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A Conceptual Model for Evaluation of Ecological Impacts in Environmentally Sensitive Areas

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Abstract

The Ecological Impact Assessment (EcIA) section of an EIA report requires that ecological impacts are identified and evaluated. However, a review undertaken of EIAs completed before 2005 in Sri Lanka was determined that EIA reports are of poor quality, with regard to the EcIA. The review also noted that there were no clear guidelines for the proper evaluation of ecological impacts of development projects in Sri Lanka. Sensitive ecosystems could be irreversibly damaged and ecosystem services lost due to the consequences of the on-going rapid development process unless care is taken to address the ecological impacts and introduce mitigation measures. Therefore, this research aimed to determine whether there has been an improvement in the quality of ecological impacts being addressed in EIAs completed after 2005; and to develop a conceptual methodological framework to effectively address ecological impacts in EIAs of projects implement within environmentally sensitive areas in Sri Lanka.

Ten EIAs of projects completed after 2005 in environmentally sensitive areas were examined for effectiveness in addressing ecological issues. Sampled EIAs were selected based on the potential significant adverse ecological impacts due to the project and implemented within close proximity to protected areas that are regulated by the Forest Department and the Wildlife Department in Sri Lanka. The Key parameters for adequately addressing ecological impacts were identified based on the check lists described in book of Environmental Impact Assessment (Larry, 1996) and the Millennium Ecosystem Assessment report, 2005. Thereby a checklist appropriate for Sri Lanka was developed to assess ecological impacts based on the previous work undertaken in Sri Lanka and international best practices. The selected EIAs were evaluated based on the modified check list and the methodology used by Samarakoon and John in their 2005 review, (2008). Further, this study went on to develop a conceptual framework to effectively address of the ecological impacts of development projects.

The evaluation revealed that EIAs conducted after 2005 have not addressed ecological impacts adequately. Ecosystem services were neglected in most EIAs. The developed conceptual framework requires assessment of baseline conditions, ecological integrity and environmental services in detail with a descriptive ranking system. This information is an input to an equation developed for assessing the existing environmental conditions and to predict the significance of ecological impacts of the proposed development activities.

The composite index is a quantitative value of total ecological value of the existing environment/ total value of ecological impacts due to the project; X_i and Y_{ij} are value of key parameter and value of sub parameter of each key parameter respectively; Z_{ijk} and Z_{ijkmax} are significance value of each sub parameter and maximum significance value of each sub parameter relevant to each key parameter respectively.

$$\text{Composite Index} = \frac{\sum_{x_{i=1}}^{x_{i=n}} \left[X_i \left\{ \sum_{y_{i,j=1}}^{y_{i,j=n}} (Y_{ij} Z_{ijk}) \right\} \right]}{\sum_{x_{i=1}}^{x_{i=n}} \left[X_i \left\{ \sum_{y_{i,j=1}}^{y_{i,j=n}} (Y_{ij} Z_{ijk_{max}}) \right\} \right]} \times 100\%$$

This model could be used as a planning and decision making tool to ensure ecological impacts of development projects are better addressed in EIA reports. The important key parameters of any ecosystem can be applied to the model; hence it is applicable for all sensitive areas and all projects in Sri Lanka.

Keywords: EIA, Development projects, Checklist, Conceptual model