,a-;=ß;hd	LC	Resident
14	Strigidae	<i>Otus bakkamoena</i> Pennant, 1769	Collared Scops- owl	lrmá lkaniaid	LC	Resident
15	Strigidae	<i>Ninox scutulata</i> (Raffles, 1822)	Brown Hawk-owl	ÿUqre Wl=iqniaid	LC	Resident
16	Columbidae	<i>Stigmatopelia chinensis</i> (Scopoli, 1786)	Spotted Dove	w¿ fldfnhshd	LC	Resident
17	Rallidae	<i>Amaurornis phoenicurus</i> (Pennant, 1769)	White-breasted Waterhen	<h iqÿ fldrjlald	LC	Resident
18	Rallidae	<i>Porphyrio porphyrio</i> (Linnaeus, 1758)	Purple Swamphen	oï ueË-ls;,d	LC	Resident
19	Jacaniidae	<i>Hydrophasianus chirurgus</i> (Scopoli, 1786)	Pheasant-Tailed Jacana	iejq,a-Ëhiekd" mka l=l=<d	LC	Resident
20	Scolopacidae	<i>Actitis hypoleucos</i> (Linnaeus, 1758)	Common Sandpiper	fmdÿ is,s;a;d	NE	Migrant
21	Recurvirostridae	<i>Himantopus himantopus</i> (Linnaeus, 1758)	Black-Winged Stilt	lÆmsh bm,amdjd	LC	Resident
22	Charadriidae	<i>Vanellus indicus</i> (Boddaert, 1783)	Red-Wattled Lapwing	r;a háu,a lsr,d	LC	Resident
23	Laridae	<i>Chlidonias hybrida</i> (Pallas, 1811)	Whiskered Tern	w¿ msh ldÖ=,a,sysKshd	NE	Migrant
24	Accipitridae	<i>Accipiter badius</i> (Gmelin, 1788)	Shikra	l=re¿f.dhd	LC	Resident
25	Accipitridae	<i>Haliastur indus</i> (Boddaert, 1783)	Brahminy Kite	nuqKq mshdl=iaid	LC	Resident
26	Accipitridae	<i>Pernis ptilorhyncus</i> (Temminck, 1821)	Oriental Honey- Buzzard	isÆ nUrl=iaid	NT	Resident
27	Accipitridae	<i>Spilornis cheela</i> (Latham, 1790)	Crested Serpent- eagle	isÆ i¾ml=iaid	LC	Resident
28	Podicipedidae	<i>Tachybaptus ruficollis</i> (Pallas, 1764)	Little Grebe	mqkaÑ f.ô;=rejd	LC	Resident
29	Anhingidae	<i>Anhinga melanogaster</i> Pennant, 1769	Oriental Darter	wysldjd	LC	Resident

30	Phalacrocoracidae	<i>Phalacrocorax niger</i> (Vieillot, 1817)	Little Cormorant	moxÑ Èhldjd	LC	Resident
31	Phalacrocoracidae	<i>Phalacrocorax fuscicollis</i> Stephens, 1826	Indian Cormorant	bkAÿ Èhldjd	LC	Resident
32	Ardeidae	<i>Ardea cinerea</i> Linnaeus, 1758	Grey Heron	wç fldld	LC	Resident
33	Ardeidae	<i>Ardea purpurea</i> Linnaeus, 1766	Purple Heron	lrje,a fldld	LC	Resident
34	Ardeidae	<i>Ardeola grayii</i> (Sykes, 1832)	Indian Pond-heron	lK fldld	LC	Resident
35	Ardeidae	<i>Bubulcus ibis</i> (Linnaeus, 1758)	Cattle Egret	f.ß fldld	LC	Resident
36	Ardeidae	<i>Casmerodius albus</i> (Linnaeus, 1758)	Great Egret	iqÿ-uy fldld	LC	Resident
37	Ardeidae	<i>Egretta garzetta</i> (Linnaeus, 1766)	Little Egret	mqaÑ wkq-fldld	LC	Resident
38	Ardeidae	<i>Ixobrychus sinensis</i> (Gmelin, 1789)	Yellow Bittern	ly ueá-fldld	NT	Resident
39	Threskiornithidae	<i>Threskiornis melanocephalus</i> (Latham, 1790)	Black-headed Ibis	ysi lç oEle;a;d	LC	Resident
40	Pelecanidae	<i>Pelecanus philippensis</i> Gmelin, 1789	Spot-billed Pelican	;s;afydg meia;=vqjd	LC	Resident
41	Ciconiidae	<i>Anastomus oscitans</i> (Boddaert, 1783)	Asian Openbill	újr;=vqjd	LC	Resident
42	Ciconiidae	<i>Mycteria leucocephala</i> (Pennant, 1769)	Painted Stork	,;=jelshd	LC	Resident
43	Chloropseidae	<i>Chloropsis jerdoni</i> (Blyth, 1844)	Jerdon's Leafbird	c¼okaf.a fld<ßishd	LC	Resident
44	Laniidae	<i>Lanius cristatus</i> (Linnaeus, 1758)	Brown Shrike	ÿUqre inß;a;d	NE	Migrant
45	Corvidae	<i>Corvus splendens</i> Vieillot, 1817	House Crow	fld<U lmqgd	LC	Resident
46	Artamidae	<i>Artamus fuscus</i> Vieillot, 1817	Ashy Woodswallow	wç jk,sysKshd	LC	Resident
47	Oriolidae	<i>Oriolus xanthornus</i> (Linnaeus, 1758)	Black Hooded Oriole	lyl=re,a,d	LC	Resident
48	Dicruridae	<i>Dicrurus caeruleus</i> (Linnaeus, 1758)	White-bellied Drongo	ljqvd	LC	Resident
49	Monarchiidae	<i>Terpsiphone paradisi</i> (Linnaeus, 1758)	Asian Paradise Flycatcher	wdishd /yekaudrd	LC	Resident
50	Aegithinidae	<i>Aegithina tiphia</i> (Linnaeus, 1758)	Common Iora	fmdÿ wfhdardjd	LC	Resident
51	Muscicapidae	<i>Copsychus saularis</i> (Linnaeus, 1758)	Oriental Magpie Robin	fmd,alsÉpd	LC	Resident
52	Muscicapidae	<i>Saxicoloides fulicatus</i> (Linnaeus, 1766)	Indian Robin	lçlsÉpd	LC	Resident
53	Sturnidae	<i>Acridotheres tristis</i> (Linnaeus, 1766)	Common Myna	uhskd	LC	Resident

54	Hirundinidae	<i>Hirundo hyperythra</i> Blyth, 1849	Red rumped swallow	ks;U r;a jeys,sysKshd	LC	Resident
55	Pycnonotidae	<i>Pycnonotus cafer</i> (Linnaeus, 1766)	Red-vented Bulbul	fIdKavhd	LC	Resident
56	Pycnonotidae	<i>Pycnonotus luteolus</i> (Lesson, 1841)	White Browed Bulbul	neu iqy fIdKavhd	LC	Resident
57	Cisticolidae	<i>Prinia hodgsonii</i> Blyth, 1844	Gray-breasted Prinia	,hç m%Skshd	LC	Resident
58	Cisticolidae	<i>Prinia inornata</i> Sykes, 1832	Plain Prinia	ir, m%Skshd	LC	Resident
59	Sylviidae	<i>Acrocephalus dumetorum</i> (Blyth, 1849)	Blyth's Reed- warbler	í,hs;a mka /úhd	NE	Migrant
60	Sylviidae	<i>Orthotomus sutorius</i> (Pennant, 1769)	Common Tailorbird	nÜáÉpd	LC	Resident
61	Timaliidae	<i>Turdoides affinis</i> (Jerdon, 1845)	Yellow Billed Babbler	fou,sÉpd	LC	Resident
62	Dicaeidae	<i>Dicaeum erythrorhynchos</i> (Latham, 1790)	Pale Billed Flowerpecker	,d;=vq ms<,sÉpd	LC	Resident
63	Nectariniidae	<i>Nectarinia lotenia</i> (Linnaeus, 1766)	Long Billed Sunbird	Èla;=vq iQálald	LC	Resident
64	Nectariniidae	<i>Nectarinia zeylonica</i> (Linnaeus, 1766)	Purple Rumped Sunbird	ks;U oi iQálald	LC	Resident
65	Motacillidae	<i>Dendronanthus indicus</i> (Gmelin, 1789)	Forest Wagtail	jk ye,fmkaod	NE	Migrant
66	Estrildidae	<i>Lonchura punctulata</i> (Linnaeus, 1758)	Scaly Breasted Munia	<h ldhqrè ù l=re,a,d	LC	Resident
67	Estrildidae	<i>Lonchura striata</i> (Linnaeus, 1766)	White Rumped Munia	ks;U iqy ù l=re,a,d	LC	Resident

Table 4: Detailed list of reptiles observed at the study site

Abbreviations used: **DS** - Distribution Status; **NCS** - National Conservation Status_Red List 2012; **EN** - Endangered; **LC** - Least Concern; **NE** – Not Evaluated; **NT** - Near Threatened; **VU** - Vulnerable.

