ENVIRONMENTAL CLEARANCE FOR HIGH RISE BUILDINGS

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Abstract:-

Rapid Industrialization and population explosion in India has led to the migration of people from villages to city which increases human settlement in India's growing cities and town. . This generates several issues concerning the environment. Environmental Impact Assessment (EIA) is becoming a very vital study before the commissioning of any project, plan, or development in addressing the environmental issues in our country. EIA is considered the starting point in the process of implementing sustainable development agendas. Undertaking EC for the construction industry and improving site management can reduce environmental impacts both on and off-site.

In this paper, the EC study will be undertaken with an aim to prepare a detailed account of the environmental impact necessary for providing an anticipatory and preventive mechanism for environmental management of the proposed activity so that appropriate interventions could be taken. An attempt will be made in this to study EC of high rise building construction projects using Checklist Analysis Methodology. The study will focus on various parameters such as total area, parking area, rain-water harvesting system, basement area, sewage treatment, water management, nearest sensitive zones, and other factors. At last, analyze and demonstrate the application of a site project in Hadapsar as an example.

1.INTRODUCTION

Environmental Impact Assessment (hereafter referred to as EIA) is an interdisciplinary domain which puts forth the related environmental concerns of the project and ensures that these are considered and included in the decision making of whether to go ahead with the intended projects or not. It can be broadly defined as the systematic identification, evaluation, and monitoring of the potential impacts of proposed projects relative to the physical – chemical, biological, cultural, and socio-economic components of the total environment (Canter, 1996). EIA has now become an integral part of granting of the Environmental Clearance (hereafter referred to as EC) to various upcoming projects. The preliminary purpose of the EIA is to predict, identify, and evaluate the potential, beneficial and adverse impacts of the proposed development on the environment at an early stage of project planning and designing.

It systematically examines all consequences of the proposed projects will have and ensures that these effects are included while designing the project. It helps in foreseeing all the probable environmental impacts and provides various mitigation measures for these. It also identifies whether these measures will negate the adverse environmental effects of the proposed project or not.

EC and EIA are two-sides of the same coin. Both are concerned with the effects any proposed construction activity has on the surroundings and proposes mitigation measures to ensure negating the effect of these activities. The EC process serves an important role by promoting overall transparency and public involvement.

2.ENVIRONMENTAL CLEARANCE GUIDELINES

2.1 Requirements of Environmental Clearance for Constructed Project

The proponents who propose their new project or expansion or modernization of any existing industry or project listed in Schedule I must apply to the Secretary, Ministry of Environment and Forests, New Delhi. The application must be made in the proforma specified in Schedule II and must include an EIA Report according to the guidelines issued by the Central Government in the MoEF timely. Cases rejected due to the submission of insufficient data and plans may be reviewed as and when submitted with complete data and plans. If submitted for the second time would itself be a sufficient reason for the Impact Assessment Agency (hereafter referred to as

IAA) to reject the case summarily. In case of the on-site projects like mining, pithead thermal power stations, hydro-power, major irrigation projects and/or their combination including flood control, ports, and harbours, and exploration of major minerals having area above 500 ha, the project authorities will inform the location of the project site to the Central Government in the MoEF while initiating any investigations and surveys. The Central Government in the MoEF will convey a decision regarding the suitability of the site within a maximum period of 30 days. The said site clearance shall be granted for a sanctioned capacity and will be valid for five years from commencing the construction, operation, or mining. The reports submitted with the application shall be evaluated, and if deemed necessary, it may consult a committee of experts by IAA. The IAA would be the Union Ministry of Environment and Forests. The said committee of experts shall have full right of entry and inspection of the site or, as the case may be after the commencement of the operations relating to the project. The IAA shall prepare points of recommendations based on technical assessment of documents and data, furnished by the project authorities, supplemented by data collected during visits to sites if undertaken, and interaction with affected population and environmental groups, if necessary. Summary of the reports, the recommendation, and the conditions, subject to which EC is given, shall be made available subject to the public interest to the concerned parties or environmental groups on request. Comments of the public may be solicited, if so decided by the IAA, within thirty days of receipt of the proposal, in public hearings arranged for the purpose after giving thirty days notice of such hearings in at least two newspapers. The public shall be provided access, subject to the public interest, to the summary of the reports at the Headquarters of the IAA. The assessment shall be completed within 90 days from receipt of the requisite documents and data from the project authorities and completion of the public hearing, where required, and decision conveyed within 30 days hereafter. The clearance granted shall be valid for five years from the start of the construction or operation. No construction work, primary or otherwise, relating to the setting up of the project may not be undertaken until the environmental site clearance is obtained.

3.ENVIRONMENTAL CLEARANCE PROCESS

3.1 Introduction

The emphasis of the EC process is on prevention and hence is more proactive than reactive in nature. It consists of a set of procedural steps culminating in a written impact assessment report, which informs the decision-maker whether to approve or reject the proposed project.

An application seeking EC will attach the prescribed Form 1 annexed herewith and Supplementary Form 1A as given in Appendix, after the identification of the proposed site for the project and activities to which the application connects, before the commencement of any sort of construction activity such as preparation of land by the applicant. The applicant shall also present a copy of the conceptual plan, along with the above forms.

3.2 Categorization of Large Constructed Projects

The EIA was made mandatory in 1994 under the provision of EPA in 1986. There were certain notifications amended on 14.09.2006, and the EC for large construction projects was redefined and modified. Depending on the area of the project and whether it comes under state or central government two categories are made.

Category A - Projects require environment clearance from the Central Government.

Category B - Projects require environment clearance from State Level EIA Authority.

