

The Art and Science of EIA in Achieving Sustainability In a Hong Kong Transport Development Project

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Abstract

This paper presents good practice in environmental impact assessment, for the achievement of environmental sustainability in railway development. The good practice permeated all stages of the development, from planning and design to construction and operation. The strategic Lok Ma Chau Spur Line project, once controversial, and now applauded by Green Groups, is used as a demonstration model to illustrate the art and science of impact assessment. The paper describes the challenges that the project overcame, such as alternative considerations, stakeholder engagement, conflict resolution, mitigation and compensation effectiveness, enforcement and compliance. The main outcomes are the protection of an ecologically important valley, as well as enhancement of a 37 ha wetland for long term conservation. The wetland has since been widely used as a showcase for conservation and educational purposes, and is the site of a spectacular increase in endangered bird-life. This Spur Line case provides an important reference model for projects with similar issues, particularly for the latest strategic infrastructure development projects in Hong Kong.

Introduction

The paper presents experience from the development of a strategic transport project, the Lok Ma Chau Spur Line railway. This illustrates how environmental impact assessment (EIA) practice has evolved from scientific process to incorporate understandings from social and political processes. The project was to benefit the Hong Kong community at large. Public consultation was conducted throughout the planning stage and the project was generally supported. However some reservations were initially expressed by conservation groups whose main concern was potential ecological impacts from the siting of the railway on two ecologically significant areas. The paper outlines the challenges that the project overcame during the planning and implementation stages, eventually winning the trust and acceptance of all stakeholders. This Spur Line case provides an important reference model for infrastructure development projects.

The Spur Line Project

In 1999, the Hong Kong Government commissioned the former Kowloon-Canton Railway Corporation (KCRC) to construct the Sheung Shui to Lok Ma Chau Spur Line Project (the Spur Line), linking the existing East Rail system from Sheung Shui Station to a new border crossing into Mainland China at Lok Ma Chau (LMC). The strategic project mainly involved the construction of a 7.3km double-tracked railway line and the LMC Terminus with cross-boundary facilities linking via a double-deck footbridge across the



Shenzhen River to a new Huanggang metro station on the Mainland side. The railway alignment goes through rural areas in northern New Territories, through two ecological significant areas -

“ Long Valley is an area of predominantly agricultural freshwater wetland of about 33 hectares bounded broadly on the West and North West by the River Beas and on the East by the River Suttlej. It is a known area of high ecological value even though it has no special legal protection as a Conservation Area or the like. It is the single largest remaining area of freshwater wetland agriculture in Hong Kong and is made up of a mosaic of small plots, such as active and inactive wetland agriculture, and bloodworm ponds. The area supports a high diversity of bird species, with over 200 species recorded, 29 of which are of conservation importance.”

“ The fishpond habitats in the Lok Ma Chau area are close to and contiguous with the Deep Bay Ramsar Site (a Wetland of International Importance under the Ramsar Convention), with high ecological importance. These areas are designated as Wetland Conservation Area and Wetland Buffer Area by the Town Planning Board, to protect and conserve the existing ecological function of fish ponds in order to maintain the ecological integrity of the Deep Bay wetland ecosystem as a whole.”

Challenges

Presented below are the challenges met and experience gained through public engagement, conflict resolution, innovation and mitigation, illustrating the art and science of EIA in achieving sustainability.

Siting – Alternative Alignments

Planning of the Spur Line took place over a 10 year period. The Spur Line proposal was first presented in the Railway Development Strategy in May 1993.

In 1998, a Preliminary Project Feasibility Study (PPFS) evaluated the engineering and environmental feasibility of the potential routes linking the two rail systems. The PPFS studied at grade, tunnel and viaduct routes across the ecologically sensitive Long Valley. The horizontal rail alignment at Lok Ma Chau, proposed in 1993, was amended to meet environmental constraints, doubling up with the existing transport corridor for the Lok Ma Chau Road crossing and minimising the impacts on the fishponds within the newly designated Wetland Conservation Area (WCA).

To ensure that the project met the criteria of being a sustainable transport development, a number of factors were taken into consideration during the railway alignment study. These factors included present and future land use, planning of a future new town, minimisation of impacts to the environment, integration with future railways network as well as minimisation of impacts to the nearby business operators, residents and villagers. In addition, social impacts to the nearby villages and local communities due to the project were considered, such as avoidance of private land resumption as far as practicable to minimise impact on occupants; minimisation of landtake to reduce land clearance impact; and Feng Shui issues (the Chinese practice of positioning objects eg. houses and graves, based on a belief in patterns of yin and yang and the flow of chi that have positive and negative effects), and proximity of the railway alignment to nearby ancestral graves. To support the Government's planning of a future new town to be built in the Kwu Tung area, an underground concrete box was constructed in that area to act as advance enabling work for a future railway station to serve the residents of the planned Kwu Tung new town.