No.	Family	Scientific Name	English Name	Sinhala name	NCS	DS
1	Crocodylidae	<i>Crocodylus palustris</i> Lesson, 1831	Mugger crocodile / Marsh crocodile	ye, lsUq,d	NT	Native
2	Bataguridae	<i>Melanochelys trijuga</i> (Schweigger, 1812)	Black turtle	.,a bind	LC	Native
3	Agamidae	<i>Calotes calotes</i> (Linnaeus, 1758)	Green garden lizard	m<d lgqiaid	LC	Native
4	Agamidae	<i>Calotes versicolor</i> (Daudin, 1802)	Common garden lizard	.rd lgqiaid	LC	Native
5	Gekkonidae	<i>Hemidactylus frenatus</i> Schlegel in Duméril & Bibron, 1836	Common house-gecko	iq,n f.a yQkd	LC	Native

6	Gekkonidae	<i>Hemidactylus parvimaculatus</i> Deraniyagala, 1953	Spotted housegecko	mq,a,s f.a yQkd	LC	Native
7	Scincidae	<i>Lankascincus fallax</i> (Peters, 1860)	Common lankaskink	iq,n ,laySrζjd	LC	Endemic
8	Scincidae	<i>Lygosoma punctatus</i> (Gmelin, 1799)	Dotted skink	;s;a ySrζyslk,d	LC	Native
9	Varanidae	<i>Varanus bengalensis</i> (Daudin, 1802)	Land monitor	;f.dhd	LC	Native
10	Varanidae	<i>Varanus salvator</i> (Laurenti, 1768)	Water monitor	Inrf.dhd	LC	Native
11	Natricidae	<i>Amphiesma stolatum</i> (Linnaeus, 1758)	Buff striped keelback	wyrl+lald	LC	Native
12	Natricidae	<i>Xenochrophis asperrimus</i> (Boulenger, 1891)	Checkered keelback	Èh fmd<Öd" Èh nßhd	LC	Endemic
13	Homalopsidae	<i>Cerberus rynchops</i> (Schneider, 1799)	Dog-faced water snake	l=Kq Èh lζjd	LC	Native
14	Colubridae	<i>Lycodon aulicus</i> (Linnaeus, 1758)	Wolf snake	wt rokld	LC	Native
15	Colubridae	<i>Ptyas mucosa</i> (Linnaeus, 1758)	Rat snake	.erâhd	LC	Native
16	Elapidae	<i>Naja naja</i> (Linnaeus, 1758)	Indian cobra	khd" kd.hd	LC	Native
17	Viperidae	<i>Daboia russelii</i> (Shaw & Nodder, 1797)	Russell's viper	;s;a fmd<.d	LC	Native
18	Viperidae	<i>Hypnale hypnale</i> (Merrem, 1820)	Merrem's Hump nose viper	fmdf<dka f;,siaid	LC	Native

Table 5: Detailed list of amphibians observed at the study site

Abbreviations used: **DS** - Distribution Status; **NCS** - National Conservation Status_Red List 2012; **EN** - Endangered; **LC** - Least Concern; **NE** – Not Evaluated; **NT** - Near Threatened; **VU** - Vulnerable.

No.	Family	Scientific Name	English Name	Sinhala Name	NCS	DS
1	Bufoidea	<i>Duttaphrynus melanostictus</i> Schneider, 1799	Common toad	f.hs f.ïnd	LC	Native
2	Microhylidae	<i>Kaloula taprobanica</i> (Parker, 1934)	Sri Lankan bullfrog	úis;=re r;= ueâhd	LC	Native
3	Dicroglossidae	<i>Euphlyctis cyanophlyctis</i> (Schneider, 1799)	Indian skipper frog	W;a m;k ueâhd	LC	Native
4	Dicroglossidae	<i>Euphlyctis hexadactylus</i> (Lesson, 1834)	Indian green frog	iheÖ's,s m,d ueâhd	LC	Native
5	Dicroglossidae	<i>Fejervarya</i> cf. <i>syhadrensis</i> (Annandale, 1919)	Common paddy field frog	fj,a ueâhd	LC	Native

6	Dicroglossidae	<i>Hoplobatrachus crassus</i> (Jerdon, 1853)	Jurdon's bullfrog	c¾vkaf.a Èh ueähd	LC	Native
7	Rhacophoridae	<i>Pseudophilautus popularis</i> Megaskumbura & Manamendra- Arachcchi, 2005	Common shrub frog	iq,N myre ueähd	NT	Endemic

Table 6: Detailed list of fish species observed at the study site

Abbreviations used: **DS** - Distribution Status; **NCS** - National Conservation Status_Red List 2012; **EN** - Endangered; **LC** - Least Concern; **NE** – Not Evaluated; **NT** - Near Threatened; **VU** - Vulnerable.

No.	Family	Scientific Name	English Name	Sinhala name	NCS	DS
1	Cyprinidae	<i>Puntius vittatus</i> (Day, 1865)	Silver Barb	nKaä ;s;a;hd" fmdä fm;shd" bms,slvhd	LC	Native
2	Cyprinidae	<i>Rasbora dandiya</i> (Valenciennes, in Cuvier & Valenciennes, 1844)	Broad line Strip Rasbora	oKaähd" l=vuiaid	LC	Native
3	Cyprinidae	<i>Rasbora microcephalus</i> (Jerdon, 1849)	Narrow line Rasbora	Isß oKaähd" l=vuiaid	LC	Native
4	Heteropneustidae	<i>Heteropneustes fossilis</i> (Bloch, 1797)	Stinging Catfish	yqx.d" ly yqx.d" f,a yqx.d	LC	Native
5	Anguillidae	<i>Anguilla bicolor</i> Mc Clelland, 1844	Level Finned Eel	uv wd d" llal=gq wd d" l<mq wd d	LC	Native
6	Channidae	<i>Channa punctata</i> (Bloch, 1794)	Spotted Snakehead	uv lkhd" uv wdrd" uvlßhd	LC	Native
7	Channidae	<i>Channa striata</i> (Bloch, 1793)	Murrel	“,d" y,am;a uy	LC	Native
8	Aplocheilidae	<i>Aplocheilus parvus</i> (Raj, 1919)	Dwarf Panchax	l<mq y hd" Wv y hd	LC	Native
9	Cichlidae	<i>Etroplus suratensis</i> (Bloch, 1785)	Green Chromide	fldr,shd" u,a fldr,shd	LC	Native
10	Cichlidae	<i>Oreochromis niloticus</i> (Linnaeus, 1758)	Nile Tilapia	;s,dmshd	NE	Exotic
11	Anabantidae	<i>Anabas testudineus</i> (Bloch, 1795)	Climbing Perch	ldjhshd" fmd,a ldjhshd	LC	Native
12	Loricariidae	<i>Pterygoplichthys multiradiatus</i> (Hancock, 1828)	Sucker Mouth Catfish	gexls iqoao	NE	Exotic
13	Osphronemidae	<i>Trichopodus pectoralis</i> Regan, 1910	Snake Skin Gourami	fj,a .=rdñ	NE	Exotic

14	Poeciliidae	<i>Poecilia reticulata</i> Peters, 1859	Guppy	fj,a .mams \$ idß .mams	NE	Exotic
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Table 7: Detailed list of butterflies observed at the study site

Abbreviations used: **DS** - Distribution Status; **NCS** - National Conservation Status_Red List 2012; **EN** - Endangered; **LC** - Least Concern; **NE** – Not Evaluated; **NT** - Near Threatened; **VU** - Vulnerable.

No.	Family	Scientific Name	English Name	NCS	DS
1	Papilionidae	<i>Graphium agamemnon</i> Linnaeus, 1758	Tailed Jay	LC	Native
2	Papilionidae	<i>Papilio clytia</i> Linnaeus, 1758	Mime	LC	Native
3	Papilionidae	<i>Papilio polytes</i> Linnaeus, 1758	Common Mormon	LC	Native
4	Pieridae	<i>Catopsilia pomona</i> Fabricius, 1775	Lemon Emigrant	LC	Native
5	Pieridae	<i>Catopsilia pyranthe</i> Linnaeus, 1758	Mottled Emigrant	LC	Native
6	Pieridae	<i>Delias eucharis</i> Drury, 1773	Jezebel	LC	Native
7	Pieridae	<i>Eurema hecabe</i> Linnaeus, 1764	Common Grass Yellow	LC	Native
8	Pieridae	<i>Leptosia nina</i> Fabricius, 1793	Psyche	LC	Native
9	Nymphalidae	<i>Danaus chrysippus</i> Linnaeus, 1758	Plain Tiger	LC	Native
10	Nymphalidae	<i>Danaus genutia</i> Cramer, 1779	Common Tiger	LC	Native
11	Nymphalidae	<i>Euploea klugii</i> Moore, 1888	Brown King Crow	LC	Native
12	Nymphalidae	<i>Ideopsis similis</i> Linnaeus, 1764	Blue Glassy Tiger	VU	Native
13	Nymphalidae	<i>Junonia iphita</i> Cramer, 1779	Chocolate Soldier	LC	Native
14	Nymphalidae	<i>Melanitis leda</i> Linnaeus, 1763	Common Evening Brown	LC	Native
15	Nymphalidae	<i>Mycalesis perseus</i> Fabricius, 1775	Common Bushbrown	LC	Native
16	Nymphalidae	<i>Neptis hylas</i> Linnaeus, 1758	Common Sailor	LC	Native
17	Nymphalidae	<i>Parantica aglea</i> Stoll, 1782	Glassy Tiger	LC	Native
18	Nymphalidae	<i>Phalanta phalantha</i> Drury, 1773	Leopard	LC	Native
19	Nymphalidae	<i>Tirumala limniace</i> Cramer, 1775	Blue Tiger	LC	Native
20	Nymphalidae	<i>Ypthima ceylonica</i> Hewitson, 1864	White Four-ring	LC	Native
21	Lycaenidae	<i>Chilades lajus</i> Stoll, 1780	Lime Blue	LC	Native
22	Lycaenidae	<i>Euchrysops cnejus</i> Fabricius, 1798	Gram Blue	LC	Native
23	Lycaenidae	<i>Jamides bochus</i> Stoll, 1782	Dark Cerulean	LC	Native
24	Lycaenidae	<i>Jamides celeno</i> Cramer, 1775	Common Cerulean	LC	Native
25	Lycaenidae	<i>Lampides boeticus</i> Linnaeus, 1767	Pea Blue	LC	Native