In January 2013 the Director of National Environmental Engineering Research Institute, Nagpur, re-categorized 'B' category projects into categories 'B1' and 'B2' under EIA Notification, 2006, and its amendments. The projects categorized as B1 require the EIA report for appraisal and also have to undergo a public consultation process. The projects categorized as 'B2' (except for township and area

development projects) are to be appraised based on the application having pre-feasibility reports and other essential documents. The MoEF is assigned the task of issuing appropriate guidelines for Category A projects, and State Environment Impact Assessment Committee hereafter referred to as (SEIAC) is assigned the task of issuing appropriate guidelines for Category B projects.

The Environment Clearance for an area of the constructed project under the new EIA Notification, 2006 is as per the following schedule (Table 3.1) -

Table 3.1: Building/Construction projects/ Area development projects and townships

8	**Building /Construction projects/Area Development projects and Townships**		
8(a)	Building and Construction projects	≥20000 sq.mtrs and <1,50,000 sq.mtrs. of built-up area#	The built up area for the purpose of this notification is defined as "The built up or covered area on all the floors put together including basement(s) and other service areas, which are proposed in the building/construction projects"
8(b)	Townships and Area Development projects.	Covering an area ≥ 50 ha and or built up area ≥1,50,000 sq .mtrs ++	**All projects under Item 8(b) shall be appraised as Category B1

Table 3.1: Building/Construction projects/ Area development projects and townships

3.3 Screening and Appraisal

Screening:

The first step in the process of obtaining EC is Screening. It determines whether the proposed project requires an EIA and if it does require an EIA, then the level of assessment required.

It entails the scrutiny of an application seeking the prior EC made in Form 1 and Form 1A by the concerned SEAC. It determines whether the proposed project requires any further environmental studies of an EIA for its appraisal before the grant of EC depending upon the nature and location of the project. Then the proposed projects are classified into two different categories – B1 and B2.

The applications can be rejected in this stage itself by the regulatory authority on the recommendation of EAC or SEAC. In such cases, the decision along with valid reasons is communicated to the respective applicant in writing with in sixty days from the receipt of the application.

Appraisal:

Appraisal implies the detailed scrutiny of the proposed project that includes the application and other documents such as the final EIA report, submitted by the applicant to the concerned authority for the grant of EC by the Expert Appraisal Committee (hereafter referred to as EAC) or SEAC.

A proceeding is then carried out wherein the applicant shall be invited for furnishing necessary clarifications in person or through an authorized and approved representative. The conclusion of this, the concerned EAC or SEAC makes categorical recommendations to the regulatory authority regarding the granting of prior EC on certain stipulated terms and conditions, and if the application for prior EC is to be rejected then the reasons for the same to be provided.

For the proposed projects that are not supposed to undergo public consultation, or to submit an EIA report, the appraisal is carried out based on the prescribed application Form 1 and Form 1A, along with any relevant information available and a site visit by the EAC or SEAC concerned.

The appraisal of the proposed project should be completed within sixty days of the receipt of the final EIA report and other documents or the receipt of Form 1 and Form 1A, where the public consultation is not required and is completed by the EAC or SEAC. The recommendations provided by these committees should be placed before the required competent authority for the final decision within the next fifteen days.

3.4 Flowchart Steps in EC Process:

Step 1: Screening

This is the preliminary stage if EIA, which determines whether the proposed project requires an EIA and if does, the level of assessment required. While all category A projects are required to undertake EIA studies as part of the EC process, only certain category B projects have to do the EC process. The SEAC scrutinizes the application and determines, based on the 'nature and location specificity' of the project, whether future EIA studies need to be undertaken before appraising the project for the grant of EC. Projects that require EIA studies before appraisal are referred to as Category B1 projects and the rest are referred to as Category B2 projects.

Step 2: Scoping

'Scoping' requires the concerned SEAC to issue detailed, comprehensive Terms of Reference (hereafter referred to as TOR) addressing all concerned environmental concerns, for the preparation of the EIA report. The key issues and the impacts of the project are further investigated within the proper boundary and time limit of the study. The TORs are typically drafted by the relevant SEAC after considering the information provided by the project proponent in Form 1/1A and the draft TORs proposed by it.

Step 3: Impact Analysis

The environment and socio-economic impact of the proposed project are predicted and evaluated, along with its significance.

Step 4: Mitigation

This includes the recommendations to reduce and avoid the potential adverse environmental consequences of development activities.

Step 5: Reporting

Present the result of EIA analysis in the form of a report to the decision-making body and other interested parties.

Step 6: Review of EIA

Provide information necessary for the decision-making (granting clearance) and the adequacy and effectiveness of the EIA report.

Step 7: Decision Making

Decide whether the project is rejected, approved, or requires future changes.

Step 8: Post Monitoring

It checks whether the impacts of the project exceed the legal standards and implementation of the mitigation measures.

Once the project proponent has submitted the revised EIA report , the SEACs undertake a 'detailed scrutiny' of the EC application and other documents, including the final EIA report. It is affected by the nature and extent of consideration given to each project proposal by SEAC. In case the project proponent is not informed about the final decision on its EC application within the stipulated time limit, the project proponent can assume the final recommendations of SEAC to be the final decision of the appropriate regulator. If the regulator (MOEF) has not issued a final decision within forty-five days from the date of the SEAC's recommendation, it is assumed that the EC has been granted.

