IMPROVING EIA AND LUP PRACTICE IN INDIA: CHALLENGES AND APPROACHES

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1. Introduction

Post 1991 liberalization, there has been a major transformation in the development of the industrial sector in India. Being a cost effective and labor-intensive economy, India has benefited substantially from business process outsourcing over the last two decades, and has built a strong manufacturing and export oriented industrial framework. Presently, in India is 9th in the world in terms of nominal factory output and industry accounts for 25.8% of the total national GDP (Index Mundi, 2014). However, in recent years with increasing industrialization, there is a growing concern about the hazards deriving from industrial sites neighbouring residential areas. Accidents such as the Bhopal tragedy (1984), Indian Oil Corporation fire (2009) and the Fukushima disaster(2011), have already demonstrated of the how proximity of populated areas to industrial sites in India as well as elsewhere, can severely exacerbate the consequences of accidents.
The conflict between the environmental and human safety versus industrial development is a critical one for a developing country like India. India's constitution was one of the first to provide for the protection and improvement of environment (Gupta, 2006). Several codes exist to separate certain industrial facilities from neighboring developments (Punjab Pollution Control Board, 1999;Mistry, 2011), and government has always distinguished between 'industrial zones' and other land uses. Despite this, demographic pressure, lack of consolidated Land Use Planning (LUP), absence of objective risk tolerability criteria, and diversity within the states of India in terms of development levels and land use patterns (Census Data, 2001) are a few reasons that has led to gradual creation of several high-risk areas.
LUP with respect to major accident hazards was one of the key requirements of the well known 'Seveso II Directive' in Europe (Christou & Mattarelli, 2000; Christou, Struckl& Biermann, 2006).A*sufficient* distance for the safety of humans and sensitive environment must separate industries from human population (Christou et al., 1999). Such a distance depends on both the source of risk i.e. the installation itself, the substances involved, the technology employed and the maintenance systems, and on the vulnerability of the environment affected by a potential accident.

Risk is a measure of economic loss or human injury in terms of both the likelihood and the magnitude of the loss or injury (*CCPS,* 2000). LUP throughrisk-based technique involves comparing the risk imposed by a facility with the respective allowed upper limits to the risk set by the state called the *risk tolerability limits*(Health and Safety Executive, 2010).Various European Member States have developed or are developing adequate procedures, approaches and criteria for the acceptability of hazards or risk. There exist various approaches to LUP and each has its pros and cons (Cozzani, Bandini, Basta, & Christou, 2006). In India since it is the Ministry Environment and Forests (MoEF) which looks at the implementation of Environmental Impact Assessment (EIA), it appears that there is more emphasis on environmental aspects than the cost-benefit analysis of the industrial risks. Although there are LUP policies inherent in every Environmental Protection (EP) law, there is no consolidated quantitative risk based LUP decision making framework followed in India as yet. It is debatable that India may simply accept the European norms as India varies in not only the population density and level of development but also owing to differences in the standards of the safety measures adopted (Gupta, 2006). As Trbojevic (2004) has demonstrated, as the level of development increased in UK it has continuously made the tolerable risk limits more and more stringent. A similar approach could be necessary during India's path to become a developed nation.

It is to be noted that land is an economic good. Thus, while there is a need for establishing sufficient separation distances to eliminate *intolerable risks* at the same timeone has to consider that itdoes not unduly restrict development around the industrial set ups and waste valuable resource like land. Other socio-economic considerations such as contribution of the establishment for the national economy, infrastructure (roads, power, communication etc.), employment opportunities, and benefits for the local community from the operation of the plant also constitute additional objectives of the authorities. Moreover, the stakeholders including industry, authorities, employees, the population and other interest groups may have a conflict of interests and values. For example, the industry may be financially motivated to solve most of the problems whereas the local population may be concerned more about the environment and the authorities about employment generation or development of the region.

The present paper attempts to highlight how industrial risk assessment can be effectively integrated with LUP to mitigate the effects of major accident hazards posed by fixed installations while keeping in mind the industrial development priorities of a developing country like India. It discusses relevant problems and recommendations regarding EIA in India as there exists no risk acceptance criteria in India as of today. It lays down a case for usage of social, environmental and economic quantified parameters in decision making process. Finally a LUP approach for decision making for India is proposed by addressing the gaps in the current system.