26	Lycaenidae	<i>Spalgis epeus</i> Westwood, 1851	Apefly	LC	Native
27	Lycaenidae	<i>Zesius chrysomallus</i> Hübner, 1819	Redspot	LC	Native
28	Lycaenidae	<i>Zizina otis</i> Fabricius, 1787	Lesser Grass Blue	LC	Native
29	Lycaenidae	<i>Zizula hylax</i> Fabricius, 1775	Tiny Grass Blue	LC	Native
30	Hesperiidae	<i>Ampittia dioscorides</i> Fabricius, 1793	Bush Hopper	LC	Native
31	Hesperiidae	<i>Parnara bada</i> Moore, 1878	Smallest Swift	NT	Native
32	Hesperiidae	<i>Suastus gremius</i> Fabricius, 1798	Indian Palm Bob	LC	Native
33	Hesperiidae	<i>Taractrocera maevius</i> Fabricius, 1793	Common Grass Dart	LC	Native

Table 8: Detailed list of Odonates observed at the study site

Abbreviations used: **DS** - Distribution Status; **NCS** - National Conservation Status_Red List 2012; **EN** - Endangered; **LC** - Least Concern; **NE** – Not Evaluated; **NT** - Near Threatened; **VU** - Vulnerable.

No.	Family	Scientific Name	English Name	NCS	DS
1	Coenagrionidae	<i>Agriocnemis pygmaea</i> (Rambur, 1842)	Wandering Wisp	LC	Native
2	Coenagrionidae	<i>Onychargia atrocyana</i> Selys, 1865	Marsh Dancer	VU	Native
3	Coenagrionidae	<i>Ischnura senegalensis</i> (Rambur, 1842)	Common Bluetail	LC	Native
4	Coenagrionidae	<i>Ceriagrion coromandelianum</i> (Fabricius, 1798)	Yellow Waxtail	LC	Native
5	Coenagrionidae	<i>Pseudagrion microcephalum</i> (Rambur, 1842)	Blue Sprite	LC	Native
6	Platycnemididae	<i>Copera marginipes</i> (Rambur, 1842)	Yellow Featherleg	LC	Native
7	Gomphidae	<i>Ictinogomphus rapax</i> (Rambur, 1842)	Rapacious Flangetail	LC	Native
8	Aeshnidae	<i>Gynacantha dravida</i> Lieftinck, 1960	Indian Duskhawker	NT	Native
9	Libellulidae	<i>Brachydiplax sobrina</i> (Rambur, 1842)	Sombre Lieutenant	LC	Native
10	Libellulidae	<i>Orthetrum luzonicum</i> (Brauer, 1868)	Marsh Skimmer	NT	Native
11	Libellulidae	<i>Orthetrum sabina</i> (Drury, 1770)	Green Skimmer	LC	Native
12	Libellulidae	<i>Acisoma panorpoides</i> Rambur, 1842	Asian Pintail	LC	Native
13	Libellulidae	<i>Brachythemis contaminata</i> (Fabricius, 1793)	Asian Groundling	LC	Native
14	Libellulidae	<i>Crocothemis servilia</i> (Drury, 1770)	Oriental Scarlet	LC	Native
15	Libellulidae	<i>Diplacodes trivialis</i> (Rambur, 1842)	Blue Percher	LC	Native

16	Libellulidae	<i>Neurothemis intermedia</i> (Rambur, 1842)	Paddyfield Parasol	NT	Native
17	Libellulidae	<i>Neurothemis tullia</i> (Drury, 1773)	Pied Parasol	LC	Native
18	Libellulidae	<i>Rhodothemis rufa</i> (Rambur, 1842)	Spine-legged Redbolt	NT	Native
19	Libellulidae	<i>Rhyothemis variegata</i> (Linnaeus, 1763)	Variagate Flutterer	LC	Native
20	Libellulidae	<i>Pantala flavescens</i> (Fabricius, 1798)	Globe Skimmer, Wandering Glider	LC	Native
21	Libellulidae	<i>Tramea limbata</i> (Desjardins, 1832)	Sociable Glider	LC	Native

Table 9: Detailed list of molluscans observed at the study site

Abbreviations used: **DS** - Distribution Status; **NCS** - National Conservation Status_Red List 2012; **EN** - Endangered; **LC** - Least Concern; **NE** – Not Evaluated; **NT** - Near Threatened; **VU** - Vulnerable.

Fresh water Molluscar

No.	Family	Species	NCS	DS
1	Ampullariidae	<i>Pomacea canaliculata</i>	NE	Native
2	Unionidae	<i>Lamellidens consobrinus</i>	NE	Native

Land Molluscar

3	Ariophantidae	<i>Cryptozona bistrialis</i> (Beck 1837)	LC	Native
4	Ferussaciidae	<i>Digoniaxis cingalensis</i> (Benson 1863)	LC	Native
5	Achatinidae	<i>Lissachatina fulica</i> (Bowdich 1822)	NE	Exotic
6	Acavidae	<i>Acavus phoenix</i> (Pfeiffer 1854)	NT	Endemic

Figures

Some of the flora found in the study site



Gymnopetalum scabrum (NCS – VU)



Lepironia auriculata (NCS – VU)



Exallage auricularia (NCS – VU)



Mimusops elengi (NCS – NT)



Eichhornia crassipes (invasive species)



Annona glabra (invasive species)

Some of the fauna found in the study site



Asian Groundling (NCS – LC)



Wandering Wisp (NCS – LC)

Duttaphrynus melanostictus (NCS – LC)



Euphlyctis cyanophlyctis (NCS – LC)



Palm Squirrel (NCS – LC)



Green Garden Lizard (NCS – LC)

ANNEX 10: BREAKUP OF FRESH WATER REQUIREMENT DURING CONSTRUCTION

SN	Purpose	Quantity (KL)
1	For of subproject road construction, a) Construction related to earthwork c) Construction of WMM d) Bridges, culverts, retaining walls & other structures	
2	Dust suppression and wheel washes	
3	Ready mixed concrete wagons Site / general cleaning Specialist / high pressure cleaning	
4	For drinking & other household purpose	
5	Labour camps/Temporary Accommodation Toilets, catering, washing (personnel)	
6	General Site Activities Tool washing Rinsing	
7	Wet Trades <ul style="list-style-type: none"> ● Brick/blockwork ● Screening ● Concreting ● Plastering ● Core Boring ● Lightweight Roofing ● Ceramic Tile ● Bentonite Mixing ● Rendering 	
8	Groundworks <ul style="list-style-type: none"> ● Grouting ● Drilling/Pilin 	
9	Cleaning <ul style="list-style-type: none"> ● Cleaning Tools and Small Equipment ● Plant and Equipment ● Paintbrush Washing 	
SN	Purpose	Quantity (KL)
1	For road construction and the building a) Construction related to earthwork b) Construction of GSB	

	c) Construction of overhead bridge to connect to the university d) culverts, retaining walls & other structures	
2	Dust suppression	
3	For drinking & other household purpose	

ANNEX 11: SUMMARY OF STAKEHOLDER CONSULTATION MEETING HELD ON UNIVERSITY OF KELANIYA

Date – 03rd May 2018. **Time** – 9.30 am – 11.15 am.

Location – Senate room, University of Kelaniya

Invitees: Government officer & Private Sector representatives

- Architecture, State Engineering Corporation in Sri Lanka
- Admin Grama Niladhari, Kelaniya DS office
- Grama Niladari, Himbutuwelgoda
- Grama Niladari, Dalugama
- S.P.M, MÄGA Engineering (Pvt) Ltd.

University of Kelaniya Representatives

- Deputy Vice Chancellor
- Dean, Faculty of Computing and Technology
- Assistant Registrar, Faculty of Computing and Technology
- P.H.I., University of Kelaniya
- Bursar, University of Kelaniya
- Head of the Department, Department of Applied Computing
- Senior Lecturer, Department of Applied Computing
- Senior Assistant Secretary, Laws and Records
- Curator, Landscaping Division
- Project Manager
- Assistant Registrar, General Administration

Student representatives

- K.T. Rukmal
- P.H.T. Wickramage
- M.K.Y. Maduwanthi
- G.A.S. Dilini
- W.A. Amila Madhushan

Representation from the Community

- Incumbent, Shanthi Viharaya in Kelaniya

Consultant firm representatives

- Director of TMS Company – Dr. Sithara Atapattu
- Environmental Compliance Consultant ADB – Charmini Kodituwakku
- Project Manager of TMS Company – Yasundara weerasekara

Matters Presented at the Meeting

- a) Brief introduction about purpose of the meeting
- b) Brief introduction about the proposed site location (where the land is located / how the take land for proposed project).
- c) Objective of the meeting (location / key findings / flood risk / Bio Diversity)
- d) Presentation of draft proposal of Faculty of Computing and Technology Building Complex.
- e) Stakeholder Discussion

Section (c) was presented by the Environmental Compliance Consultant from TMS and Section (a, b) presented by Professor Lakshman Senevirathna, Deputy Vice Chancellor in University of Kelaniya. Presentations were made in Sinhala. Section (d) presented by Ms. T.S. Madhushani, Architecture in State Engineering Corporation in Sri Lanka.