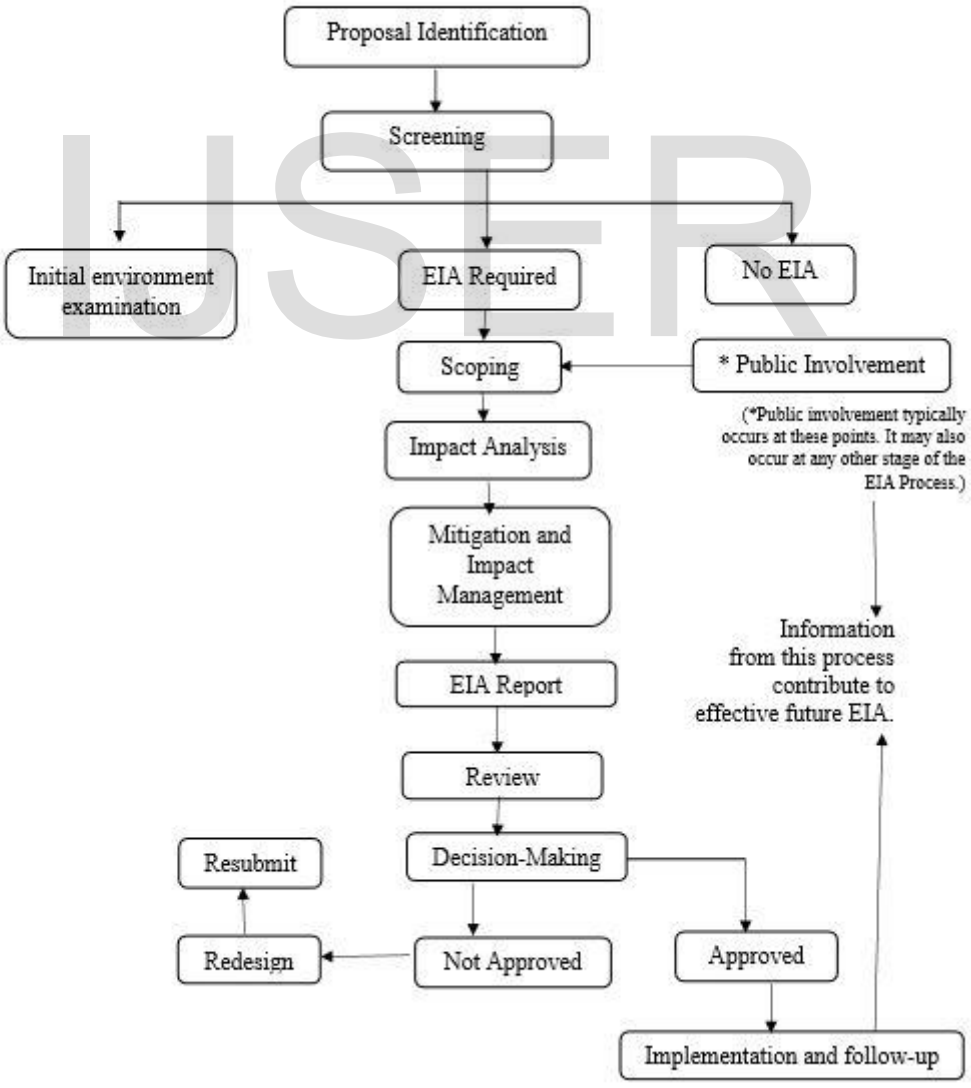

Fig:3.1Flowchart for Environmental Clearance.

3.5 Grant or Rejection of Environmental Clearance

The concerned regulatory authority shall consider the recommendations of the EAC or SEAC and then convey its decision to the applicant:-

a. within forty-five days of the receipt of the recommendations of the EAC or SEAC concerned.

b. within 105 days of the receipt of the complete application with requisite documents

Generally, the recommendations given by the EAC or SEAC concerned are taken into consideration by the regulated authority. When the regulatory does disagree with the recommendations of the EAC or SEAC concerned, it requests for reconsideration by the EAC or SEAC concerned within forty-five days of the receipt of the recommendations of the EAC or State EAC concerned while also stating the reasons for the disagreement at the same time.

This decision taken by the regulatory authority is then conveyed to the applicant simultaneously. The EAC or SEAC concerned, in turn, will consider the observations of the regulatory authority and furnish its relevant views on the same within a further period of sixty days.

The final decision lies within the regulatory authority, after considering the views of the EAC or SEAC concerned and is conveyed to the applicant within the next thirty days.

If in the case that the decision of the regulatory authority is not communicated to the applicant in the above-mentioned cases, as applicable, the applicant can proceed as if the EC sought for has been granted/denied by the regulatory authority in terms of the final recommendations of the EAC or SEAC concerned.

On the expiry of the period specified for decision by the regulatory authority for the above mentioned circumstances, as applicable, the decision of the regulatory authority, and the final recommendations of the EAC or SEAC concerned shall be public documents.

Unless sequentially dependent on EC either due to a requirement of law, or for necessary technical reasons, clearances form other regulatory bodies or authorities shall not be required to the receipt of applications for EC of projects or activities, or screening, or scoping, or appraisal, or decision by the regulatory authority concerned.

Based on deliberate concealment and/or submission of misleading information or data which is material to screening or scoping or any other step of the application, the application shall be liable for rejection and the EC granted on that basis will apply for cancellation. Rejection of an application or cancellation of the EC already granted, on such grounds, shall be decided by the concerned authority, after giving a personal hearing to the applicant and following the principles of justice.

4.CHECKLIST METHODOLOGY

4.1 General

The checklist methodology gives us various lists of questions and documents to be submitted if any for the proposed project by the proponents. These lists of questions are mentioned in Form 1 and Form 1A. The questions asked must be: -

a. Will the proposal have any changes to the demographic structure of the local population?

b. Details of the existing social infrastructure nearby the proposed project must be given.

c. Does the project cause any adverse effects on local communities, disturbance to sacred sites, or other cultural values? Are any safeguard measures looked upon?

4.2 Land Environment

The proposed project may result in potential impacts on land use such as agriculture, pasture, and forest and result in conflicting land use (land use/land cover maps to be prepared).

