EES - 441: Environmental Impact Assessment
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EIA: Assignment 1 Solution

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Reference:

https://www.sociolegalreview.com/post/from-2006-to-2020-the-ongoing-problems-of-the-eia

Question 1:

About 850 metric tonnes of Municipal Solid Waste (MSW) are generated in a city daily of which collection capacity is 70%. These collected MSW are dumped in three to four places without any treatment, which results in severe environmental impacts in and around the surrounding areas. Hence, an EIA study using Rapid Impact Assessment Method (RIAM) was conducted to assess these dumpsites. RIAM analysis was carried out for the following 3 waste disposal options based on the four components (PC/BE/EO/SC):

- Open dumping
- Sanitary landfill
- Incineration

Twelve physical/chemical components (PC), eight biological/ ecological components six sociological/cultural components and nine economical operational components have been considered.

i) Prepare RIAM matrix each of the three options.

ii) Calculate ES, Relative ES and mention their range bands (+E to -E) in which each sub components lies for every option.

iii) Infer which option has the maximum and which one the minimum negative impact, using grouped bar chart (Rel ES vs Range Bands, grouped into PC/BE/EO/SC) or other appropriate visualization or statistical approaches.

You will be required to consult appropriate literature, past EIA for solid waste management sector or other appropriate resources to help guide the scores you will allot to each of the items. You can also use intuitive arguments, your understanding of physico-chemical process and multi-media transfer of solid waste components. In all cases, you are required to cite the relevant literature you used (or if it was just a judgement call) to justify the scores allotted by you for each of the components.

Solution:

Definitions:

- Open Dumping: It is an unregulated waste disposal site which poses a threat to human health, festers disease - causing organism growth, causes environmental degradation and ground/surface water contamination, releases toxic gases and degrades quality of life of nearby public spaces due to odor, air & noise pollution. The accumulated wastes are not recycled, and naturally degrade in situ instead. It is illegal to open dump and is punishable by law.

- Sanitary Landfill: Sanitary landfill is a modern engineering landfill where waste is allowed to decompose into biologically and chemically inert materials in a setting isolated from the environment. It is considered as the most common E-waste disposal technique which aims to reduce or mitigate the potential risks associated with the environment and human health. Landfills are typically positioned in areas where prevailing land features can perform as natural buffers between the environment and landfills. It makes use of modern technological innovations to segregate, decompose and reuse waste materials in a more efficient and eco-friendly way. It also sorts & converts some useful material into fuel sources (eg. biogas, CO2, CH4, etc). The combination of machinery operations and manual labor also supports a diverse employment scheme for the locals. However, it still contributes to the ground-water & soil contamination (through leaching), GHG emissions, detrimental effects on human health and wildlife endangerment.

- Incineration is a waste treatment process that involves the combustion of substances contained in waste materials. Incineration of waste materials converts the waste into ash, flue gas and heat. The ash is mostly formed by the inorganic constituents of the waste and may take the form of solid lumps or

particulates carried by the flue gas. The flue gases must be cleaned of gaseous and particulate pollutants before they are dispersed into the atmosphere. Before the flue gas cleaning system (if installed), the flue gases may contain particulate matter, heavy metals, dioxins, furans, sulfur dioxide, and hydrochloric acid. If plants have inadequate flue gas cleaning, these outputs may add a significant pollution component to stack emissions. In some cases, the heat that is generated by incineration can be used to generate electric power. Incineration has particularly strong benefits for the treatment of certain waste types in niche areas such as clinical wastes and certain hazardous wastes where pathogens and toxins can be destroyed by high temperature. Odor pollution can be a problem with old-style incinerators, but odors and dust are extremely well controlled in newer incineration plants. Findings from a systematic review of previous research also identified a number of symptoms and diseases related to incinerator pollution exposure.

Methodology, Results & Analysis:

The excel sheet for the computational sections of the questions is enclosed here-with:

https://docs.google.com/spreadsheets/d/1hko9Zz6lLTW4T0Nn5kpnLbjNDRSSg-z3dQaNhbo3_VY/edit?usp=sharing

Some important explanations for the excel sheet:

- The values of A1, A2, B1, B2, B3 are selected after reviewing references (given below) and extensive personal judgemental deliberation.

- The graphs plotted for each of the methods depict the relative ES values as a function of the serial nos. of the sub-components (eg. PC1, BE7, EO4, etc). I found this to be the best way of representing the data for comparison and analysis and it produces equivalent results compared to plotting relative ES values as a function of range bands (-E to +E).

- In the analysis results section of the excel, the mean of the relative ES values are computed and plotted. This is because each component in the RIAM matrix has different no. of components, so a comparison of the sums of the relative ES would produce # bias.