Method of information dissemination and collection:

- Notes were taken on the discussion
- 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. The issue that were broadly covered in the questioner was:
 - Current Flood levels observed in the project associated area
 - Nature of environmental problems presented in the surrounding and the issues and concerns.
 - Disturbance due to project work for the surrounding community
 - Improvement of the drainage in the canal system associated with the project.
 - Issue of environmental pollution concerning solid and waste water waste disposal.
 - Stability of the building and foundation of the proposed building. Evaluation of current situation of other building.
 - Access road and accessibility issues from the main road
- Discussion were based on adoption of possible migratory measures for environmental issues that were encountered as result of project activities.
- Record of the Meeting: General information of the participants such as Name, 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

Common issues and concerns raised at public consultation meetings

1. Mrs. Charmini (ADB/TMS environmental compliance consultant specialist) raised the question on accessibility of the site. Dr. Gamini Wijayarathna, Dean of the Faculty of Computing and Technology pointed out that this issue was resolved and that the SLLRDC has provided an alternative access road for the site. He mentioned that this road will be constructed by SLLRDC and handed over to the UOK.
2. Administrative Grama Niladhari of Kelaniya DS officer Mr. K.R.W.K. Kaththota stated that the selected project land was previously a wetland with abandoned paddy field. He said that SLLRDC had carried out the land development without an EIA to assess the hydrological or the biodiversity impact. He pointed out that the Colombo waste transfer site that is located 80 m from the site will have an impact on the proposed project. Already there is leachate that is released from this dump site that is impacting on the surrounding environment and smell and odor are some of the problems. Because of that there are harmful issues on the wetland and the bio diversity.
3. Mr. Kaththota appraised the fact that a stakeholder meeting was called by UOK at the onset of the project. He pointed out that before SLLRDC took over the land for development the areas were a rich biodiversity habitat. He asked as to what measures

have been proposed on biodiversity conservation. Ms Charmini in response to his question stated that a habitat enrichment program has been proposed for the site. She added that as per the findings of the RBA the recommended species of trees and shrubs will be planed during landscape activities.

4. On the issues of reduced water flow in the project associated canal system, Pradeshiya saba representative pointed out that the Hume Pipes on Mudun Ela and other streams were not adequate to carry the water flow and should be replaced with alternative box culverts. He further explained that the stagnation and reduced flow rate in these canals were due to narrow opening in these water canal systems that accumulates debris and result in blockage.
5. He added that the solid waste deposit site which is 80m to the site is maintained by the Pradeshiya saba and that is unregulated and is dumping the leachate to the canal without any form of treatment. He also questioned why there was no representation from the Kelaniya divisional secretariat to address the problems associated with the waste deposition site. And he pointed out that currently there was an issue on untreated water being directly discharged in to the local drainage on the Colombo Kandy highway.
6. Furthermore, the Pradeshiya saba representative pointed out that the Mudun Ela required to be cleaned once in three months. He explained that Mudun Ela invasive species like *Eichonia*, *Salvinia* need to be mechanically removed to improve the water flow. Therefore, when the proposed development activity is planned to ensure that the canal reservation is maintained in order to employ such mechanical removal of these invasive species.
7. Dr. Gamini Wijayarathna, Dean of the Faculty of Computing and Technology in response to the replacement of the narrow culvert pointed out that they would consult SLLRDC and try to replace the culverts with other better options. Dr Chamli pointed out that the land adjoins the Mudun Ela and tributary canal on the extreme western boundary was not under their faculty but was under the post graduate institute of Pali and Buddha Sasana.
8. Ms. T.S. Madushani an Architect from the State Engineering Corporation in Sri Lanka presented the draft layout proposal for Faculty of Computing and Technology. In her presentation she mentioned that this draft proposal was done in compliance with the UDA and Colombo municipal council guidelines. She explained that in their design they have allowed for 15m reservation on the Mudun Ela. Dr Chamli explained that the detailed designs were not available and that will be entrusted to another company to design. In her draft proposal she said that she had included space for a waste water treatment plant to treat the water before discharge to the canal.
9. Ms Charmini raised the question on adoption of green building certificate for the proposed building. Ms. Madushani in response stated that they would adopt Green building concept and follow the regulations proposed by UDA. Dr Chamli said that they will seek guidance from a green consultant to comply with the requirements to obtain the green building certificate that will be in the biding document.
10. Ms. Madushani briefed the forum on the building that will come up in phase 01 of construction. This would include academic building and administrative building in the phase 01 along with the canteens. This Academic building will consist of space for parking, canteen, lecture halls, faculty library, laboratories, staff area and auditorium. In phase 02

of construction will consist of academic building, student canteen, health center, gymnasium, and bookshop.

11. Ven. Ambanpola Silarathana Thero the incumbent of Shanthy Viharaya in Kelaniya one of the residents adjoining the project said that the smell and odor from the waste deposit was an issue of concern. He added that according to his observation that waste dump has increased over time. In response to this, Mr. Kaththota (Admin Grama Niladhari) pointed out that the waste was collected on this site as only a temporary measure until the permanent solution was implemented. This waste will be eventually transported through wanwasala railway station to Puttalm. Furthermore, he pointed out that Metro Colombo solid waste management project will begin in 2020 that all the waste that is collected from Colombo will be received at this transfer site and processed and transferred to the land fill in Aruwakkalu, Puttalam. The proposed project will eliminate haphazard open waste dumping at the adjoining site by Kelaniya Pradeshiya Sabah (KPS) as the waste generated within the KPS will be handled through the new project.
12. The Ven. Ambanpola Silarathana Thero pointed another issue. That during the monsoonal period the flooding level has increased over the years. Currently there are 6 floors in the temple building which is the heights in the area. Thero was concerned about possible increased flooding due to the proposed development at the site. Mrs. Charmini (ADB/ TMS consultant) answered that the flood risk assessment for the area has not properly address this issue. However, detailed engineering designs and the consultation with the SLLRDC will ensure that the impact of flooding will be mitigated. Dr Chamlie ensures that they will coordinate with SLLRDC on this issue and adopt the mitigatory measures that will be proposed.
13. Mrs. Charmini from ADB/TMS consultant further said that there is an Environmental officer in PIU who will coordinate and mitigate the project associated problems during construction and operation.
14. Mr Bandara Senior project manager and Mr Susil Kumara of MÄGA Engineering (Pvt) Ltd mentioned that flooding is common with the development in the project associated areas. It has been aggravated since the construction of the Colombo Katunayake highway and associated reclamation of land. These current developments should be done on piles and not by filling since the bedrock is highly unstable. He invited us to visit their concrete batching site to assess the situation. And also, their land is tipping and would not be suitable even for a car park. And he pointed due to unstable geological conditions of boggy soil the building has tipped nearly 6, 7 ft.
15. The representative from Kelaniya Pradeshiya Saba explained the development proposed for the Mahara, Mudun Ela water drainage. He pointed out that new bridge is implemented by Ministry of Megapolis and Western Development.
16. Mr. G.A.L.P. Wimalarathna the Public Health Inspector assigned to the University of Kelaniya informed that waste management was an issue in the university premises and dengue was prevalent vector born disease among the students.
17. The students at the Faculty of Computing and Technology addressing the forum said that they are waiting the proposed development. They were positive and appreciative of the academic staff for bring such a proposal. At the moment they are training in a makeshift facility which does not have adequate space and equipment. In reply to the question

raised students explained that there practiced separation and sorting out of solid waste in color-coded bins. But there was not comprehensive waste management strategy devoted for the university campus.

18. After that Mr. N.M. Aruna Shantha who is the curator in charge of the university landscaping said that composting was done on organic waste generated from the university premises.

19. At the end of the session, Dean of the Faculty of Computing and Technology Dr. Gamini Wijayarathna thanking the gathering and the organisers, resource persons for their participation at the meeting.

THE KEY INFORMANT MEETING

Report: On 3rd of May 2018 at 12.00pm after the stakeholder meeting our team (Dr Sithar Attapattu, Charmini Kodituwakku, Yasundara Weerasekera) were invited to visit the MÄGA Engineering (Pvt) Ltd at No 977/1, Mudunela Wedamulla, Kelaniya concrete batching site 145m from the project site. We met with Mr Bandara Senior project manager and Mr Susil Kumara of MÄGA Engineering (Pvt) Ltd at their project office in Mudunella Wedamulla. The office has been established since 2006 and since then flood conditions have been the norm for their site during the monsoonal seasons.

They briefed us on the following:

a) Photographic record of flooding events in the project site and MÄGA Engineering (Pvt) Ltd concrete batching plant from years 2010 to 2016 (plates 1 & 2, 3). Mr Bandara said that in 2016 when 120mm of rain was recorded in a day their site was flooded and that their work force commuted in raft to the site.

b) Tube wells on site contained acidic water and was not suitable for construction or as drinking water.

c) Discussed instability of the bed rock due to the underlying geological forces of hydrostatic pressure and water clogged soil conditions. Photographic record of floor fractures of 4mm were recorded during our site inspection (refer plates 4&5).

d) On the issue of ground improvement of the proposed site and reclamation of the land he said that it was not feasible considering the high groundwater table and the geotechnical conditions of the proposed site.

e) Issues of blocked canal system adjoin the project access road. He pointed as result of improper disposal of garbage and infrequent cleaning schedules the project associated canal systems are frequently blocked.