Moreover, land use indirectly draining catchment along with physical characteristics of soil affect sediment transport to the river and subsequently to the reservoir, limiting its storage capacity and lifetime and robbing downstream waters of sediment. The projects accompanied by construction activity, creation of new settlements, diversion of forest areas, and introduction of new development, all these factors affect the soil cover resulting in compaction, increased sedimentation, soil erosion, and loss of soil fertility and flash floods.

Therefore, the study of land use patterns and physical characteristics of soil in the catchment area are important considerations in the EIA of construction projects.

The checklist methodology gives us various lists of questions and documents to be submitted, if any, for the proposed project by the proponents. This list of questions is mentioned in Form 1 and Form 1A. The questions asked must be: -

a. Does the existing land use get significantly altered from the project that is consistent with the surroundings?

b. List all the major project requirements in terms of the land area, built-up area, water consumption, connectivity, power consumption, community facilities, parking needs, etc.

c. Will there be any significant land disturbance inferring to subsidence, erosion, & instability?

d.Does construction debris & waste during construction cause health hazards?

e. What are the most likely impacts of the proposed activity on the existing activities adjacent to the proposed site?

4.3 Water Environment

Water available in the project catchment should be considered in terms of surface runoff, precipitation, groundwater, rivers, and lakes. One of the vital analyses of any water development project is the quantity of water of adequate quality which could be made available in the project area for various uses, via; drinking, irrigation, hydropower, navigation, and industry.

The checklist methodology gives us various lists of questions and documents to be submitted if any for the proposed project by the proponents. This list of questions is mentioned in the

Form 1 and Form 1A. The questions asked must be: -

a. Give the total quantity of water required for the proposed project with the breakup of requirements for various uses.

b. How much of the water requirement can be met from the recycling of treated wastewater?

c. Give details of the water requirements met from water harvesting?

d. Impact on groundwater.

e. What precautions are taken to prevent the runoff from construction activities polluting land & aquifers?

4.4 Air Environment

Transportation and operation of construction machinery are an integral part of big construction projects. Any large construction site is never a single unit, but it is a part of the citys system. Road layout affects the users and uses patterns on the one hand, and the operation of construction machinery affects the people residing or working near the site on the other. Both of these activities affect the environment. The pollutants likely to be thrown out due to the construction activities are particulates and impacts will be limited to an area close to the project site. Air quality monitoring should be restricted to the project site and at downwind direction. The air quality concerning Suspended Particulate Matter (hereafter SPM) and Repairable Suspended Particulate Matter (hereafter referred to as RSPM) is monitored for seven days at each location. In case the study area is lacking of any air pollution source, there is no need for ambient air quality monitoring.

The guidelines for managing transport (including air and noise) is divided into two parts, the first pre-construction stage, and the second is the construction stage.

4.4.1 Pre- Construction Guidelines (Site Planning)

A planned transportation system is the one, which is safe for users and facilitates direct and easy bicycle and pedestrian circulation between the residence and schools, shops, and workplaces. The design, scale, and development plan of the neighborhood should suit such a type of safe movement. There should be proper coordination of land use decisions with existing and planned public transportation services and the need for non-motorized access. The concerns about the design of such system and the mitigation option are-

a. Excessive use of fuel.

b. The danger of accidents.

c. Air and noise pollution.

4.4.2 Guidelines for Reduction of Pollution during Construction and Demolition Activities:-

The main concerns during demolition and construction activities are the emissions generated by the machinery and vehicles. The main emissions are dust, noise, and vibrations.

The checklist methodology gives us various lists of questions and documents to be submitted, if any, for the proposed project by the proponents. These lists of questions are mentioned in Form 1 and Form 1A. The questions asked must be: -

a. Will the project increase the atmospheric concentration of gases and result in heat islands?

b. Provide different mitigation measures adopted.

c. Will there be a remarkable increase in traffic noise & vibrations?

4.5 Socio-Economic Factors

4.5.1 Demographic Profile

The data on the population in the project area should be collected to find the number of people and the extent to which they are favorable and adversely affected. The population data collected would provide the basis for analyzing migration, immigration, population, projection, rehabilitation and resettlement, identification of beneficiaries, the relative distribution of benefits, and urban-rural clash.

The population data can be collected from the available records at Municipalities, Village Panchayats, Block Development Officer, Local Self Government Officers, as well as from the latest available census report. District gazetteers are the major source of information. If necessary, door to door sample surveys can be undertaken to review the quality of information available.

4.6 Biological Environment

The baseline status of the biological environment should be established by studying community structure, distribution patterns, population dynamics, and species composition of fauna and flora belonging to all groups. Species diversity, richness indices should be analyzed to establish the overall biodiversity richness. The red-listed species and faunal species belonging to the schedule category of act should be identified and enumerated or listed for conservation and rehabilitation. A field survey shall record and report all the type of available species, supplemented by secondary data from forest working plans and other important published literature. The specimen of all the species observed in the area should be collected, maintained, and shown to EAC during the presentation of the EIA report.

The checklist methodology gives us various lists of questions and documents to be submitted, if any, for the proposed project by the proponents. These lists of questions are mentioned in Form 1 and Form 1A. The questions asked must be:-

a. Will there be any threat of the project to the biodiversity?

b. Is the construction involve extensive clearing or modification of vegetation?

c. What are the measures required to be taken to minimize the impacts on important site features?

d. Will there be to be any displacement of fauna?

4.7 Energy Conservation

One of the preliminary requirements of a building is that it must have optimum energy performance and yet would provide the required thermal and visual comfort.