2. The Indian EIA practice

The 1984 Bhopal gas tragedy has played a significant role in promoting the enactment of the Environmental (Protection) Act, 1986 (MoEF, 1986) by the Parliament of India. Land use planning in India today is more or less controlled through the EP Act. Various sets of codes and regulations have been made under the EP Act including the Manufacture, Storage and Import of Hazardous Chemicals Rules (MSIHC Rules, 1989), Hazardous Wastes Management and Handling(1989), Public Liability Insurance Act (1991), Manual on Emergency Preparedness For Chemical Hazards(1992), The Chemical Accidents Rules, (emergency planning, preparedness, and response) (1996), etc. Among these, the MSIHC rules play a key role in determining the effect on the location and operation of hazardous chemical plants (MoEF, 1989).Industry requires clearance from the Government of India for expansion or modification of any existing industry or siting of a new project planned in various sectors including all chemical industries, nuclear power plants, large construction projects, etc. (MoEF, 2000).

3.1 EIA: Methodology for India

The MoEF Notification 2006 (Part-II, and Section 3, Sub-section (ii)) describes the EIA clearance procedure to be followed in India (MoEF, 2006). Firstly, the projects or activities which require prior environmental clearance are characterized in Category ‘A’ and ‘B’ on the basis of the spatial extent of their impact. The concerned regulatory authority for the clearance is the Central Government (MoEF) for matters falling under Category ‘A’ and at State level the State Environment Impact Assessment Authority (SEIAA) for matters falling under Category ‘B’. The next step is submission of an application by the industry seeking prior environmental clearance which in all cases is made before commencing any activity, or preparation of land. The applicant provides, along with the application, a copy of the pre-feasibility project report. Post the submission of the application, the regulatory authority sends the pre feasibility report to the concerned consulting bodies – Expert Appraisal Committee (EAC) or State level Expert Appraisal Committee (SEAC). The report is then scrutinized by the committees in 4 steps namely, screening, scoping, public consultation and appraisal. Public consultation is the step in which the concerns of local affected persons and others who have plausible stake in the environmental impacts of the project or activity are ascertained. It has to be conducted by the State Pollution Control Board. Finally, the regulatory authority considers the recommendations of the EAC or SEAC and conveys its decision to the applicant within forty five days of the receipt of the recommendations of the EAC or SEAC. The post clearance monitoring protocol states that the industry must submit half yearly compliance reports in respect of the stipulated prior environmental clearance terms and conditions to the regulatory authority concerned and that these are public documents.

3.2 EIA: A Critique

The current EIA methodology has several shortcomings which need to be overcome to make the process efficient and effective. The following critique of EIA is based on available information on EIA process in MoEF notification, 2006. The gaps in EIA were identified using a modified version of the model suggested by Wood (Wood, 2003 and Toro, Requena & Zamorano, 2010) and the relevant criteria. The three main elements on which the overall efficiency was assessed are the legal and administrative support to the EIA process, the EIA process itself and the follow up and control.

3.2.1 Legal and administrative support to the EIA process

(1) National legal foundations: There should be legal and administrative supports to the elements of an EIA process to ensure legitimacy and legality (Wood, 2003).India has a number of acts, rules and notifications which are referred while granting EIA clearance like The Water (prevention and control of pollution) Act, 1974, The Air

(prevention and control of pollution) Rules, 1982, The Hazardous Wastes (management and handling) Rules, 1989, Noise Pollution (regulation and control) Rules, 2000, The Wildlife (protection) Rules, 1995, Forest (conservation) Acts, 1980 etc. This suggests that the legal framework in India regarding EIA is available and is reasonably extensive. If applied in true spirit it should suffice to aid the EIA process.

(2) Guidelines for EIA implementation: No specific assessment method is suggested in the terms of reference mentioned in the MoEF notification of 2006. Only a general description of the method to be followed by the industry is required which includes both criteria and constraints. The Environmental Impact Study (EIS) must analyze and classify impact, area of influence, intensity, risk of occurrence, duration, magnitude etc. Thus, there is a lack of exactitude and the method is not quantifiable or measurable.