Figure 01



Figure 02



Figure 03



Figure 04



Figure 05

Invitation letter of the Stakeholder meeting



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 UNIVERSITY OF KELANIYA, SRI LANKA
 කලාපීය කලාපී KELANIYA

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2018.04.27

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ඒ කලාපී විකේන්ද්‍රය/ කලාපී/ කලාපීය පාලන කොටසට පාලන කොටසට පිළිතුරු දැක්වීමට, එසේ පාලන කමිටුවේ සාමාජිකයන් අතරම කමිටුවෙන් කලාපී විකේන්ද්‍රයට ඒ කලාපී පාලන කොටසට පිළිතුරු දැක්වීමට කමිටුවෙන් කම අග.

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උප කුලපති Vice-Chancellor	2914474 Fax : 2911485	ලේකම් Registrar	2911599 Fax : 2908167	ප්‍රකාශක Bursar	2911393 Fax: 2911393	සාමාන්‍ය General	2911391, 2911397 2910164, 2911487 2913854-B
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ANNEX 12: COMPLAINS FORM

Sample Grievance Registration Form (To be available in Sinhala, Tamil and English)

The _____ Project welcomes complaints, suggestions, queries, and comments regarding project implementation. We encourage persons with grievance to provide their name and contact information to enable us to get in touch with you for clarification and feedback.

Should you choose to include your personal details but want that information to remain confidential, please inform us by writing/typing ***(CONFIDENTIAL)*** above your name. Thank you.

Date	Place of registration	Project Town Project		
Contact information/personal details				
Name	Gender	* Male *Female	Age	
Home address				
Place				
Phone no.				
E-mail				
Complaint/suggestion/comment/question Please provide the details (who, what, where, and how) of your grievance below: If included as attachment/note/letter, please tick here:				
How do you want us to reach you for feedback or update on your comment/grievance?				

FOR OFFICIAL USE ONLY

Registered by: (Name of official registering grievance)		
Mode of communication: Note/letter E-mail Verbal/telephonic		
Reviewed by: (Names/positions of officials reviewing grievance)		
Action taken:		
Whether action taken disclosed:	Yes No	
Means of disclosure:		

ANNEX 13: TERMS OF REFERENCE FOR ENVIRONMENT SAFEGUARDS CONSULTANT

Project	SRI 50275-002: Science and Technology Human Resource Development Project
Professional Group	C
Job Level	5
Expertise	Environmental Management
Expertise Group	Environmental Science, Environmental Management, Natural Resource Management
Source	National/International

OBJECTIVE AND PURPOSE OF THE ASSIGNMENT

The Science and Technology Human Resource Development Project in Sri Lanka is being proposed for Board approval in September 2018. During implementation, technical support is required in ensuring safeguards policy compliance in preparing environmental monitoring reports for the 4 universities. The Environmental Safeguards Specialist will provide support in ensuring that the Project complies with ADB's Safeguards Policy Statement, 2009 (SPS) for environmental safeguards, and national laws and regulations.

SCOPE OF WORK

During implementation, the Specialist will support executing and implementing agencies (EA/IAs) and their project implementation units (PIUs) in preparing environmental monitoring reports in accordance with categorization based on SPS. The Specialist will review compliance with IEE and its EMP with ADB's Safeguards Policy Statement, 2009 (SPS) for environment safeguards and national laws and regulations. The Specialist will guide the EA/IAs in incorporating the EMP, IEE, and relevant environmental clauses in bidding documents.

The Specialist will monitor EMP implementation ensuring compliance with SPS; loan agreement; and national laws and regulations. The Specialist will guide EAs/IAs in conducting monitoring, conduct verification of monitoring reports—and provide reviewed reports to ADB. The Specialist will revise the monitoring reports, as necessary. Based on the Project Administration Manual, monitoring will be done on a semiannual basis during construction phase and annually during construction phase.

DETAILED TASKS AND/OR EXPECTED OUTPUT

The Specialist will carry out the following tasks:

1. Conduct tailored capacity building training sessions on environmental safeguard for PIUs, university staff and contractors and prepare guides/forms/training proceedings to ensure EA/IAs comply with the SPS, and national laws and regulations. Documentation will be included in monitoring reports.
2. Guide the EA/IAs in updating existing IEEs: based on detailed design and/or due to any change in design, location, alignment, unanticipated impact/s identified during project implementation) as required, including leading its preparation in the initial stages of project implementation to ensure that EA/IAs are compliant with the PAM, SPS, loan agreement, and national laws and regulations.
3. Guide EA/IAs and ensure that environmental safeguards are incorporated in bidding documents in accordance with the loan agreement and SPS.
4. Guide the EA/IAs in determining compliance with the loan agreement with regard to ensuring contracts and contract award. The Specialist will devise a checklist for

- EAs/IAs and their PIUs to ensure subprojects comply. The documentation will be included in monitoring reports.
5. The Specialist will conduct field visits for subproject sites/locations verification, discussions with PIUs, technical experts, design and supervision consultant, other consultants, and/or design engineers.
 6. The Specialist will guide EA/IAs and their consultants in conducting monitoring, conduct verification of monitoring reports—and provide reviewed reports to ADB. The Specialist should ensure that monitoring reports provide detailed information, flag non-compliance including any safeguards related grievances, and recommend corrective actions agreed by the EA/IAs.
 7. Prepare environmental awareness materials and organize environmental awareness workshop/training for EAs/ contractor/community.
 8. Perform other activities as required by ADB, EA/IAs on mutually-agreed arrangements.

Reporting

The Specialist will report directly to the ADB in RM/HQ counterpart. The consultant will provide direct support to relevant EA/IAs and their PIUs, including design and supervision consultants. Overall framework and direction will be provided by the ADB project officer in consultation with the EA/IAs, PIUs, and other government officials. The Specialist is expected to perform independently and take initiatives to inform or consult with the ADB project officer on problem areas and major constraints, and ways forward to achieve intended objectives of the assignment.

Minimum Qualification Requirements

Master's degree in Environmental Management, Natural Resources Management, Engineering, or related field with at least 10 years' experience in environmental safeguards, particularly preparation of Initial Environmental Examination (IEE) and Environmental Management Plan (EMP). Good understanding of ADB and Sri Lanka's environmental policies and legislation. Past experience in safeguards work with ADB or World Bank projects preferable. Experience on environmental management of education projects will add value.

Minimum General Experience: 15 Years

Minimum Specific Experience: 10 Years (relevant to assignment)

Regional/Country Experience: Required

Deliverables

The Specialist will provide ADB with the following documents:

1. Inception Report and Timebound Work Plan;
2. Updated IEEs, as necessary;
3. Environmental awareness materials;
4. Verified monitoring reports; and
5. Training plan and training materials.

ENVIRONMENTAL MANAGEMENT PLAN

Activity Title: Proposed Faculty of Computing and Technology Building Complex in Kelaniya

District: Colombo

Local Authority: - Kelaniya Pradeshiya Saba

Implementing Partner: Ministry of Higher Education /University of Kelaniya

Issue for concern	Environmental Impact	Mitigation measure(s)	Monitoring indicator(s)	Responsible party (ies) I-Implement M-Monitoring	Fund Sources for Implementing Mitigation Measure	Time Frame
PLANNING						
Clearance for the project	Unless Local Authority building approval is obtained for new building it may lead to environmental and social impacts. It will not be in compliance with national environmental and social regulations.	Obtain approval from Kelaniya Pradeshiya Saba and UDA before commencement of construction. Site is nearby wetland and should follow CEA SLLRDCC and Kelaniya Pradeshiya Saba guidelines.	Provisional approval obtained from relevant local authority and UDA	PIU(I) Site Engineer (M)	Project cost	Before construction
	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 Codes for design (such as UDA), Seismic Zone V coefficient, appropriate wind load factor (corresponding to 22km/h wind speed), and detailed design after carrying geotechnical investigations and topographic survey. The initial designs of FCT academic building should consider that net allowable carrying capacity of 3.0MN/m ² . The	Verification of the design parameters Geo technical and topography report in place	PIU (I)	Project cost	Before construction

Issue for concern	Environmental Impact	Mitigation measure(s)	Monitoring indicator(s)	Responsible party (ies) I-Implement M-Monitoring	Fund Sources for Implementing Mitigation Measure	Time Frame
		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.				
Utilities	Establishment of utilities for the FCT such as water, telecommunication and electricity will disrupt the services to the project associated establishments and communities.	<ul style="list-style-type: none"> -The location of utilities 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. 	List and maps showing establishment of utilities. Contingency plan for services disruption.	PIU will prepare preliminary list and maps of utilities. During detailed design phase, contractor to prepare list and operators of utilities and contingency plan	Contractor	Preconstruction
Public consultations		Continue information dissemination, consultations, and involvement or participation of stakeholders during project implementation.	Disclosure records; consultations	PIU (M & I) TMS (I)	Project cost	During Preparation of IEE report. Prior to starting construction During construction