After a number of possible railway alignments were set out which would satisfy both the engineering and operational railway requirements, assessment of each possible alignment was conducted based on the above-mentioned factors. As most of the land traversed by the railway alignment was agricultural, no physical constraints on or beneath the land surface were encountered allowing the alignment to remain relatively straight. As a result, the land resumed for construction of the project was kept to a minimum, thus causing less impact to nearby businesses, residents and villagers as well as the agricultural land and existing fishponds

The original Spur Line alignment scheme was gazetted in October 1999 and was generally supported by the local communities. In response to requests and enquiries received from the public, the alignment scheme was refined and re-gazetted in April 2000 for further public consultation.

Long Valley Conservation

In accordance with the HKSAR's Environmental Impact Assessment Ordinance (EIAO), the Spur Line is a Designated Project. The Corporation as the Project Proponent was required to conduct an Environmental Impact Assessment (EIA) study to demonstrate that the project would be environmentally acceptable with no adverse residual impacts, and to obtain an Environmental Permit (EP) from the authority Environmental Protection Department (EPD) before commencing construction and operation of the Spur Line.

A full EIA study was undertaken from May 1999 to June 2000. The EIA reviewed the development of a feasible rail alignment with environmental, engineering and railway design constraints being considered. These requirements defined the route across the ecologically sensitive area of Long Valley. The viaduct was proved to be the most effective option for Long Valley and an ecological compensation scheme was devised to overcome the potential adverse construction and operational impacts. The EIA also identified and quantified all the other potential environmental impacts of the railway proposal and formulated suitable mitigation measures, covering air quality, noise, water quality, waste management, contaminated land and fisheries. The EIA was confirmed by the authority to have met the requirements of the Technical Memorandum of the EIAO and passed into the statutory public consultation phase.

In the public consultation period, a number of comments were received. The main concern, largely from conservationists, was the viaduct section proposed in Long Valley, due to potential significant ecological impacts such as disturbance to birds' habitats. Key public comments were related to issues of alternative alignments and uncertainties as to the potential for success of proposed ecological compensation measures.

The Corporation had further dialogues with the Agriculture, Fisheries and Conservation Department (AFCD) and EPD, as well as conservation groups, on the way forward for the Spur Line project. Uncertainties about the sufficiency of information to ensure an effective ecological compensation design and management strategy, and the time required to address these doubts, favoured selection of a tunnel below Long Valley, rather than viaduct so as to avoid any ecological impacts. The principal benefits of the tunnel option were the avoidance of adverse impacts on ecology, visual and landscape features, and the potential benefits to the new and advantageous opportunities in the overall planning of the Kwu Tung North NDA.

In response to the conservation groups' concerns, the Corporation made a commitment to adopt a tunnel construction method for the railway alignment to go beneath the Long Valley area, at an estimated additional cost of HK\$2 billion (US\$260 million).

Lok Ma Chau Wetland Compensation

The other ecological issue was associated with the construction of the above ground terminus and viaduct at LMC, which would lead to direct and indirect habitat loss of fishponds utilized by large waterfowls. Approximately 23.6ha of fishponds were impacted by the project. In order to maintain sustainability, the Corporation proposed a compensation scheme on the "no net loss" principle by raising the ecological value of the existing fishponds.

The ecological compensation proposal for the Spur Line project was unique in Hong Kong, for its consideration of habitat loss and disturbance impacts, and provision for early compensation of construction impacts in the Lok Ma Chau fishponds area. This approach allowed a mechanism for the long term protection and management of Hong Kong's ecological resources.

To compensate for loss of ecological habitats, a scheme for creating, enhancing and maintaining 37ha wetland (27ha reprofiled fishponds, 5ha marshland and 5ha reedbed) was adopted. The approach was to enhance the existing semi-abandoned commercial fishponds adjacent to the terminus and carry out active management including vegetation and water quality control, management of fish stocks, draining down of ponds and construction of a water distribution network. The outcome of

these was to increase the carrying capacity of wetland species of conservation importance and fully compensate for the habitat loss caused by the construction of the project.