(3) Number and competence of the personnel working in the EIA system: The consultants who prepare the EIA reports and the administrators who monitor the EIA process do not require any formal training to be certified. Thus the competence of these personnel needs to be ensured. Instances of this nature have been cited in literature (Murthy & Patra, 2005).

3.2.2 EIA process

(1) Screening of projects: There is an ambiguity in the categorization of the projects, Category A projects are to be cleared by the MoEF while Category B projects are to be cleared by the SEIAA. However, state government is directly involved in seeking industrial growth and company investments in several occasions. Substantial powers given to SEIAA as well as lack of accountability can prove ineffective. The projects requiring an EIA report falls in Category 'B1' and remaining projects are classified in Category 'B2' and do not require an EIA report. However, there is inadequate clarity of guidelines to discourage SEIAA from transferring projects to category B2 (MoEF, 2006).

Even though some of the industrial estates do not require EIA as per the statutory norms, like those with an area less than 500 hectares, they might involve certain technological processes which could be harmful to the environment, as a result of which such enlisted industries could have potential impacts on the environment and on public health. Exempting industries from the EIA requirements based on the investment value of specific projects is not appropriate. There are no specific studies conducted till now which demonstrate that environmental impacts are always inconsequential for projects under a given size of the project land. In some cases small scale industries may have sizeable contribution to pollution with respect to the major industries depending on pollution abatement practices.

(2) Determination of impact: Scoping is used to evaluate the issues to be analyzed in the EIA process. The depth of scoping is decided after determining the direct and indirect impacts. These methods of identification of impacts are currently absent in the EIA system. This could result in loss of valuable information for decision-making.

(3) EIA report content: The MoEF notification nowhere requires a typical EIA report to state the degree or quantitative and objective measure to justify the tradeoff between project's impact on the socio economic development vis-à-vis effect on human health and environment. While some reports do contain tables and matrices to compare the impact of the project on various natural resources, it is neither mandatory nor essential. There exists no tolerability limits in various categories to assess the total environmental impact and health risks in the area. Thus, the acceptance or rejection based on such information is quite subjective. The current system does not employ quantitative means of measuring the tradeoff between benefits and exploitation in the current system.

(4) Weighting of socio-cultural factors: There is a lack of exhaustive ecological and socio-economic indicators for impact assessment in a typical EIA report.There is no mention of the weighting of socio-cultural factors or to the methodology that should be followed in the terms of reference. This is decided by the evaluator. Thus, possible lack of objectivity can deter the use of EIA as a tool to conserve the environment.

3.2.3 Follow up and control

There should be continuous monitoring to make sure that the implementation is in accordance with the approval terms and conditions.

(1) EIS review: This is performed by experts who are familiar with the environmental regulations. But the guidelines for the same contain very general recommendations rather than criteria for impact assessment, evaluation method and benchmarks.

(2) Publication of final decision on EIA process: The final decision on the granting of the environmental license should be made public. The availabilityfinal EIA document on the basis of which the decision on the project is made is not automatically ensured. This decreases the transparency of the process and may offend certain stakeholders.

(3) Public participation: This is an integral part of EIA process and if done properly it can lead to a smooth siting process. Public comments are not mandatorily taken into account at the early stage, which often leads to conflict at the later stage of project clearance.

The public consultation process (MoEF, 2007) can only be attended by local population being affected directly by the facility and no quorum is required to start the meeting. Other interested groups such as NGOs, trade unions and local community groups may not be allowed to attend the public consultation proceedings or their views need not be considered if the authority conducting the public hearing is not convinced of the plausible stake of these groups. These groups can only send make submissions in writing to the EACs. In several earlier instances, these parties have proved to be influential in not only spreading awareness amongst the local population but also in performing systematic critique of the pre feasibility report. For example, according to Fisher (1995) the Narmada Bachao Andolan(1989) the NGOs found out that the officials had overlooked the post-project problems and that all those displaced were only given compensation for the immediate standing crop and not for displacement and rehabilitation.

