

Environmental Management Plan of the Central Expressway Project - Section 02 "A Case Study of Sri Lanka"

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Abstract

The development of the infrastructure facilities in Sri Lanka has been identified as a vital requirement of the economic development in the country, thereby to improve the welfare of the citizens. Under the development of these infrastructure facilities, development of the road networks seems to be crucial. However, most of these developments are likely to detrimental to the environment if not managed and regulated, properly.

Mitigating environmentally negative impacts and enhancing the positives of the development proposals (projects) is a regulatory requirement of Sri Lanka. Accordingly, the Central Expressway (CEP) of which having 03 sections as Section 01, Section 02, and Section 04 having a total length of 136.9 Km., underwent an Environmental Impact Assessment (EIA) process in 2016 and granted environmental approval dated September 2016 subject to conditions. The CEP is being implemented in section wise under separate contracts.

The Environment Management Plan (EMP) of the CEP-Section 02 from Mirigama to Kurunegala, having a total length of 39.29 Km covers all three phases of the project, viz. preconstruction, construction, and operation. Since the CEP-Section 02 trace runs through physically, ecological and socially sensitive area, the EMP of it includes the actions relevant to mitigation of negative environmental impacts of such environmental attributes and enhancing the positive as identified in the environmental impacts assessment report, conditions in the environmental approval granted to the project and post-EIA studies carried out during the preconstruction phase of the project.

Also, the EMP has provided the implementation and monitoring responsibilities and incorporated the cost of the same, as well.

Further, the EMP is a part of the Contract, and implementation of it is a contractual obligation of the Contractor relevant to the construction phase and the Road development Authority (RDA) has the responsibility to implement the EMP relevant to preconstruction and construction phases of the project. The Employer (RDA) and the appointed Supervision Consultant (Engineer) oversee the Contractor's implementation of the EMP relevant to the construction phase and intimate the Contractor the non-compliances with necessary actions to comply. In addition, the project approving agency and the appointed monitoring committee monitored the project activities periodically to check the compliance with the EMP requirements of the three phases of the project to ensure the project is implementing environmentally and socially sustainable.

1. Background

In Sri Lanka, it has identified the requirement of developing the country's infrastructure facilities as a critical path to achieve its economic targets and thereby to improve the citizen's welfare. However, most

of these developments are likely to detrimental to the environment if not such development projects are managed and regulated properly. In this context the Sri Lankan law particularly, the National Environmental Act (NEA), Coast Conservation Act and Fauna and Flora Act, provide the legal base to manage and regulate the development activities to sustainability through environmental impact assessment processes, which is important to identify the likely impacts of the development projects on the environment prior to implementation and make necessary recommendations to mitigate the negative environmental impacts and enhance the positive impacts.

In this regard, the Environmental Management Plan (EMP), which is constructed during the EIA process incorporating the methods and procedures to mitigate the negative environmental impacts and enhance positive impacts along with a plan for monitoring of such mitigation actions to identify for effectiveness/weaknesses, plays an avital role.

Moreover, the EMP provides a framework to minimize adverse environmental impacts of the project of its all phases i.e. preconstruction, construction, and operation, and defines the roles and responsibilities of the key stakeholders and reporting and feedback mechanisms. The EMP also provides a basis for a systematic collection of data to determine the actual environmental effects of the project, compliance with regulatory standards and measures the success/progress of the environmental protection activities identified during the EIA process.

However, this plan is not static and may be subjected to update time to time-based on post-EIA studies, to suit the actual site conditions, nature of construction, design changes (if any), etc.

Accordingly, this case study is on the EMP of the Central Expressway Project (CEP)-Section 02 of Sri Lanka which is implemented by the RDA and executed by the Ministry of Highways and Road Development.

2. Introduction to Central Expressway Project (CEP)

The CEP from Kadawatha to Dambulla and the Link Expressway from Pothuhera to Galagedara with the Highway link to Ambepussa is the 4th access-controlled expressway in Sri Lanka, which connects major cities of the country known as Gampaha, Veyangoda, Mirigama, Pothuhera, Kurunegala, Rideegama, Melsiripura, Galewela, Dambulla, Rambukkana and Galagedara. Interchanges of the CEP are at Kadawatha (system interchange), Gampaha, Veyangoda, Mirigama, Nakalagamuwa, Pothuhera (system interchange), Dambokka, Kurunegala, Rideegama, Melsiripura, Galewela, Dambulla and Galagedara. The access to expressway is provided only at the Interchanges with toll systems and the system interchanges provide connectivity among the expressways.

