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Innovations on management of sustainable construction in a large earthwork project: an Australian case research

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Abstract

Along with the recent real estate development in major cities of Australia, sustainable construction is one of the measures being implemented to reduce negative impacts of the construction industry on the environment, society, and economy. However, there is a lack of detailed review of this kind of important studies that is critical to Australian future endeavour.

This paper presents a systematic review of a large scale earthwork project and discusses concerns/examples under three dimensions. Firstly the environment aspect, factors including remediation of the various type of contaminated and general waste, management of runoff water, dust control, noise and vibration monitoring are showcased; secondly the society aspect, factors including innovated wheel wash facility, CCTV system, drainage protection, and wildlife protection are mentioned; lastly the economy aspect, factors including integrated weighbridge management system, recycling waste water, recycling rock are demonstrated.

The research identifies future opportunities such as the innovation of evaluation system, project design framework, finance analysis model, and potentially integration of sustainable construction practise into Australian code of practice.

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1. Introduction

Innovation has long been recognized as one of the major factors contributing to national economic growth, international competitiveness, and human living standards. However, innovation has a complicated and industry sensitive nature, and it varies from industry to industry. Unlike other industries, construction involves the production of unique projects on site by a variety of teams that are temporarily brought together [1]. This dynamic constitution of resources and locations bring a great challenge to innovation in project level. In Australia, the construction industry contributes 7.5% to the Gross domestic product (GDP) and provides more than 1 million jobs [2]. In the other side, the negative impacts of buildings and construction activities are also well recognized. These include the emission of construction noise, dust, traffic congestion, odour, water pollution and contamination/waste disposal during the construction stage.

In the past, many of the literature has focused on investigating innovation at the firm or national level, and the project level has barely been mentioned. The objective of this case study is to investigate the innovated ways in a major earth construction project located in east of Melbourne, centre within dense residential area. A framework has been developed prior to project commencement, taking in account the characteristics of the project environment concerns in four aspects. The four aspects are including elimination of environmental impacts, substitution of the traditional process with alternative environmental friendly method, engineering control via newly developed technic and implementation, and finally, administration control by batter environmental focus system.

2. Sustainable Construction Framework

This bulk earthwork project in east of Melbourne is scoped in approximate 200,000m² land, client has raised highly expectations on environmental standard and sustainable construction during pre-commencement stage. In order for project managers to deliver sustainable construction according to clients' expectations and cost restriction, modifications have been made to traditional project management processes and practices.

The main scope of this earthwork project is to processing the existing contaminated materials on site, cut and fill over 600,000m³ site materials, plus importing over 200,000m³ clean fill from external sources to construction surface. During the busiest period while major activities in place, there were more than 200 regular trucks movement.

The project site has been illustrated in Figure 01 below. It is adjacent to a major road network on the western boundary, and very close to residents on its eastern boundary. Site is secured with permanent wire mesh fence along all border, plus shade cloth to cover the fence, and silt fence at base of the fence to prevent any excessive surface run off water escaping construction site.

2.1. Elimination of environmental impacts

The growing awareness of sustainable construction's potential to positively impact environmental issues is pushing green process to the forefront [3]. The most effective way to achieve sustainable construction project starts from elimination of environmental impacts. This section covers innovation technic and systems to eliminate the transport traffic causing road pollution, prevent asbestos removers and worker exposure to asbestos, and minimum construction vibration.

- System and audit

At the level of each individual construction project, environmental policy would emanate from: company policy; relevant legal requirements (Environmental Protection Authority, EPA guideline), and the Environmental management plan (EMP) for the project, which would identify those principles of sustainable construction deemed relevant to the project through consultation with interested parties at an early stage in the EMP.

With EMP in place, the Auditing of an EMP for a construction project could be done internally by the environmental managers or externally by a consultant. Typically, an external audit would be preferred for a large

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