(4) Environmental management plans, follow up and control of the project: Mitigation measures are necessary to minimize damages and so is the monitoring of those measures so that they are implemented properly. But in India the emergency plans are often not discussed in sufficient detail with the local communities. Also for strategic industries like nuclear power plant, critical information may be kept confidential for political reasons which pose a bottle neck for formulating effective mitigation measures (Murthy & Patra, 2005).

(5) Monitoring of the EIA system: One of the problems in India regarding monitoring is the location of the regional offices of MoEF and their large jurisdictions, which result in difficulties in discharging their functions effectively. The responsibilities and capacities of these offices, to monitor compliance has not been appropriately defined and strengthened over the years. The local population is not a part of monitoring and thus industry may not reflect the true status of compliance in their reports to the MoEF. The lack of access to compliance reports severely affects the rights of the local people (Murthy & Patra, 2005).

4. Constraints for LUP in India

The trade-off between the increase in socio economic benefits vis-à-vis decrease in human safety due to increase in the risk imposed on the surrounding population by the industrial establishment should be measured objectively. Additionally, the efficacy and fit of, for example, the European limits are questionable for a developing country like India. There exists no consolidated quantitative risk based land use planning framework for India. Prior to proposing such a framework, it is important to identify other constraints and characteristics of the Indian state that can affect the LUP.

The first essential point to note is that unlike most of the European countries with well set LUP frameworks and criteria, India is an emerging economy. Therefore, the focus as well as priority on industrial development is relatively high as compared to the developed nations. Development of national industrial zones clearly have shown that setting up of industrial facilities not only increases the money flow in the region and creates jobs but also supports the evolution of infrastructure on the boundaries of the establishments with time (Tata International, 2005 & Shell Foundation, 2010). Stricter risk limits for example increases the amount of unused land around the facility and pushes the development of resources farther from the industry. Thus, even though the industrial risks to human population and environment are critical, it is important to address its relevance and weight for an emerging economy.

The next attribute which is equally essential is the diverse nature of Indian state. To start with, the states differ in

their land use patterns and resources such as eco-sensitive regions, coastal regions, tribal regions, historical monuments, transportation routes to the facility, safety and security aspects, location of defense establishments, etc. The level of development and priorities differ drastically from one state to another due to variation in the size of industry and priority to growth, need to create jobs, protection of biodiversity areas etc. Thus, apart from addressing the shortcoming of the current EIA system, there is also a need to for a planning framework which concurs with the above attributes of a country like India.

4.1 Social aspects associated with siting a plant

Human attitudes concerning the plant being set up can vary significantlyand may often hinder development and the attitudes. This creates conflicts and the acceptance of a new industrial facility can be made more acceptable to the local population and thus improve the siting of such facilities by the following (Susskind, 1985):

(1) Joint Fact Finding: Local people may get distanced if the siting decision is made on technical grounds that are too complex for the lay man to grasp. Thus, the investigations of facts and probable impacts should be collaborative to make a good decision. This can be included in the EIA scoping process.

(2) Reducing Risk: Even if the forecast is done according to the consensus of all stakeholders, they may not all react in the same manner to the information generated. Thus spreading risk or reducing it becomes necessary which can be achieved using insurance schemes. The local people may not resist the setting up of a project if they are guaranteed the current value of their lands or homes plus inflation.

(3) Promising to Mitigate: Stakeholders need conviction that the promises to mitigate unexpected adverse effects will be kept. This can be done by posting a bond or empowering an independent actor through pre-negotiated contracts to hold the parties to their word or phasing a project so that the latter stages proceed only if earlier commitments are honoured. Further, efficient modes of compensation to affected stakeholders, and declaration of shared responsibility of monitoring the facility need to be ensured.

5. Evolving a risk based LUP framework for India

A critical aspect of designing the risk based LUP framework includes setting up of risk tolerability limits for the country. The individual risk limits considered in practice in India are often derived from the European countries. However, the risk of living in each country is different owing to difference in health facilities, resource, economic landscape and so on.

Acceptance of an activity in the society is based on the perceived benefits of the activity vis-à-vis the risk from the activity. To derive the proposed acceptance criteria for India, it would be valuable to calculate several voluntary and involuntary risks borne by an Indian in several day to day activities. Such a basis of risk limit would imply different numbers for risk limit for different countries based on fatalities and risk associated with voluntary activities in that country (Trbojevic, 2004). Risk limit for India calculated by this method could be argued to be different than that prevalent in Europe given the fact that in developed countries risk borne by a citizen may be less than that in India due to better medical facilities and emergency services.