As can be seen in the result analysis section of the excel sheet:

- Open dumping has the highest PC, BE and SC impacts amongst all waste management options. This is due to the unregulated conditions of the method which has severe direct negative implications on the environment as well as the social health. The runner up in these categories is the incineration methodology. This again follows intuitive trends as incineration has a greater impact on the atmospheric pollution aspects compared to other pollution measures due to the production of ash, air particulates and gas emissions. However, the process is much more regulated compared to open dumping and thus achieves more filtration and screening of the harmful materials before the waste products are expelled to the environment. Sanitary Landfill proves to be the best option in this regard as it has the least environmental and social distress potential. The method achieves this by extensive processing of the waste and careful scrutinization of the filtering process until it is deemed sufficiently safe to be exposed to the environment.

- The EO component shows a negative trend compared to the rest of the 3 components. Open dumping attains the least EO values due to its non-regulatory nature. Filtering and recycling are negligible in the process, and the only costs that substantiate are due to the follow up on the regulatory compliance and fines issued by the overseeing authorities. This changes in case of sanitary landfills and incineration processes where the EO is high due to the employment costs for strict supervision of regulatory bodies and the set-up & maintenance costs of the filtering/recycling technology. The routine is more disciplined for sanitary landfills (also requires the use of a larger legal land parcel for landfilling) than incineration resulting in the former having even higher EO values.

Inference & Conclusion:

Sanitary landfilling seems to be the most environmentally and socially responsible solid waste management option. While it also requires the relatively largest monetary investments, the average/net economic value might tilt in favour of this method if the quantitative analysis is done over the entire lifecycle of the plant. However, making any strong statements in this regard might require more complementary quantitative analysis methodologies than only an isolated RIAM analysis.

References:

- https://www.sciencedirect.com/science/article/abs/pii/S0921344909002353
- https://www.researchgate.net/figure/1-Default-list-of-impact-categories-to-be-characterised-in-LCA-after-Udo-de-Haes-1996_tbl1_27452523
- https://www.sciencedirect.com/science/article/abs/pii/S2210670714000298
- https://www.researchgate.net/publication/271364464_Industrial_Waste_Management_with_Application_of_RIAM_Environmental_Assessment_A_Case_Study_on_Toos_Industrial_State_Mashhad
- https://pubag.nal.usda.gov/catalog/6751783
- https://aet.irost.ir/article_919_5331f946ece3e25f7dacd4585486137a.pdf
- https://www.researchgate.net/publication/329327313_Environmental_impact_assessment_of_solid_waste_management_options_using_the_Rapid_Impact_Assessment_Matrix_RIAM_in_Birjand
- http://www.bioline.org.br/pdf?st16152
- https://link.springer.com/chapter/10.1007/978-1-4020-6385-5_27
- https://jest.srbiau.ac.ir/article_8846.html?lang=en

Question 2:

Water treatment projects within a district were selected for evaluation of the impact of pollutant parameters from raw and treated water. The evaluation was done using Leopold Matrix Method. Fourteen physio-chemical parameters were selected to assess the possible environmental impact of water treatment projects. The unit of measurement for the pollutants investigated were NTU for turbidity, °C for temperature, pH, and µs for electrical conductivity, with all other pollutants measured in mg/l.

- Calculate IV & EIV values for each pollutant
- Explain with a simple column chart which pollutants were most affected upon treatment.
- The change in difference of which pollutants between raw and treated water is acceptable/unacceptable?

Solution:

Link to the spreadsheet:
https://docs.google.com/spreadsheets/d/1hko9Zz6lLTW4T0Nn5kpnLbjNDRSSg-z3dQaNhbo3_VY/edit?usp=sharing

The parameter that was most affected by the treatment was **pH** while the most affected pollutant was **Potassium (K)** followed by **Magnesium (Mg)**.

In treated drinking water, **pH, Temperature, Ca, T.H, $(SO4)^{2-}$** & **TDS** were in unacceptable concentrations while the rest were in acceptable concentrations.

In raw water, **pH, Turbidity, $(SO4)^{2-}$** & **TDS** were in unacceptable proportions while the rest were in acceptable concentrations.

Question 4:

Discuss three keys elements of the 1994, 2006, and 2020 (draft) EIA notifications. Prepare a comprehensive summary of these notifications highlighting the salient feature, commonalities and differences. Also, what in your opinion are the key benefits and limitations of EIA 2020 (draft) notifications?

