ABSTRACT

Enhancement of Environmental Impact Assessment in India through Integrated Assessment and Simulation of Sustainability Linkages

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This thesis presents a methodology for integrated assessment and simulation of sustainability linkages in coupled natural-human (socio-ecological) systems. The research work was carried out in three interlinked phases. The first phase was directed towards analyzing the EIA system in India and identifies areas for improvement. The Environmental clearance process as followed in India, the screening component of EIA and the follow-up system were analyzed in the first phase. The second phase was directed towards developing the conceptual foundation for integrated assessment of the ecological, social, physical and financial components of sustainability in any area which is under assessment. The methodology for integrated assessment of sustainability linkages through local knowledge based cognitive mapping, elicitation of indicator status and zonal linkages was also developed in the second phase. The methodology is illustrated through application in the Village of Kalarampatti in southern India. The steps for general application of the methodology and direct application of cognitive maps and indicators in other coupled systems are also outlined after verification in the Village of Srinivasapuram.

The third phase was devoted to bring out the utility of fuzzy inference system in building a rule based decision support system for the simulation of the impact of any activity on the sustainability linkages and to generate scenarios of sustainability based on the status of components and sub-components of sustainability. This approach is explained with the example of the village of Kalarampatti where the integrated assessment methodology
was developed. The proposed approach relies on the cognitive maps, indicators and their zonal linkages developed in the second phase of the research. The interactions captured in the cognitive maps are used to derive the rules, which govern the sustainability states of the components. Fuzzy inference system is used to simulate various scenarios to study the effect on the sustainability of livelihoods. Cognitive mapping and FIS promise to be an effective combination in building participatory rule based sustainability expert systems.