

**CHAPTER 6**  
**CONCLUSIONS**

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The studies on the environmental aspects of the Re-aligned road FR55 at Kuala Kubu Bharu showed that the project proponent, SPLASH, has the potential to initiate and fully implement the ISO 14001 program. During the study, the importance of EMS has been conveyed and promoted to the top management of SPLASH, which is the basis for SPLASH to commit to the environment aspects in road construction industry.

The initial audit exercise (interview and observation) identified the following potential significant impacts on the environment by the various road construction activities as follows:

- degradation of natural resources due to land clearing
- deterioration of river water quality due to earthwork activity, disposal of waste (construction waste, scheduled waste and domestic waste) and discharging of waste water etc.
- siltation and sedimentation in watercourses due to erosion process on the bare slope and bare platform
- damming of water courses caused local mud flood due to disposal of biomass into waterway
- air pollution due to movement and emission of vehicles, earthwork activity, batching plant and quarry activity

- noise pollution and ground vibration due to rock blasting activity, rock drilling machine and rock crushing machine
- soil contamination due to improper handling of diesel and scheduled waste such as used oil and others lubricants
- life hazard due to bridge construction, works at height and blasting works
- exploitation of natural resources due to consumption of fuel, plywood and others materials to support the road construction
- loss of aesthetic value and human health due to diseases, mosquito breeding, pest and odor

Based on the site environmental audit, which included the compliance audits (first and second audit) and monitoring programs (for river water quality, air quality, noise & vibration quality and silt traps discharge quality) over a three-month interval and 5 months period at the project site, respectively, there are several findings and weaknesses in the management of the project site were observed, which included:

- 11 and 9 non-compliance records (NCRs) identified during the first and second audit, respectively. Most of the NCRs are related with the site clearing and earthwork activity, control of water quality and management of scheduled waste.
- The river water quality parameters such as pH, DO, BOD, Ammonia Nitrogen and *E.coli* within all the sampling stations complied with the baseline data except TSS, where the sampling stations, DW3, DW5 and DW9 which exceeded the baseline limits of 50mg/l during dry season.
- All the air quality-monitoring stations for TSP and PM10 complied with the limiting values of 260 $\mu\text{g}/\text{Nm}^3$  and 150 $\mu\text{g}/\text{Nm}^3$ , respectively.
- All vibration quality readings recorded were below the limiting value of 5mm/s

- Noise levels within the project site complied with the limiting value of 65 dBA, except DN7, which located near the quarry site.
- The silt traps such as T25, T31, T1, T2, T9, T14, T19, T34, T38, T18, T37 and T39 failed to comply with the limiting value of 100mg/l

Nevertheless, the management of SPLASH implemented effective and practical mitigation measures to abate the environmental impacts, which included:

- a) **Mitigation measures for soil erosion** – including minimization of working area, control slope cutting and filling, spoil tips handling method, revegetation of exposed area, temporary plastic sheeting and construction of silt trap
- b) **Mitigation measures for river water quality management** – including maintenance of vegetation buffer strips, construct temporary culvert crossing for tributary and waste disposal method
- c) **Mitigation measures for hazardous materials management** – including method of storage and handling of fuel (diesel), explosive and cement
- d) **Mitigation measures for waste management** – including the management of construction waste, domestic waste, biomass waste and scheduled waste (used oil)
- e) **Mitigation measures for wastewater management** – including management of toilet effluent and wash water from concrete batching plant
- f) **Mitigation measures for air quality management** – including emission from the vehicles, trucks and machines, movement of vehicle, dust emission from quarry and concrete batching plant
- g) **Mitigation measures for noise and vibration quality management** – including delay-blasting method at quarry, regular maintenance of vehicle and speed limit

- h) **Mitigation measures for transportation and machinery management** – construction of oil trap, scheduled maintenance etc., and
- i) **Mitigation measures for occupational safety and health management** – environmental and safety procedures and Emergency Response Plan (ERP).

A preliminary EMS, ISO 14001 was drafted in this report. Nevertheless, details of each component of the EMS have to be planned and trial implemented at the project site. During the process of developing and implementing the Environmental Management Systems for an open system like road construction, the following are the findings of these studies:

- The study help to evaluate the practical difficulties involved in implementing the EMS standards and procedures within the construction team organization,
- the working group discovered that implementation of the standards of Environmental Management Systems required a firm commitment and support from all levels of staffs involved, from general workers to the top management.
- the involvement of top management and middle management are essential in the preparatory review and set up stages when record-keeping systems had to be altered to collect the required information,
- the amounts of workers involved for most staffs would reduce as routine procedures became established when implementing EMS at the project site,
- programs of staff training and education are essential and required to ensure that all the staffs within the Re-aligned Road of FR55 project are clear with the objectives of the management system and their role in its implementation, and

- funds for implementation of the Environmental Management Systems and subsequently application for ISO 14001 have to be properly allocated. This included funds to expand the environmental units of the Re-aligned Road of FR55 and engaged external environmental consultants to periodically audit, monitor and continuously reanalyze the Environmental Management Systems at the project site in order to ensure the EMS would be implemented smoothly.

In conclusion, the implementation of Environmental Management Systems in the re-aligned road FR55 project had the potential to reduce the environmental impacts on the road construction and it enhanced the management system, development manner. However, the preliminary EMS framework is a suitable pathway for the certification of ISO 14001 in road construction industry.