Solution:

Features of the EIA 1994 Notification:

Advantages:

- It was the first Indian comprehensive framework to keep check on industrial activities that could be detrimental for the environment and social aspects by considering quantitative and semi-quantitative methodologies for assessment of balances between the environmental, developmental (economic), social and legal spheres.
- The framework was commended for its broad-scale applicability to almost all industrial projects with very few but well defined exceptions.
- The notification instituted the Impact Assessment Agency (IAA) for overlooking all EIA related responsibilities and also assigned fixed time-frames and detailed guidelines for following through on the framework in an orderly and timely manner.
- The notification provided proponents the opportunity to reapply for EC in case of rejection due to insufficiency/modification of data parameters. It also applied a monetary penalty for misrepresentation/falsification of data to discourage this behaviour.
- Location sensitivity was considered as a valid discourse to negate highly development driven projects. This helped protect ecologically sensitive areas from industrialization.

Limitations:

- Many industries were exempted from the clearance process on the basis of their potential investment plans, i.e. if the investment was less than Rs 100 crore. This was a problem because several such projects had a very high social and environmental impact despite their minor funding.
- Several industries and project categories were exempted from the EIA framework (or their requirements were relaxed) in its subsequent modifications. This diluted the effect of the original framework.
- Poor availability and reliability of data.
- Lack of consideration of alternative sites, technologies, designs and strategies.
- Insufficient emphasis on required cost effectiveness of EIA.

Features of the EIA 2006 Notification:

Advantages:

- Attempt to decentralize power from the central to the state governments for obtaining EC. This helps in reducing burden on the central government and facilitates quicker response times and refreshment of proposals.
- There is an overall reduction in time for discussion and process of granting ECs.
- Introduction of the concept of Environmental Permissions (EP) for B2 category projects.

Limitations:

- Decentralization of EC permissions grants absolute authority in the hands of the local governments which can be misused by development-biased governments to exponent industrialization in their state.
- If the EAC gets delayed in drafting the ToR, the proponent's sole discretion can bend the ToR conditions to his will without considering any biases against environmental impacts.
- The draft does not mention any sort of post-monitoring activities after the EC has been granted and the project has commenced.
- While public consultation is given a seat at the table in the EIA framework, it is only mandated after the EC has been granted, thus nullifying its impact on the results of the overall proposal and EC. This step should have been incorporated before granting the EC so that its outcome could also be incorporated in the decision-making.

- Public consultation is divided into public hearings for the locals and a written report for all other parties. This means that NGOs and civil society organisations cannot voice their views during the hearing.
- Reduction in EC granting time is compromised by the reduction efficiency and transparency of the EC process.
- Public consultation can be completely foregone if the concerned authorities feel that the situation is not conducive enough for it to be conducted.
- Fails to integrate EIA with other frameworks that form a part of environmental governance.

Features of the EIA 2020 Notification:

Advantages:

- Institutionalization of the Technical Expert Committee from the 1994 draft. The gravity of this specially weighs in when there is categorisation or re-categorisation of the project categories.
- Several additional stages have been introduced in the EIA framework such as the proposal of a draft EIA, submission of a final EIA and the generation of EMP for B2 category projects.
- The terms and conditions of the subsections of the notification are much more detailed compared to the 2006 notification.

Limitations:

- The time for public hearing is reduced from 45 days to 40 days, thereby giving affected people lesser time to formulate their response.
- The duration for giving notice of public hearing is reduced from 30 to 20 days. This is not good enough for the notice to reach the concerned people, for them to read and understand it and to formulate their arguments.
- Fails to integrate EIA with other frameworks that form a part of environmental governance.
- The penultimate step of ‘public consultation’ is very limited because, by the time this process starts, the EIA study is complete and the draft report is already prepared. The

right of communities to meaningfully participate in decision-making has been repeatedly ignored. Rather than a simple 'consultation' process, the full consent and participation of the Gram Sabha must also be secured within the EIA framework.

- The frequency of compliance reports reduced from biannual submissions to an annual affair. This extended reporting time provides opportunity for the projects to delay compliance with conditions and impairs the ability of regulatory bodies and project affected communities to constantly monitor the projects.
- It ignores the critical role of the project affected communities and limits the monitoring and compliance process to government agencies and project proponents.
- Allowance for those projects which had 41 undertaken construction activities or were operating without obtaining an EC to apply for a post-facto EC. I find that this is the biggest downside of the notification as the institutionalisation of the violation process will provide an opportunity for several projects which have been operating illegally to apply for a post-facto EC. The proposed amnesty to be granted to the illegal projects negates the very purpose of EIA which is to try and ascertain social and environmental risks of a project before it starts functioning.
- The draft notification places a restriction on the EAC, from carrying out additional studies during the appraisal process. While this is being done in order to reduce the time taken to grant a clearance, these additional studies are of great consequence in arriving at a decision.