Even though such a method for devising limit appears logical, it has its own short-comings. Several voluntary and involuntary activities which citizens indulge in have different risks associated with it. The fatality data for all these activities is not readily available to be analyzed to form a risk limit. Secondly, the activities which involve voluntary risks differ considerably between citizens depending on their lifestyle. What might be a typical combination of activities in cities may be not be relevant for those in villages where industries are being set up today.

To analyze possible limits for risk in India, Atomic Energy Regulatory Board, Mumbai (2007)examined the available fatality data due to road accidents (voluntary risk) and lightning striking (involuntary risk). During the years 1995-2006 the average individual risk of death (no. of deaths/year/total population) due to road accidents was 8.2×10^{-5},while for deaths due to lightning the average risk was 1.76×10^{-6}.

Therefore it may be proposed that no risk greater than that due to road travel in India can be tolerated from an industrial activity, whether existing or new (or maximum tolerable risk to a member of public is approximately 10^{-4}) while acceptable risk to an individual from facility should be lower than the probability of death due to lightning (approx. 10^{-6}). The activities with individual risk value below the acceptable risk level can be readily admitted. The activities posing individual risk values beyond the maximum tolerable risk should not be tolerated. However, although such an estimate provides a good estimation for possible risk limit for India, it can be argued that there exist several other voluntary and involuntary activities which can be used as the basis for risk tolerability criteria

instead of road accidents and lightning. Once such risk limits are accepted, LUP may be executed on the basis of the principle that land areas peripheral to a process plant (for example) are demarcated as high, medium and low risk zones. The usage of the land may be accordingly fixed so that acceptable risk – individual or societal – to the public is ensured.

6.Conclusions

Rational Land Use Planning (LUP) can help ensure that the likelihood and the consequences of the potential accidents are taken into consideration during siting of hazardous installations and extension or modifications of existing installations. A critique of theEIA methodology as practiced in India, suggests the need for both greater quantification of the EIA objectives and integration of socio-economic parameters into a probable risk based LUP framework. Other issues which might be indispensable to address in the process of implementing an improved LUP framework are availability of consolidated data for local factor selection and valuation, rehabilitation of the local community, subjective value-based tradeoffs etc. Yet another important consideration is to formulate policies compatible with both old and new developments. With the progress of the economy, the risk tolerability limit should ideally also become more stringent. Time dependent risk limits are complicated to implement though they ensure that the implications of the increased risks are not be paid by the future generations. Finally, since the available land resource of the country is limited, it is also imperative to study the land types and use patterns across country at the central level (beyond the state boundaries) and find out on the basis of set a development goal for the country, the most suitable sites for industrial development which leave maximum utilization of agriculturally fertile land, environmentally bio-diverse area and sustainable forest cover.

While the present paper proposes a risk-based decision-making framework for LUP to mitigate the effects of major chemical accidents in an emerging economy like India, it needs to be examined if risk tolerability criteria used in the more developed nations (such as EU) may be directly applicable to the former. While on one hand, relaxation of the risk tolerability limit may permit higher industrial investments and consequent economic growth, on the other hand, it may imply that the 'worth of life' is lesser in an emerging economy. Further, since development levels are unequal in various Indian states, it may be necessary to keep the risk limits flexible for customization at local level so as to include the state-wise priorities.

It is proposed that integration of socio-economic parameters into a probable risk based LUP framework may provide an answer to "customization" of risk acceptance criterion for a country. The author suggests further that this may be achieved by calculating a projected index in both the scenarios when the industry is set up and when it isn't and assessing if it's beneficial for the plant to set up. Towards this end, various existing socio-economic indices like Human Development Index (HDI), Life Quality Index (LQI) currently used to determine regions in need of government funding, etc. can be used, or a new index can be formulated if the current ones don't cover all the aspects of setting up an industry. Our research group is currently exploring various feasible approaches to develop such a decision making framework which is exhaustive of all the factors that need to be considered while making land allocation decisions.

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