Issue for concern	Environmental Impact	Mitigation measure(s)	Monitoring indicator(s)	Responsible party (ies) I-Implement M-Monitoring	Fund Sources for Implementing Mitigation Measure	Time Frame
Disaster management	Extreme climate events such as intense rainfall (flooding), cyclone etc. and fire may cause damages to lives and property.	Adoption of appropriate disaster risk reduction strategy, emergency preparedness and recovery, training/orientation program for lecturers and students and construction worker, etc. 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.	Disaster Management Plan in place for the FCT. Scheduled operation and maintenance table for the canal system associated with project site in place Observation of adjacent canal.	PIU (M) Contractor (I) Maintenance engineer of the FCT at UOK	Project cost	Before construction
DESIGN						
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 logged conditions around the site. Currently the canal that borders the western part of the land with the 12m access road is poorly drained resulting in flooding and also stagnant water. The site is located close to main canal that discharges rain water from surrounding areas. This will increase the risk of flooding of the FTC and sewage system.	(a) Consult SLLRDC Kelaniya Pradeshiya Saba and the resident population and develop road side drains. May require and construction of drains to manage the flood waters in the area. (b) Develop a proper drainage mechanism for the project site after careful evaluation. Coordinate with the Kelaniya Pradeshiya Saba, Ministry of Megapolis and Western Development, SLLRDC and Department of Railway to remove pipe culverts that are said to be blocking the water flow in the canal systems around the project site and improve the water flow.	Flood situations properly managed and controlled Arrangement for proper diversion of storm water runoff in place	PIU (I) Site Engineer (M)	Incidental to the construction cost	During construction After mobilization of contractor at site and during establishment of construction n camp

Issue for concern	Environmental Impact	Mitigation measure(s)	Monitoring indicator(s)	Responsible party (ies) I-Implement M-Monitoring	Fund Sources for Implementing Mitigation Measure	Time Frame
		<ul style="list-style-type: none"> (c) Establish storm water management system for the site during detail design process (d) Maintain design features such as drainage structures (e) Select the foundation design that will least impact the surrounding community such as the cast in situ RC pile foundation (f) Erosion control measures should be taken (g) Ground Water Recharge Pit/ Rainwater Harvesting Structures: Unlined drain in the subproject 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 subproject area. These should be permanent areas. 				

Issue for concern	Environmental Impact	Mitigation measure(s)	Monitoring indicator(s)	Responsible party (ies) I-Implement M-Monitoring	Fund Sources for Implementing Mitigation Measure	Time Frame
Integration of energy efficiency and energy conservation programs in design of project components. Noncompliance 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.	Specifications for rain water harvesting structures, electrical fixtures, details of water heating system Observations Check whether energy efficient lighting systems are installed	PIU (I) Site engineer(M)	Project cost	During finalization of detailed designs of FCT buildings PMU
Solid and liquid waste	Lack of properly designed disposal mechanisms for solid and liquid waste may lead to contamination of surface and ground water resources	(a) Incorporate solid waste storage area in the plan. (b) Design a waste water treatment plant to accommodate 600 persons usage. Plan should be approved by ADB prior to implementation. (c) 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	Review waste disposal plan. Review of the waste water treatment plant and sewerage system (plans should be reviewed with ADB).	PIU (M) Design architect (I)	Project cost	During finalization of detailed designs of FCT building
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	Review of design plans for fire safety	PIU (M) Site Engineer (I)		At design stage and during construction.

Issue for concern	Environmental Impact	Mitigation measure(s)	Monitoring indicator(s)	Responsible party (ies) I-Implement M-Monitoring	Fund Sources for Implementing Mitigation Measure	Time Frame
CONSTRUCTION PHASE						
Site clearance 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 (a) Permanent and temporary work should be undertaken to control soil erosion, sedimentation and water pollution. (b) Top soil generated from construction sites should be stored properly (c) Use of silt traps and erosion control measures close to water bodies is also necessary. (d) Construction activities including earth work and construction of cross drainages should be conducted during the dry season (e) Temporary earth drains should be provided until required line or earth drains are provided after excavation and other construction activities (f) 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	Site observation and reporting	PMU(M) Contractor (I) Project site Engineer from the Building Department (I)	Project cost	Weekly during construction

Issue for concern	Environmental Impact	Mitigation measure(s)	Monitoring indicator(s)	Responsible party (ies) I-Implement M-Monitoring	Fund Sources for Implementing Mitigation Measure	Time Frame
Land preparation	Activities such as site clearing, construction of culverts, removal of trees and green cover vegetation and etc., will potentially impact the ecological resources. Noise generated from construction vehicles, equipment, and vehicle traffic has the potential to disturb breeding, foraging, and migrating behavior of wild species	(a) Awareness programs should be organized for the workforce about the importance of flora, fauna and ecology of the wetland. (b) Contractor shall adhere to the guidelines and recommendation made by CEA and DS regarding removal of trees (c) Contractor should especially be aware not to introduce any alien species during construction related activities. Vehicles being brought in should be clean. (d) Saplings for tree planting program should comprise of native or endemic species which is suitable to the existing ecology condition Refer vol II annex XXX Rapid Biodiversity assessment recommendations	Site observation and reporting Check for the CEA, recommendation letters	PIU(M) Contractor (I) Project site Engineer (I)	Project cost	During construction
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.	Location of slope protection Observations and water sample checks for mosquito larvae.	PIU (M) Contractor (I)	Contractor fee	During construction. Monthly PHI checks especially during rainy season.
Establishment of baseline environmental parameters.	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	(a) Conduct documentation of areas for construction zone (camp, staging, storage stockpiling, etc.) and surroundings (within direct impact	Records and photographs	PIU (M) Contractor (I)	Contractor	Once prior to construction and thereafter quarterly.

Issue for concern	Environmental Impact	Mitigation measure(s)	Monitoring indicator(s)	Responsible party (ies) I-Implement M-Monitoring	Fund Sources for Implementing Mitigation Measure	Time Frame
	<p>audit process because it forms the standard against which environmental impacts are assessed.</p> <p>Impact of vibration noise, ground water pollution due to solid and waste water disposal etc.</p>	<p>zones). Include photos and GPS coordinates</p> <p>(b) Conduct base line monitoring in respect of ambient air quality, water quality, and noise levels as per monitoring plan.</p> <p>(c) Thus, baseline monitoring for water quality, noise, vibration will be audited prior to the start of construction and in site supervision.</p>				
Air pollution	<p>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.</p>	<p>Air quality parameters will meet IFC-WB-EHS standards.</p> <p>(a) Wet down and spray water at construction site, quarries if required to reduce dust emissions during</p> <p>(b) Transportation of construction materials should be controlled by enforcing speed limits on the vehicles close to site</p> <p>(c) Take steps to avoid dust emissions during loading and unloading of construction material. Tarpaulin covering is mandatory on trucks/lorries which are used for transporting materials.</p> <p>(d) All filling works are to be protected or covered in a manner to minimize dust generation</p> <p>(e) The air quality monitoring will be conducted as per the plan</p> <p>(f) 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 gazette under NEA</p>	<p>Observations – controlled dust emissions.</p> <p>Air quality monitoring results and the water spray records available</p> <p>Dust screens in place.</p> <p>Construction material stored properly. Record of vehicle emission tests according to the standards issues under CEA</p>	PIU	Subproject	Quarterly and continued annually during operation

Issue for concern	Environmental Impact	Mitigation measure(s)	Monitoring indicator(s)	Responsible party (ies) I-Implement M-Monitoring	Fund Sources for Implementing Mitigation Measure	Time Frame
		(g) The Contractor shall maintain a record of pollution under control for all vehicles and machinery used during the contract period, which shall be produced for verification whenever required				
Noise pollution	Construction noise can disturb surroundings	<p>(a) All machinery, equipment and vehicles should be maintained in a good condition by engaging skilled mechanics and regularly maintained. 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.</p> <p>(b) Contractor must ensure that all vehicles and equipment used in construction shall be fitted with exhaust silencers.</p> <p>(c) Construction work should be limited to daytime.</p> <p>(d) At the construction sites, noisy construction work such as crushing, operation of diesel generator sets, use of high noise generation equipment shall be stopped during the night time between 10:00 p.m. to 6:00 a.m.</p> <p>(e) Adhere to noise levels stipulated under IFC-WB-EHS standards for noise in mixed development area.</p>	Observation and noise measure	PIU(M) Contractor (I)	Subproject	Quarterly and continued annually during operation.