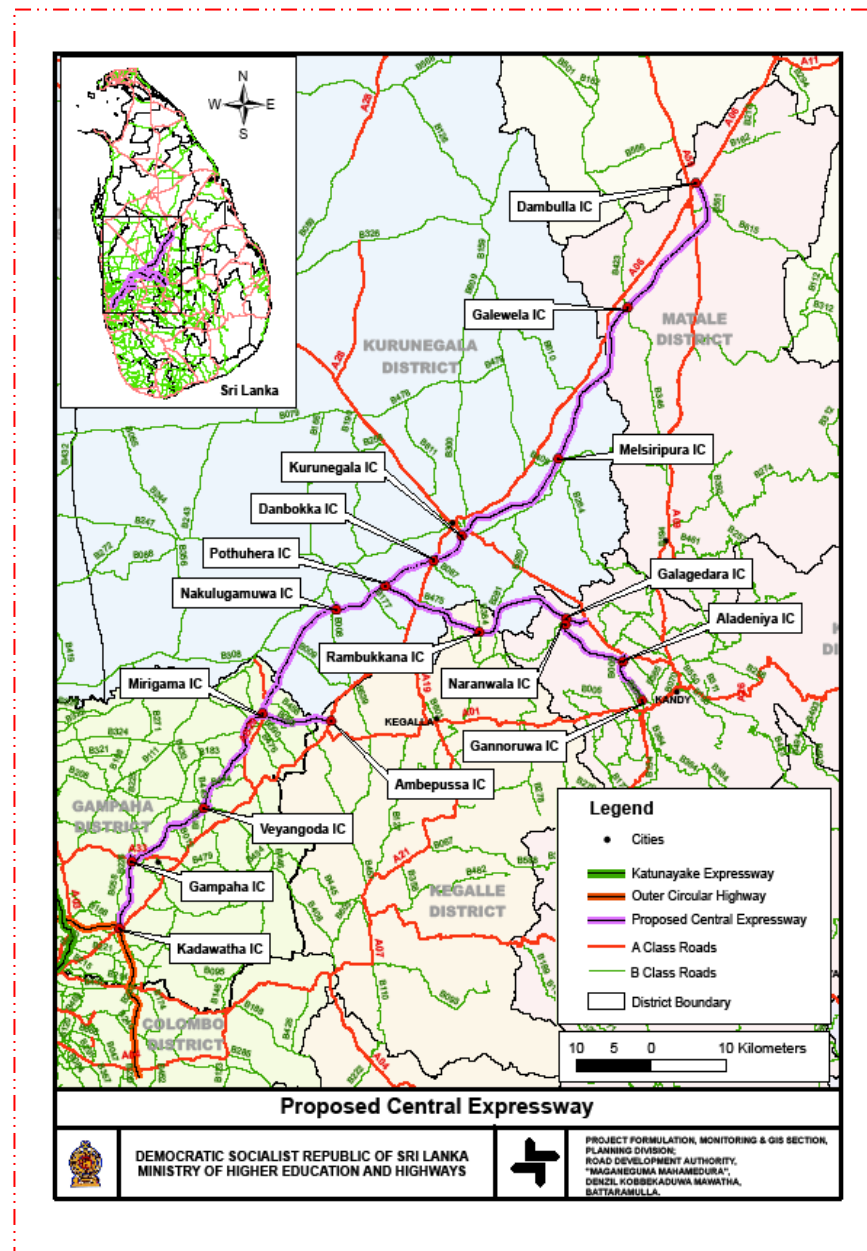
The CEP has been divided into 04 sections for easy implementation and this division shows in the Table 01, below.

Table 01: Sections of the CEP - Section 02

Section No.	Name of Section	Length (km)
Section 01	Kadawatha - Meerigama	37.09
Section 02	Meerigama - Kurunegala	39.29
Section 03	Pothuhera - Galagedara	34.12
Section 04	Kurunegala - Dambulla	59.30

The CEP-Section 02 has a length of 39.29 km. and designed as a dual carriageway, an access-controlled expressway comprising 04 interchanges at Mirigama, Nakalagamuwa, Dambokka, and Kurunegala and a system interchange at Pothuhera. The map showing the location of the CEP-Section 02, interchanges and the interchanges connectivity roads are given Figure 01, below.

Figure 01: Map showing location of the CEP-Section 02,



3. Environmental Impact Assessment of CEP-Section 02

The CEP Section 01, Section 02, and Section 04, a total length of 136.9 km, underwent an Environmental Impact Assessment process in 2016 and granted environmental approval in September 2016 subject to

conditions. The CEP Section 03 underwent a separate environmental impact assessment process later to the above.