The three fundamental strategies adopted to optimize energy performance in a building can be broadly classified as:

a. Incorporate passive solar techniques in building design and enhanced building material specifications to minimize load on conventional systems (heating, cooling, ventilation, and lighting)

b. Design energy-efficient lighting and heating, ventilation, and air-conditioning (HVAC systems)

c. Using renewable energy systems (solar photovoltaic systems or solar water heating systems) to meet a part of the building load.

It specifies the low energy strategies and energy-efficient techniques and technologies that could be adopted in various climate zones of India. Simple solar passive techniques such as optimum building orientation, landscaping, arrangement and shape of buildings, the effective surface to volume ratio, proper location and size of the glazing type, opening, shading of windows, and relevant selection of building materials are described regarding different climate zones of our country.

5.CASE STUDY

To practically understand the implementation of all the factors mentioned which are designed to obtain EC, we visited a site, which we will be described in this section.

(a) (b)

Plate 5(a, b): The Site

5.1 Number of Flats

The entire society had a total of 416 flats.

There were many buildings in the society, and each building had a total of 24 flats in it. Each floor had six flats, and each building had thus four floors in it.

5.2 Number of Residents

As there were 24 flats in each building, 24 families could live in one building. Considering five members in each family,

Total residents in 1 building = 24*5 = 120.

Total residents in entire society = 416*5 = 2080.

5.3 Area of Flats

Almost all the flats in the society were 2 BHK flats. Every 2 BHK flat had an area of 800 sq. ft.

Out of this total plot area, 35% is the carpet area.

Hence, carpet area for each flat = 35% of 800 = 280 sq. ft.

5.4 Provisions for Environmental Clearance

The entire society was very spacious and had a lot of greenery. The building was constructed by taking into consideration the various guidelines for EC. Some of the major provisions provided to obtain the EC were:

5.4.1 Water Supply

The water demand considered was 100 liters per family.

Thus, the total water demand for the entire society = 100* 416 = 41600 liters.

(1 cubic meter = 1000 litre)

Total water requirement for entire society = 41.6 cubic meters.

Source of water: open well (bore water) is provided.

The well is located 16 feet below the ground.

Total sewage water to be treated is (let say)=120 m3/day.