The wetland enhancement works together with active management has been successful in providing suitable habitats for key target species. Since the establishment of the wetland area, 26 species of birds of conservation importance, together with mammals, herpetofauna, dragonflies and butterflies were monitored. Among these bird species, six representative species of large waterbirds were selected to be closely monitored: Great Cormorant (*Phalacrocorax carbo*), Grey Heron (*Ardea cinerea*), Great Egret (*Egretta alba*), Little Egret (*Egretta garzetta*), Chinese Pond Heron (*Ardeola bacchus*) and Black-faced Spoonbill (*Platalea minor*). In order to accomplish the “no net loss” principle, it was necessary that the LMC wetland supported a density of the most disturbance-sensitive species twice those of commercial fishponds, i.e. twice the number of birds per hectare. Ecological monitoring for these wetlands since May 1995 has shown that for all six target species, the mean number of birds per hectare was greater than the average of the two control areas. It is noteworthy that one of the representative species, Black-faced Spoonbill, a globally threatened species was recorded with a count of 249 in November 2005 in the recreated wetland. This was thought to be in fact some 15% of the world population. Thus the LMC wetland is supporting a significant portion of the global population of this species.

The LMC wetland compensation scheme has now set a precedent in Hong Kong to allow a mechanism for the long-term protection and management of local ecological resources threatened by developments.

Environmental Monitoring and Audit

For such a sensitive project, it was important to ensure no unacceptable impacts and to minimize disturbance to local residents and resources, in compliance with the Environmental Permit conditions. With the Corporation’s established Environmental Management System, a comprehensive environmental monitoring and audit (EM&A) programme was conducted. For example, to address public concern about contamination and lowering of groundwater at Long Valley during tunnel construction works, special proven technologies were proposed and the design audited. These included the use of an Earth Pressure Balance Tunnel Boring Machine with biodegradable and non-toxic foam, and a ground freezing method for cross-passages, with continuous monitoring of groundwater levels during tunnelling. The tunnelling works were subsequently carried out smoothly with no impacts on Long Valley ground water, and were completed over 6 months ahead of schedule. Overall the environmental follow-up during the construction phase between 2002 and 2007, and since the commissioning of the project in 2008, has shown consistent findings as predicted in the EIA report and demonstrated an effective EM&A programme.

Public Engagement

As described earlier, the original Spur Line alignment scheme was adjusted and refined during the gazettal and EIAO processes, in response to comments from the public. The Corporation’s commitment to the tunnel option in order to protect the ecosystem of Long Valley was a positive response to public aspiration, despite the substantial cost.

After the important issue of Long Valley was resolved, the second amended railway alignment scheme was gazetted in December 2001 and subsequently authorised by the Executive Council in June 2002.

During the construction phase, local Community Liaison Groups were formed to provide a forum for the general public to express their concerns or give their advice to the Corporation on improvements to the construction methodologies used on the project. Regular liaison meetings were held to ensure that the public was briefed in advance on the work progress and upcoming construction. A telephone hotline directly to the Corporation was also set up for the public to report their concerns or make any enquiries regarding the Spur Line construction work.

An Environmental Committee has also been established independently to monitor the performance of the mitigation measures, prior to the commencement of any construction work. The Committee consists of prominent members from local conservation groups and institutions, including the Friends

of the Earth, Hong Kong Bird Watching Society, World Wide Fund for Nature Hong Kong, University of Hong Kong, and University of Science and Technology. Throughout the construction period, members of the Committee were regularly briefed on the work progress and the results of the measures taken at each construction stage to mitigate environmental impacts. Advice and suggestions from the members were fully considered and incorporated in the construction methodologies. Meetings with the members are continuing in the operational phase of the project to ensure proper management and maintenance of the mitigation measures.

The LMC Spur Line project has been widely used as an educational and conservation showcase, and visited by numerous local community and conservation groups, engineering and environmental professions, as well as international institutions eg. China environmental protection agencies and science institutions. It is noteworthy that the environmental performance of the project has received acclaim such as -

“ The completion of the project is a landmark in the history of nature conservation in Hong Kong. It does not only signify that with careful planning, infrastructure building and environmental protection can go hand-in-hand, but also is a manifestation of the value of the society, the ingenuity of the engineers and the commitment of the project proponent to the conservation of natural heritage. (the Chairman, Advisory Council on the Environment) ”

“ Green groups have applauded the success of the KCRC’s HK\$46 million wetland programme at Lok Ma Chau in attracting 4,000 birds of 42 species ...frequented by the endangered White-fronted Goose and Black-faced Spoonbill (10 February 2007, South China Morning Post)”

Conclusion

This paper has described a railway case and elaborated on its challenges and their resolution towards sustainability, demonstrating the art and science of EIA practices. The synergy of Corporation commitment, public engagement, innovative mitigation and environmental effort have, it is claimed, exemplified how infrastructure developments can become opportunities for long-term protection and management of natural resources. The most prominent outcome, extensive compensatory wetlands now widely used as a showcase for conservation and educational purposes, means that the project can be seen as a strong reference case for sustainable project developments.

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