This environmental approval granted to the CEP Section 01, Section 02, and Section 04 by the Central Environmental Authority, as the project approving agency is basically on the conditions to mitigate impacts on hydrological and drainage, biological, geotechnical and socioeconomic aspects, and requirements of mitigation of the impacts of extraction, handling and transporting of construction materials and maintaining the air quality, noise and vibration and disposal of wastes.

4. Existing Environment of the CEP-Section 02

4.1. Physical Environment

The CEP-Section 02 falls within the western and north-western parts of Sri Lanka, belonging to wet and intermediate zones, respectively. The topography of the area is predominantly flat or undulating with scattered hills (03 Nos.). A major portion the CEP-Section 02 is on paddy fields and low-lying areas and the rest is on high ground.

The geological formations throughout the trace is so far shown stable. However, soft grounds are found basically in paddy field areas and more often the soft soil layers in such soft grounds are at shallow depth regions, with varying thickness.

In the hydrological point of view, the CEP-Section 02 lies mainly in Maha Oya and Deduru Oya basins, in Sri Lanka. Several major streams with higher discharges and minor streams with lower discharges are encountered in the expressway area. The expressway has a single crossing over some of these streams and multiple crossings over one stream with higher discharge known as Kuda Oya. The low-lying areas encountered by the project are approximately 25 Km and 20 Km of it are vulnerable to flooding. Thus, there is a high possibility of aggravation of flood if not the expressway is designed to address the issue.

Concerning the water quality, the EIA report dated May 2016 reveals that water quality in the CEP-Section 02 area is contaminated by organic matter and fecal coliform because of the agricultural activities, particularly paddy cultivation. Further, the findings of the said EIA reveal that the groundwater sources are also contaminated. In this situation, there is a high risk of more contamination of surface water bodies and groundwater bodies particularly during the construction of the expressway bringing about impacts to the users.

4.2. Biological Environment

The CEP -Section 2 traverses over a variety of natural and manmade habitats including terrestrial, aquatic systems such as streams, irrigation canals, and semi-aquatic systems such as paddy fields. Also, the CEP-Section 02 traverses peripheral to two declared forest reserves known as Girana Kanda Forest Reserve and Weheragala Kanda Forest Reserve that having a somewhat some extent of forest cover. These terrestrial, aquatic, and semi-aquatic habitats harbor a variety of faunal and floral species including critically endangered plant species known as *Wrightia puberulla*. As per the post-EIA Ecology, the study revealed that the percentage of the native plant species encountered in the project are is 73%, and 6.5% out of it is endemic to Sri Lanka. Also, during the above study, the recorded number total faunal species is 192 and 11 out of these are endemic to Sri Lanka. The home garden systems in the project area are also

composed of many mixed cultivations, somewhat dominated by coconut, giving incomes to the landowners.

4.3 Social Environment

The socio-economic attributes in the project area that are mainly impacted are residential, commercial, and agricultural, etc., public roads, etc. Accordingly, 4426 lands lots with an extent of 137,074.3 perches have been acquired and about 8922 Nos. the public was affected.

Also, not only land acquisition and loss of income due to the project brings about impacts to the public but the public who resides at the boundary of the Right of Way (RoW) of the expressway may affect both during the construction and operation phases of the project as residing the public very close to the RoW of the project is more.

Accordingly, of the CEP-Section 02, the expressway was designed to mitigate the negative impacts on such existing physical, biological, and social environments and proper monitoring.

In addition to the above negative impacts, the project ensures enhance of positive impacts such as job opportunities for the local public, improvement of access roads, increase of land values, etc.

5. The Environmental Management Plan of the CEP-Section 02

The construction of CEP-Section 02 involves activities that are detrimental to the environment. Accordingly, the EMP of the CEP-Section 02 has been developed incorporating measures/recommendations and responsibilities more fully to mitigate the adverse negative environmental impacts on aforesaid physical, biological and social environmental attributes and enhance the positive impacts, basically covering the following aspects related to the project's preconstruction, construction, and operational phases.

1. Land acquisition and loss of income
2. Drainage and hydrology
3. Slope stability and soil erosion
4. Biological and Ecological aspects including conserving endangered species and
5. Air pollution, noise pollution, and vibration during construction
6. Traffic noise during operation.
7. Exploitation of materials
8. Management Wastewater
9. Health and safety requirement of the project's employees and the public.
10. Management construction and solid wastes with appropriate disposal.
11. Urban planning aspects
12. Enhance the environment through greenery works, job opportunities for local public, increase of land values, improvement of local access roads etc.