5.4.1.1 Water Balance Chart for Dry Season

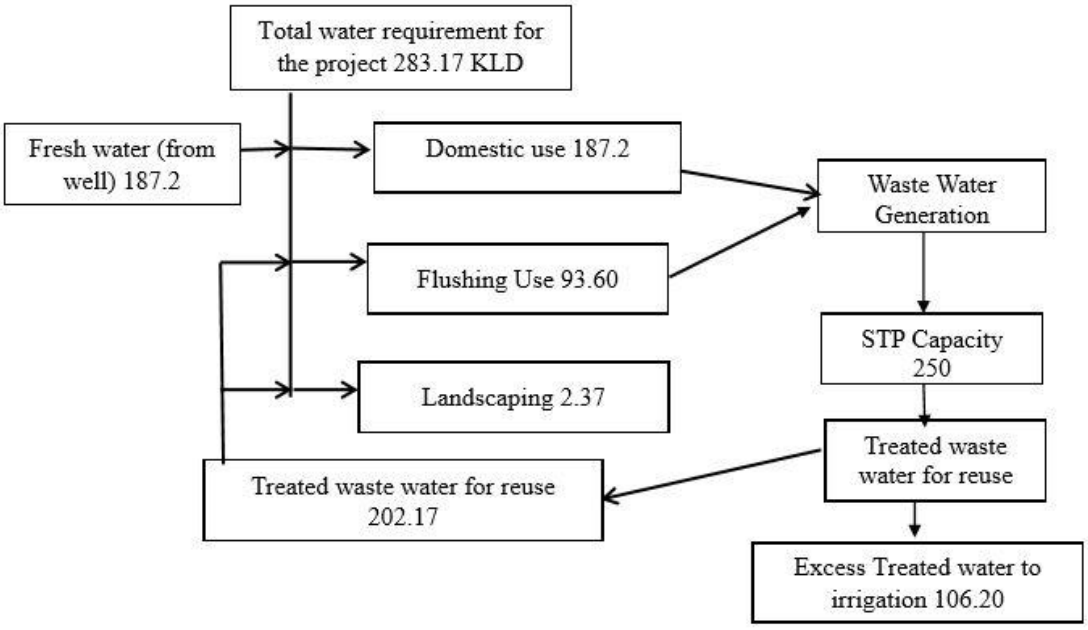

Fig 5.4.1.1: Water Balance Chart for dry season

5.4.1.2 Water Balance Chart for wet season-

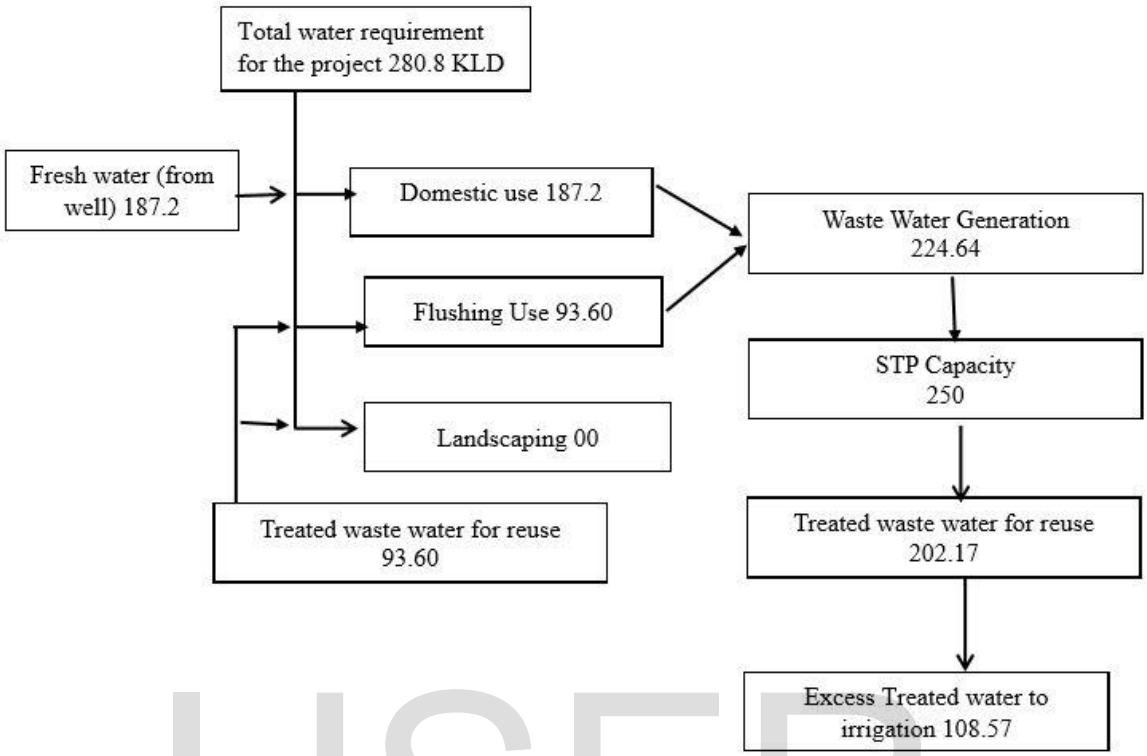

Fig. 5.4.1.2: Water Balance Chart for wet season

5.5 Waste Water Treatment Plant

Every building generates wastewater, amounting to 80% of the total water consumed. The major source of wastewater includes greywater from bathrooms, kitchens, and black water from washrooms. To maintain the surrounding environment and to minimize the demand for potable water, every new construction needs to ensure the treatment of the wastewater generated from the building through centralized or decentralized systems.

5.5.1 Treatment Technique

Wastewater can be treated suitably and reused for non-potable applications such as irrigation, flushing, etc. In this present case study, an aerobic treatment system has been used. This process is based on the biological conversion of organic contaminants in the wastewater in the presence of oxygen. Carbon dioxide is given off, and sludge produced, leaving the water is relatively clean. The wastewater is generally pre-treated by passing it through a settling chamber before aeration.

Advantages:

a. Complete treatment of wastewater
b. Used as the final polishing step before the discharge of wastewater

Disadvantages:
a. High land requirement
b. The high energy required for the operation of the treatment plant.

5.5.2 Waste Water Treatment Plant Flow Chart:-

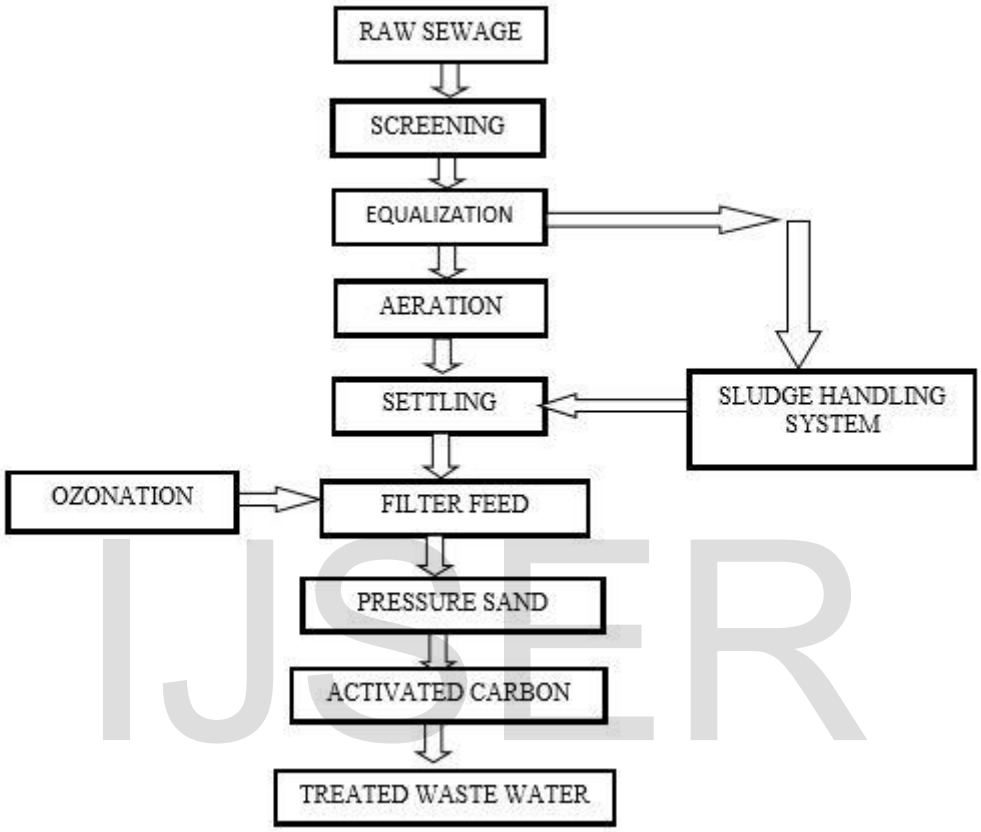

Fig. 5.5.2: Waste Water Treatment Plant flowchart

5.5.3 Design Details Sewage Treatment Plant designed to treat wastewater in the given project-

a. Flow : 120m3/day

b. Peak Factor : 3 times of Average flow

c. Operating Hours : 24 hours

d. BOD (Biological Oxygen Demand) (mg/l) : 200-250

5.5.4 Bar Screen Channel

Average daily flow = 120m3/day

Operation Hours = 24 hours

Average hourly flow = 120/ (24*60)

= 5m3/sec

Peak hourly flow = 3*Average hourly flow

= 3*5

= 15 m3/day

= 4.167*10 -3 m3/s

Maximum Approach velocity is in between 0.6 m/s to 0.75 m/s.