Issue for concern	Environmental Impact	Mitigation measure(s)	Monitoring indicator(s)	Responsible party (ies) I-Implement M-Monitoring	Fund Sources for Implementing Mitigation Measure	Time Frame
Wastewater and sewage disposal	<p>Untreated wastewater disposal will degrade surface and groundwater.</p> <p>Untreated sewage will contaminate and degrade surface and ground waters as well as pose health risks.</p>	<p>Release of wastewater will meet standards set by Sri Lanka Standards Institute (SLSI).</p> <p>Release of sewage will have to conform to IFC-WB-EHS standards if released in to the environment at any point.</p>	Water quality test results.	PIU/PMU (I &M)		Quarterly
Solid waste disposal	Haphazard disposal will pose a threat to the area's ecology, scenic beauty and public health.	<p>(a) A solid waste management plan will be prepared by the contractor in consultation with local civic authorities.</p> <p>(b) Make arrangements with the local authority on disposal of solid waste generated during construction.</p> <p>(c) Under no circumstances should the solid waste be burned on site. Additionally, under no circumstances will any construction waste will be disposed of around the project site. Garbage bins should be provided to all workers-based camps, and construction sites.</p> <p>(d) Contractor shall ensure that waste shall not be disposed of near storm water natural drain in the surrounding of the site and along the access path.</p>				
Drinking water availability at construction camp and construction site	<p>Non availability of drinking water for labours will result in dehydration and health risk.</p> <p>Lack of usable Ground water may lead to water constraints at the construction site. Water quality shows that it is acidic</p>	<p>(a) Sufficient supply of potable water to be provided and maintained at the site for the workers.</p> <p>(b) The drinking water will be obtained from the market or any alternative source.</p>	Water supply source and availability of water identified. Water availability plan.	PIU (I) Contractor (M)	Contractor Fee	Regularly during construction phase

Issue for concern	Environmental Impact	Mitigation measure(s)	Monitoring indicator(s)	Responsible party (ies) I-Implement M-Monitoring	Fund Sources for Implementing Mitigation Measure	Time Frame
	with a pH value of 6.66 (refer geotechnical report).	<ul style="list-style-type: none"> (c) The drinking water will be stored in a suitable size storage tank to ensure uninterrupted availability. (d) In the event pipe borne water supply which is to be obtained before construction is not sufficient for construction purpose then water bowsers will have to be brought in and storage tanks set up (e) Contractor will submit his plan on ensuring water availability at the site for drinking, sanitation and construction. The original source of the water supplied by the tankers will be recorded.. (f) Obtain the water supply connection to the site from the NWSDB (g) 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. (h) Wastage of water during the construction should be minimized 				
Damage to building in the area during piling	Piling activities may cause soil movement underground and also vibrations which may cause cracks etc in surrounding houses and buildings.	<ul style="list-style-type: none"> -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. 	<ul style="list-style-type: none"> -Building status assessment report. -Stakeholder meeting minutes 	PIU (I) Site engineer (M)	Project	Immediately prior to piling activities. Stakeholder meeting during piling activities.
Resources mobilization	Allocation of space for storage yard for construction material, labour camp, project office	(a) Adequate provision should be made on site to mobilize the construction equipment.	Check for approval letter on release of land for the purpose	Contractor (I) PMU/PIU (M)	Contractor	At the time of establishment of the

Issue for concern	Environmental Impact	Mitigation measure(s)	Monitoring indicator(s)	Responsible party (ies) I-Implement M-Monitoring	Fund Sources for Implementing Mitigation Measure	Time Frame
and allocation of space	requires addition amount of space. Use of additional land for resource mobilization during construction may lead to conflicts.	<ul style="list-style-type: none"> (b) Selection of land for construction material storage should be done carefully avoiding conflict with Kelaniya Pradeshiya Saba approval. (c) Siting of the construction camp shall be as per the guidelines provided by ICTAD Guidelines for Siting and Layout of Construction Camp Guidelines for Siting. Details of layout to be approved by PMU. (d) Potential sites, within the FCT plot, for the labor camp will be lined up to be visited by the environmental expert of PMU. The one having least impacts on the environment will be approved by the PMU. (e) Use local materials as much as possible to reduce the need for storage space (f) 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. (g) Construction camp sanitation facilities shall be adequately planned. (h) Selection of local un-skilled and skilled workers for the proposed 	from respective authorities Observe the location of construction camp site, sanitary facilities etc			construction camp and finalizing the storage areas.

Issue for concern	Environmental Impact	Mitigation measure(s)	Monitoring indicator(s)	Responsible party (ies) I-Implement M-Monitoring	Fund Sources for Implementing Mitigation Measure	Time Frame
		construction activities can reduce the requirement of land for labour camps.				
Use and transport of natural resources	Impact on the natural ecosystem by means of exploitation. Extraction, transportation and storage of construction materials may give negative impact such as noise, air, water, soil pollution, reduction of scenic beauty.	<ul style="list-style-type: none"> (a) Extraction of construction materials should be undertaken following ICTAD Operation and Re-Development of Borrow Areas Guidelines. (b) Environmental requirements and guidelines issued by the CEA, and LAs should be followed with respect of locating material extraction sites (c) Transport, loading and unloading of construction materials should not cause nuisance, noise, vibration and dust (d) Sand, rubble, metal bitumen and cement should be covered to ensure protection from dust to avoid emissions. 	<p>Availability of permits at the raw material extraction sites</p> <p>Observation and reporting</p>	<p>PIU (M)</p> <p>Contactor (I)</p>	Contactor	During construction period
Transport of construction material	Transportation of construction materials on road network can cause damages to the access roads.	<ul style="list-style-type: none"> (e) The Contractor should obtain permits from LAs to use local roads prior to transportation of construction materials, machineries etc. (f) Construction materials shall not exceed the carrying capacity of the local road network. (g) If it is likely to cause damage to public roads, provision should be made for their repair as part of the contract. 	<ul style="list-style-type: none"> a) Check for contractors permits from LAs to use local roads b) Check and observe whether construction materials are carried beyond the carrying capacity 	<p>PIU (M)</p> <p>Contactor (I)</p>	Contractor fee	During construction

Issue for concern	Environmental Impact	Mitigation measure(s)	Monitoring indicator(s)	Responsible party (ies) I-Implement M-Monitoring	Fund Sources for Implementing Mitigation Measure	Time Frame
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.	<p>(a) 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.</p> <p>a) Proper solid waste disposal, sanitation and sewerage facilities (drinking water, urinals, toilets and wash rooms in working condition should be provided to the site of labour camps</p> <p>b) The environmental specialist of PIU shall approve these disposal sites after conducting a joint inspection on the site with the contractor</p> <p>c) Contractor shall ensure that waste shall not be disposed of near storm water natural drain in the surrounding of the site and along the access path</p> <p>d) Practice cleanliness and good housekeeping practices on site. There should be a demarcated waste storage area on site. Provision of proper drainage facilities to minimize water stagnation around worker-based camps</p>	<ul style="list-style-type: none"> • Waste disposal sites, waste management plan in place • Contractor has an agreement for disposal of waste with the Kelaniya Pradeshiya Saba in place. • Observation on cleanliness at the construction site. • Solid waste storage area demarcated and in operation • All construction solid waste removed at end of construction 	PIU (M) PHI (M) Contractor (I)	Contractor fee	Regularly during the construction phase (Weekly)

Issue for concern	Environmental Impact	Mitigation measure(s)	Monitoring indicator(s)	Responsible party (ies) I-Implement M-Monitoring	Fund Sources for Implementing Mitigation Measure	Time Frame
Occupational Health and Safety	Unless worker safety is complied with, it can lead to injury and other health risks. Absence of an emergency plan will lead to death to the worker and economic cost to the project in event of an unexpected accident.	<p>Contractor to comply with ADB Environmental, Health, and Safety Guidelines, Labour Organization (ILO) convention No. 62, and Factory Ordinance to the extent that are applicable to his contract First aid treatment will be made available for all injuries likely to be sustained during work.</p> <p>Develop and implement comprehensive site-specific health and safety plan on Occupational Health and Safety</p> <p>A management strategy and applying practices to eliminate, or minimize, fatalities injuries, and illnesses for workers performing activities and tasks associated with the project.</p> <p>Include in the health and safety plan measures such as (i) type of hazards in the construction of the FCT buildings, (ii) corresponding personal protective equipment for each identified hazard, (iii) health and safety training for the site personnel, (iv) procedures to be followed for all site activities, and (v) documentation of work-related accidents.</p> <p>Provide medical insurance coverage and indemnity for workers.</p> <p>(a) The contractor will conform to all anti dengue instructions given to him by the PHI and the PIU</p> <p>(b) Workers employed on mixing cement, lime mortars, concrete, etc., will be provided with protective footwear and protective goggles</p> <p>(c) Workers engaged in welding works will be provided with welder's protective eye shields</p>	Health and safety plan in place First aid available onsite (appropriately equipped). Observations on safety attire of workers. Regular jobsite safety inspections being conducted. Data on available personal protective equipment.	PIU (M) Contractor (I)	Contractor fee	Regularly during the construction phase.