Similarities and differences between 1994, 2006 & the 2020 draft EIA Notifications:

EIA 1994 Notification	EIA 2006 Notification	EIA 2020 Notification
All proponents undertaking a project under schedule - I need to prepare an EIA report and obtain environmental clearance (EC) from the central government.	Schedule - I projects are divided into Category A (EC obtained from central government & EIA report necessary) and Category B (EC obtained from state government). Category B is further subdivided into B1 (require generation of EIA report) and B2 (no EIA report needed).	Unless specifically mentioned, a project under Category B2 does not have to go through the appraisal process at all. The authority grants the EC after the submission of an Environment Management Plan ('EMP') and other required documents.

Scoping is non-existent and the Terms of Reference (ToR) was completely drawn by the proponent.	Scoping is defined as a major EIA process. The ToR is initially drafted by the State and Central Expert Appraisal Committee (SEAC & EAC) for A and B1 projects with criticism and inputs from the proponent. The proponent reserves the right to draft the ToR at will if the EAC fails to prepare it within 60 days of the proponent's application.	The scoping process remains more or less the same.
Public consultation is negligible and voluntary. The proponent can apply to the State Pollution Control Board (SPCB) for mediation of public consultation. The report needs to be widely publicized throughout the jurisdiction of the authorities.	All A and B1 type projects have been mandated public consultation with the exception of 6 service sectors. The responsibility of conducting public consultation still lies with the SPCB and must be initiated within 30 days of the submission of the draft EIA proposal by the proponent. The report needs to be widely publicized throughout the jurisdiction of the authorities. Time for the public hearing is 45 days. The duration for giving notice of public hearing is 30 days.	Projects under Category B2 do not go through public consultation. Several other project categories (other than B2 projects) are also exempt from public consultation. Also, the authorities do not necessarily need to widely publicize the public hearings within their jurisdiction. The time for public hearing is also reduced (40 days) while the duration for giving notice of public hearing is reduced to 20 days.
Project proponents are required to prepare biannual compliance reports, proactively sharing the status of compliance to the conditions mentioned in their approval letter to regulatory bodies.	Project proponents are required to prepare biannual compliance reports, proactively sharing the status of compliance to the conditions mentioned in their approval letter to regulatory bodies.	Frequency of compliance reports reduced to an annual affair.
Post - facto EC was not institutionalised.	Post - facto EC was not institutionalised.	Allowance for those projects which had 41 undertaken construction activities or were operating without

		obtaining an EC to apply for a post-facto EC.
Expansions and modernisations in most cases were required to go through the entire EIA process.	Expansions and modernisations in most cases were required to go through the entire EIA process. Only a few categories such as coal mining had been given certain exemptions which allowed up to 40% capacity enhancement without having to carry out a public hearing.	The draft notification significantly dilutes the concept of expansion and modernisation. In cases where the modernisation is carried out with an increase in capacity up to 10%, only an application for prior EC and a revised EMP will be required. If it is an increase between 10% and 25% an appraisal will be carried out on the basis of the revised EMP. Only for an increase above 25% would an EIA report be required to be prepared and only for more than 50% increase in capacity will public consultations be required to be carried out.
No special technical committee was appointed.	No special technical committee was appointed.	The TEC will be constituted by the Central Government comprising of maximum 10 members. It will undertake categorisation or re-categorisation of projects on scientific principles, including any streamlining of procedures and any other tasks assigned to the committee.
Standard EIA stages have been practised.	Standard EIA stages have been practised.	Several additional stages have been introduced in the EIA framework such as the proposal of a draft EIA, submission of a final EIA and the generation of EMP for B2 category projects.
The regulatory authority shall consider the	The regulatory authority shall consider the	The regulatory authority shall consider the

recommendations of the EAC/SEAC and convey the decision to the applicant within 45 days of the receipt of the recommendations.	recommendations of the EAC/SEAC and convey the decision to the applicant within 45 days of the receipt of the recommendations.	recommendations of the EAC/SEAC and convey the decision to the applicant within 30 days of the receipt of the recommendations.
	The validity for various projects is as follows: - Mining: 30 years River Valley and Hydroelectric Projects: 10 years Other projects: 7 years	The validity is divided into two phases: 1. Construction 2. Operational In the construction phase, the prior EC or the prior EP, as the case may be will be valid for: - Mining: 50 years, subject to commencement of mining within the first 10 years. River Valley, irrigation, Nuclear Power Projects: 15 years Other projects: 10 years.

References:

- https://www.cseindia.org/eia-legislation-402
- https://www.sociolegalreview.com/post/from-2006-to-2020-the-ongoing-problems-of-the-eia
- https://cprindia.org/sites/default/files/Reduced%20Regulations%20and%20Increased%20Exemptions_Part%20I_30.07.pdf
- http://ecoursesonline.iasri.res.in/mod/page/view.php?id=93495