Let us take maximum velocity = 0.75 m/s

Q = A*V

A = 4.167*10-3 m3/day / 0.75

= 5.5*10 -3 m2

A = width*1.5*width (since depth = 1.5*width)

5.5*10-3= width*1.5*width

Width = 0.60m

Depth = 1.5*0.60 = 0.8m

Length = 1m

The dimensions of Bar Screen Channel are: 1*0.6*0.8 m SWD

Material of Construction: RCC

5.5.6 Equalization Tank

Flow rate = 120m3/day

It is observed that the water stays in the equalization tank for about half of the operating time

Therefore, T = 24/2

= 12 hours.

According to NPTEL (IIT Kharagpur):

Volume (V) >= c [(Q/T) - (K*Q/24)]

V >= [(120/12) - (1*120/24)]

V >= 60m3

Therefore, Size: 16 m2 *4m SWD

The material of Construction: R.C.C.

5.5.7 Activated Sludge Digestion Tank

V*X = [Y*Q*qc(S-So)]/ [(1+kd*qc)] * X

{where: Y = initial BOD(mg/l) content = 200 mg/l

: Q = Flow rate

: MLVSS or X = Mixed liquor volatile suspended solids

: qc or (F/M) ratio}

= BOD content*peak flow (MGD) /flow (MGD)*MLVSS

(1m3/day = 264.17 gal/day)

= 225*95101.2/ (31700.4*2400)

= 0.28125

{where: SVI = 133 (from NPTEL, IIT Kharagpur)

: MLVSS/MLSS = 0.8

MLVSS = 0.8*3000

= 2400 mg/l}

Let mean cell residence time, Θc = 10 days

V*X = [Y*Q*qc(S-So)]/ [(1+kd*qc)] *X

V*X = [200*4.167*10-3 *0.28125(250-200)]/ [1+1*0.28125)] * 2400

V*X = 9.147*2400

V*X = 21952.8

Oxygen required = [Q(S-So)/f]-1.42*Qw*Xr

{where f = BOD content at 5 days/ultimate BOD

f = 0.68}

Θc = [V*X]/ [Qw* Xr]

= [21952.8]/ [Qw*Xr]

Qw*Xr = 21952.8/10

= 2195.28

Oxygen Required = 8823.53-(1.42*2195.28]

Oxygen Required = 5706.23*10-3 kg O2/day

Oxygen Required = 5.706 kg O2/day.

5.5.8 Aeration Tank

Q = A*V

120m3/day = Area*1.5 m/min

120*3/ (24*60) = Area*1.5

Area = 0.067 m2

Q = Volume/Detention time

[360 m3/hour]/24 = Volume/5 hour

Volume = 75m3

Volume/Area = Depth

Depth = 75/0.067 = 1000m

Provide 5 aeration tanks

Depth of each tank = 1000/5

= 200m

Width/depth = 1.7

Therefore, Width = 340m

Length = 400m

Dimensions are: 400*340*200 m SWD

Material of Construction: R.C.C

5.5.9 Filtration Plant

This is an extremely important piece of construction that we saw at the site. With the help of this filtration plant, the water that is obtained from the well can be treated properly and can be used by the residents of the society. Because of this, Pune Municipal Corporation does not need to provide water to the society. The society is self-sufficient in terms of water because of the filtration plant that is installed. Since the water from the well is used, the hardness of the raw water is greater than 800 ppm. To treat the water, sand filter and resin filter are provided. These filters are used to reduce the hardness to 250 ppm.

(a) (b)

Plate 5.5.9(a, b): Filtration Plant

5.5.10.Disinfection

Disinfection of water leads to removal, deactivation, or killing of pathogenic microorganisms. In deactivation, all the harmful bacteria, viruses, and fungi are removed. At the given site, in the filtration plant sodium chloride (NaCl) is used as a disinfecting agent. 150 liters of NaCl are required per day for the treatment of the water. After treatment from these two filters and after disinfection, this water is supplied to all the flats for washing utensils/clothes, and bathing purposes.

(a) (b)

Plate 5.5.10(a, b): Disinfection Plant

5.6 Rainwater Harvesting

The rainwater is collected from surfaces on which rain falls, filtered, and stored for future use. This is known as rainwater harvesting. It helps in replenishing the groundwater levels. For the site that we visited, water is collected through the means of perforated pipes and stored in recharge pits that are 8.5 feet below the ground. 15 pits in total were provided to store the collected rainwater. 3 layers of sand are provided through which the stored water percolates into the ground and recharges the groundwater level. Because of this, the level of the well is maintained at a constant level. The excess rainwater helps in maintaining the groundwater supply throughout the year. The well is replenished because of this and the water can be used by the residents throughout the year.

Plate 5.6: Rainwater Harvesting

5.7 Secondary Treatment Plant

An STP has been provided at the given site and it has been running successfully for the past 5 years. This is the only STP in Pune city which has been constructed below ground. To save the space required for the construction of STP, this plant was constructed 30 ft. below the ground level. Also, by constructing the plant below the ground level, the toxic gases and odour released during the treatment of sewage do not affect the surrounding residences.

The wastewater that is collected from the entire society is divided into two parts: sullage and sewage.

5.7.1 Sullage Treatment

Sullage is the wastewater from household sinks, baths, and showers. It does not include wastewater from toilets and liquid excreta. The sullage is passed through filtration plant and the recycled water is used for flushing purposes.