Issue for concern	Environmental Impact	Mitigation measure(s)	Monitoring indicator(s)	Responsible party (ies) I-Implement M-Monitoring	Fund Sources for Implementing Mitigation Measure	Time Frame
		<p>(d) The use of any toxic chemical will be strictly in accordance with the manufacturer's instructions. The PIU will be given at least 6 working days' notice of the proposed use of any chemical. A register of all toxic chemicals delivered to the site will be kept and maintained up to date by the contractor</p> <p>(e) Use of licensed and trained vehicle operators, workers should adopt necessary safety measures as stated in the contract including using of hard hats, boots, gloves and appropriate clothing.</p> <p>(f) Workers employed on mixing cement, lime mortars, concrete, etc., will be provided with protective footwear and protective goggles</p> <p>(g) Workers engaged in welding works will be provided with welder's protective eye shields</p> <p>(h) The use of any toxic chemical will be strictly</p> <p>(i) First aid provisions available on site and personnel trained on use.</p> <p>(j) Keep the workplace free from hazards.</p> <p>(k) Provide suitable communication and information on safety</p> <p>The construction site will be properly barricaded through Mild Steel sheets of adequate height to avoid noise impacts in the surroundings.</p> <p>Onsite emergency management plan will be prepared by the contractor with the consultation of the PIU</p>				

Issue for concern	Environmental Impact	Mitigation measure(s)	Monitoring indicator(s)	Responsible party (ies) I-Implement M-Monitoring	Fund Sources for Implementing Mitigation Measure	Time Frame
Disaster Management Plan for flooding	Life and property damage. Economic cost for the project	For natural calamities, disaster management plan prepared by the PIU under the provisions of Disaster Management Act. Refer disaster management under "planning	Onsite disaster management plan documented and available with the PIU	PIU (M) Contactor (I)	Contractor fee	Mock drills every quarter

Issue for concern	Environmental Impact	Mitigation measure(s)	Monitoring indicator(s)	Responsible party (ies) I-Implement M-Monitoring	Fund Sources for Implementing Mitigation Measure	Time Frame
Clearing of construction 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.	Restoration plan and records of preconstruction of temporary sites	PIU (M) Contractor (I)	Contractor fee	End of construction phase
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.	(a) Project landscape activities have to be done as per either detailed design or typical design guidelines. (b) Plant floral species that are recommended in the IEE creating a green belt along the Mudun Ela boundary and also as a visual barrier on the boundary overlooking the waste dump.	Site observation and reporting. Note trees and shrubs planted by the project.	PIU(M) Contractor (I)	Contractor fee	Towards end of construction Tree planting can be done once structure is in place.
OPERATIONAL PHASE						

Issue for concern	Environmental Impact	Mitigation measure(s)	Monitoring indicator(s)	Responsible party (ies) I-Implement M-Monitoring	Fund Sources for Implementing Mitigation Measure	Time Frame
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 plan through an approved monitoring authority. IFC-WB-EHS standards for noise and air will apply and SLIS will apply for the release of wastewater.	Monitoring results and relevant standards	CEA/ Kelaniya Pradeshiya saba(M) PMU/PIU (I)	UOK	As per the monitoring plan
Drainage Congestions	Stagnation or blocking the water flows may occur due to sediments, improper disposal of debris during maintenance activities or ignorance. This will provide suitable habitats for vectors like mosquitoes etc. In the absence of a proper storm water drainage system there will be a risk of water logged conditions around the site.	(a) University needs to undertake regular maintenance of the drainage system to avoid drainage congestions that may cause local flooding (b) 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	Site observation of congested drains and reporting	Kelaniya Pradeshiya saba PHI (M) Maintenance engineer at UOK (I)	UOK	Once in 4 months

Issue for concern	Environmental Impact	Mitigation measure(s)	Monitoring indicator(s)	Responsible party (ies) I-Implement M-Monitoring	Fund Sources for Implementing Mitigation Measure	Time Frame
Solid waste management	Irregular collection of solid waste will increasing the , risk of solid waste piling up on FCT premises and would be unhygienic condition for the student population. It can also lead to an increase in vector population and increase health risks.	(a) Management plan. Ensure demarcated solid waste storage area with source separation for organic waste and other domestic non-organic waste. (b) Encourage composting programs. Follow up with Pilisaru Program of CEA. (c) Place color coded bins at necessary places to dispose waste.	Design plan waste stage area designated Cleanliness and good housekeeping practices observed. Waste management plan in place. Review solid waste management plan.	Kelaniya Pradeshiya saba PHI(M) Maintenance engineer at UOK (I)	UOK	Once in 3 months
Domestic liquid waste disposal	Poor maintenance of sanitary facilities and improper disposal of domestic waste water will result in environmental pollution.	(a) Properly designed waste water treatment plant is in place (b) Ensure that the domestic waste water is directed to waste water treatment plant in conformity with the CEA, Local Authority guidelines and should not be discharged to the environment prior to the treatment. (c) In instance of overflow, leaks, immediate repairs should be carried. Establish and collaborate with the Local Authority under such circumstances.	Check the design plans for cesspits and soakage pits. Review wastewater treatment plant maintenance. Carry out water quality tests of the treatment plant effluent.	Kelaniya Pradeshiya saba PHI(M) Maintenance engineer at UOK (I)	FCT at UOK operation cost	At the design phase and thereafter once in 6 months or when need arises.
Waste generated on account of operation and maintenance of buildings		(d) 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 with the supply at the time of the agreement is drawn	Waste generation of operation and maintenance of solar PV cells and panels	Kelaniya Pradeshiya Saba (M) UOK and the suppliers of the renewable energy systems (I)	FCT at UOK operation cost	During the entire operational phase

Issue for concern	Environmental Impact	Mitigation measure(s)	Monitoring indicator(s)	Responsible party (ies) I-Implement M-Monitoring	Fund Sources for Implementing Mitigation Measure	Time Frame
Sanitary facilities	Discharge of untreated or insufficiently treated sewage, and lack of maintenance of sanitary facilities may lead to: <ul style="list-style-type: none"> • Contamination of drinking water (ground and surface) • Spreading of diseases among the student population and surrounding community 	(a) Ensure proper maintenance of the sanitary facilities (flushable and clean) (b) Train maintenance and operation staff to monitor and repair leaks from cracked containment structures, broken pipes, faulty valves and similar structures. (c) Septic tanks will be regularly emptied and maintained (d) Provide a suitable sump/ overhead tank, taking into account the daily requirement of water to ensure uninterrupted water supply for the sanitary facilities. (e) Maintain a required ratio of male/female toilets with in the faculty.	Observation on cleanliness and maintenance of sanitary facilities. Maintenance schedule in place No leaks observed. Water supply is available in the toilets. The disposed waste water will conform to the waste water discharge standard stipulated under the NEA		FCT at UOK operation cost	Bi-annually

<p>Health and Safety of students</p>	<p>In practical sessions on laboratories students may be faced with accidents. Risk of accidental deaths due to negligence</p>	<p>Train the students on occupational risk involved in handling the equipment. Train the students and teachers on managing risk and emergencies.</p> <ul style="list-style-type: none"> - Provision of first aid kit and train the teachers on it. A medical centre will be an added advantage. - Emergency switches should be properly covered. - Fire extinguishers must be placed adequately and they should be working at all times. - Proper segregation, collection and disposal of domestic solid wastes - Ensure the road safety of the trainees on the A1 road Place a traffic light for the already existing pedestrian crossing on the Kandy Colombo highway for students to cross the road 	<p>Observations and safety reports Traffic lights in place</p>	<p>RDA for traffic light installation the(I) FCT at UOK on the traffic light installation (M)</p>	<p>FCT at UOK operation cost or RDA cost for placement of traffic lights.</p>	<p>Annually</p>
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Issue for concern	Environmental Impact	Mitigation measure(s)	Monitoring indicator(s)	Responsible party (ies) I-Implement M-Monitoring	Fund Sources for Implementing Mitigation Measure	Time Frame
Onsite emergency plan for minor accidents mishaps and disaster management plan. For natural disaster such as flooding		(a) 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	On site emergency plan and disaster management plan documented and in place	Dean of the FCT of UOK (I) Disaster management center or the Pradeshiya Saba Kelaniya (M)	FCT at UOK operation cost	Mock drills carried out every quarter. During the entire operational phase
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	(a) The faculty head with the appropriate support staff allocated for the purpose will be responsible for the maintenance of shrubs, tree and landscape of the area. Minimum of 90% survival of plants will be maintained. Any short fall of this amount will be replaced during the monsoonal period	Survival of plants, trees and shrubs in the landscape area	PIU or UGC (M) Faculty head and associated staff (I)	FCT at UOK operational cost	Every year before the onset of the monsoon period

Issue for concern	Environmental Impact	Mitigation measure(s)	Monitoring indicator(s)	Responsible party (ies) I-Implement M-Monitoring	Fund Sources for Implementing Mitigation Measure	Time Frame
Adopt food safety guidelines	If student don't maintain personal hygiene, it could be issue for the students and lecturers	<ul style="list-style-type: none"> (a) Include the under mentioned conditions in the contractual arrangement with the canteen operator (b) Health checks of the canteen should be done annually (c) Prepare set of rules on personal hygiene (d) Adopt food safety regulation imposed by the Ministry of health. Encourage the following among the student (e) Encourage regular hand washing during working hours (f) Strike rules for canteen operators Scalp hair should be fully covered 	PHI Reports, observations.	Faculty head and the supporting staff at the university (I) Praeshiya saba Kelaniya PHI (M)	Canteen operator cost	Bi-annual spot checks
Change in land use with unauthorized development	<p>Likely change of land use due to squatter / encroachment within subproject land area and the surrounding.</p> <p>Likely change of land use due to building and access road development in the subproject area.</p>	<ul style="list-style-type: none"> (a) 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. (b) Squatter development along the subproject shall be strictly avoided by proper regulation and vigilance. UOK to coordinate with LA. (c) All debris, piles of unwanted earth, spoil materials and temporary structures should be cleared away from the subproject site and disposed at locations designated or acceptable to the SLLRDC, LA and CEA. ICTAD guidelines are applicable. 	Observations	PIU/PMU (M) Pradeshya Saba (I)	UOK	Bi-annual

Issue for concern	Environmental Impact	Mitigation measure(s)	Monitoring indicator(s)	Responsible party (ies) I-Implement M-Monitoring	Fund Sources for Implementing Mitigation Measure	Time Frame
		(d) Subproject landscape activities have to be done as per either detailed design or typical design guidelines given as part of the bid documents.				

P.S. Note: PIU: project implementation unit, PHI: public health inspector allocated to the area from the pradeshiya saba kelaniya, UOK, university of Kelaniya, NEA; National Environmental Act.