Also, the EMP of the CEP-Section 02 provides a basis for a systematic collection of data to determine the actual environmental effects of the project through periodic monitoring the environmental components in the project area such as air quality, water quality, noise, vibration, etc., to check the compliance with regulatory standards and measure the success/progress of the environmental protection activities

identified during the EIA process. Further, the EMP defines the roles and responsibilities of the stakeholders and reporting mechanisms.

Further, based on the environmental approval and the EMP requirement the following post-EIA studies were conducted in the preconstruction phase of the project as a crucial requirement to identify the actual impacts and designed the project in a manner to mitigate such impacts.

1. Hydrology and drainage study to identify the flood sensitiveness and requirement to be incorporated into the design to mitigate aggravation of flood, uninterrupted drainage, and ensure the continuous supply of irrigation water as enjoyed by the public prior to projects. modern modeling techniques were used to achieve the above objectives.
2. The detailed ecological study, to identify the adverse impacts on fauna, flora and their habitats and to make recommendations to mitigate such impacts along with measures to mitigate the disturbances of animal movements, conservation of rare/endangered plants, removal of invasive species, prevention of road kills, enriching the habitats with greenery works.
3. Geotechnical studies particularly to identify the cut slope and embankment slope stability requirements and cost-effective mitigations.
4. identify the noise-sensitive receptors through noise modeling and measures to mitigate noise.
5. Scio-economic study and preparation of a resettlement action plan.

The Summary of the key mitigation measures in the EMP is given, below.

- Establishment of baseline condition of the air quality, water quality noise and vibration, and ecology of the project area and monitor periodically and rectify if any deviation of the baseline condition.
- Provision of adequate drainage structures which include bridges, culverts, viaducts, drains, etc. to provide the interrupted flow of water, thereby to minimize flooding the upstream areas and bringing about impacts to the cultivations, and public properties therein and causing land degradation owing to stranded water.
- Ensure the operation of crusher plants, concrete batching plants, and asphalt plants in compliance with the country's environmental laws and obtaining the necessary environmental approvals and recommendations and strictly comply with the conditions in such licenses and approvals.
- Adoption of extensive measures of soil erosion control at material excavated areas and reinstated the areas with planting trees.
- Stabilization of cut slope angles by adopting well-engineered measures with the consultation of the national body on this aspect viz. National Building Research Organization to prevent landslides.
- Carry out the construction works vicinity to water bodies in a manner to less pollution from the construction wastes, soil, and other materials washed out from the construction, minimum impacts to the water flow; thereby minimum impacts to the aquatic fauna and flora in such water bodies.
- Minimizing noise pollution during operation by erecting noise barriers at noise-sensitive locations identified through noise modeling. The surface of the expressway will be designed and constructed in the manner of the smooth operation of vehicles to prevent excess vehicular emissions and noise.

- In-situ conservation of the critically endangered plant known as *Wrightia puberula* species, belonging to the Apocynaceae family. Meantime actions were taken to conserve the plant in consultation with the National Botanical Garden Department, ex-situ.
- Design and construction of an adequate number of animal crossings in the areas of the declared forest reserves and peripheral forest areas to cross the animals the expressway to meet their food, water, and other ecological requirements.
- Incorporation of a mesh fence to the design to be constructed at locations where low flying birds cross the CEP-Section 02; thereby preventing collision of such birds during the operation phase of the project.
- Ensure not to clean/remove any tree outside the Right-of-Way. Also, to compensate the trees cleared for the construction, a greenery work plan has been designed incorporating indigenous plant species as well as suiting to site condition.

The EMP applies to both onsite and offsite works and the subcontractors and suppliers operate under the Contractors of the CEP Section- 02.

6. Monitoring of implementation of the EMP

The Contractor has appointed an environmental staff consists of Environmental Manager, Deputy Environmental Manager, Environmental Officers and supporting staff to implement the EMP and prepare reports on environmental and social safeguard compliance in monthly basis and submit to the Supervision Consultant (SC)/Engineer for reviewing.

The Supervision Consultant is responsible for supervising the progress of implementation of the EMP by the Contractor. Also, the Engineer undertakes regular inspections of work sites during construction alone and/or jointly with the Contractor's environmental staff aiming the following aspects.

1. Construction works are progressing in accordance with the agreed mitigation measures in the EMP.
2. Agreed mitigation measures are in place, prior to/or during the construction.
3. Construction activities have been completed in accordance with the design and commitments made during the statutory processes.

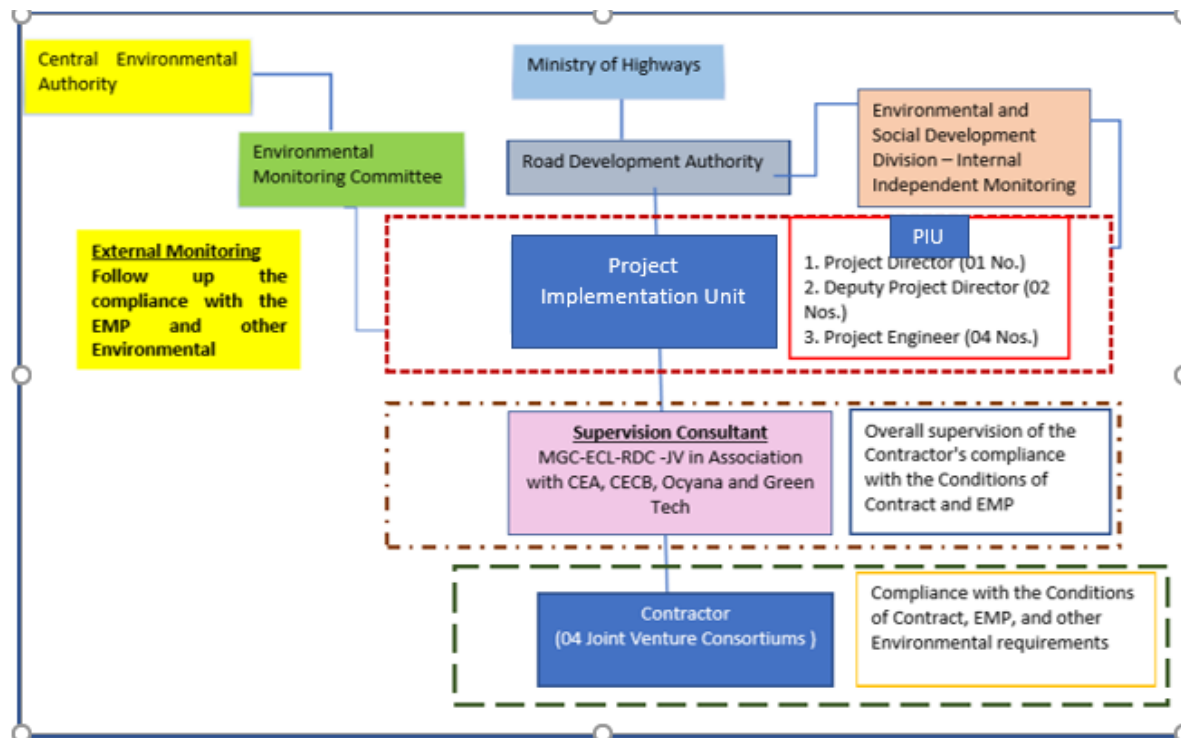
The Engineer will advise the Contractors the non- compliances identified during the site inspections.

Also, EMP monitoring relevant to operation phase paying the emphasis on the following aspects is a sole responsibility of the Employer.

1. Drainage structures, their outfall, and damage to private properties and natural resources.
2. Effectiveness of the provided slope protection and soil erosion measures.
3. The effectiveness of the noise barriers and their maintenance requirements.
4. The effectiveness of the animal crossings and constructed ponds to meet the animal's water requirement.
5. Status of waste disposal measures and management.
6. Impacts on the baseline environmental conditions such as air quality, water quality, noise etc.
7. Urban planning aspects in close coordination with the Urban Development Authority

In addition to the above, the CEA and the appointed monitoring committee, which includes relevant stakeholders will monitor the effectiveness of implementation of the EMP, as external monitoring. The institutional arrangement of implementation of the EMP and monitoring of the CEP-Section 02 is given in the figure 02 below

Figure 02: Environmental monitoring responsibilities



The cost of implementation of the EMP and aforesaid monitoring have been included into the Contract.

In addition to above all the public complaints are investigated as a vital measure of the effectiveness of the mitigation measures adopted in accordance with the EMP. Resolving the public complaints will be done by the project level and through the Grievances Redress Committees established in Divisional Secretariat levels.

7. Conclusion

The environmental impacts of the preconstruction, construction, and operations phases of the CEP-Section 02 are significant. Accordingly, to mitigate such impacts, the project has developed a comprehensive EMP based on the finding of the EIA study, conditions in the environmental approval, findings of the post-EIA studies, etc. along with adopting a well-established monitoring system. Accordingly, the negative environmental impacts of the project are mitigated, and positive impacts are enhanced successfully for the environmental sustainability of the project.

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