5.7.2 Sewage Treatment

Sewage includes the wastewater from toilets and excreta. The sewage is treated using aeration method. In this process, water and air are brought in close contact. This removes the dissolved gases, oxidizes dissolved organic matter, and increases the dissolved oxygen level in the water. In the site that we visited, we observed that below the ground, an aeration tank is provided, and the water body is exposed over a vast surface to the atmosphere. With the help of a surface aerator, the water is kept in contact with air continuously, so that organic

matter is oxidized. The volatile gases are removed, and oxygen takes its place until equilibrium is reached. Then, the water is treated with alum in vertical cylinders. Alum helps in removing the turbidity and unwanted color from the water.

The treated sewage water is provided to the adjoining areas for irrigation purposes free of cost. During the construction phase, an Engineer and a supervisor were allotted to the STP to maintain the STP in proper working condition. After the construction is properly complete, it will be handed over to the society.

(a)

(b)

(c)

(d)

Plate 5.7.2 (a, b, c, d, e): Sewage Treatment Plant

5.8 Solar Water Heating System

To gain the energy from the sun and convert it to electricity, solar panels provided on the terrace of each building in the society. These solar panels have small photovoltaic cells. These cells allow photons or particles of light, to knock free electrons from the atom thus generating a flow of electricity. This reduces the dependency on conventional sources of electricity and reduces the load on natural resources.

6 solar panels per building are provided. These solar panels are mostly used for heating water. Hence, 400 or 800-liter tanks are provided on top of each building in which the water is heated from solar energy and it is provided to the various flats for usage.

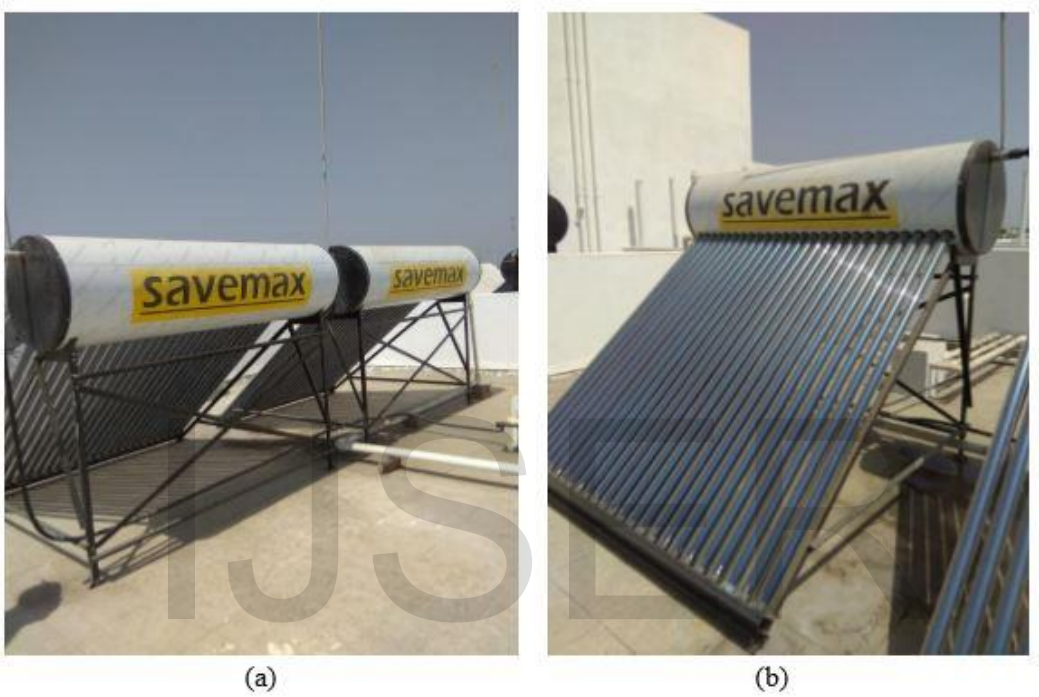

Plate 5.8 (a, b): Solar Water Heating System

5.9 Summary

The case study helped us to understand how important it is to take into consideration the guidelines for EC while building any high-rise building. It is observed that not just in theory, but if practically applied, the measures are taken to protect the environment through the EC help in making the environment and the society a better place to live in. By providing appropriate measures, the amount of water and electricity that is used can be reduced significantly. Also, the positive benefits of the project are enhanced and the negative impacts are minimized to the maximum possible level.

6.QUESTIONNAIRE

6.1 General

I have prepared a short questionnaire that can be provided at the site for which EC is to be obtained. The proponents should answer this questionnaire so that the officials get preliminary knowledge about the project that is proposed. They will get rough information about the project shortly and concisely. With the help of this information about the site, the officials can decide what measures should be taken by the project proponents, so that the negative impacts of the project are minimized, and the positive benefits are enhanced. They can also specify what measures should be taken so that EC can be granted. Rather than providing a huge amount of irrelevant information and increasing unnecessary paperwork, the officials can specify exactly what information is required in detail in Form 1A after they know the preliminary information about the project. This will minimize the delays that are caused due to a huge amount of paperwork, and miscommunication between the officials and the proponents. It will also help in checking the feasibility of the project.

6.2 Questionnaire

1) Name of project and details of the project proponent
2) Location of the site: should include
a. Google image of the site
b. Details of latitude and longitude

c. Legal documents of ownership of the site

d. Necessary permissions to undertake construction

3) Total number of residents

4) The total area of 1 flat, 1 building and the entire society

5) Brief details of the immediate surroundings of the site.

Should include mention of:

a. available natural resources like river, level of groundwater in the area

b. type of soil

c. the topography of area

6) Water Supply- should include details of:

a. Source of water supply

b. Water demand per person per day

7) Details of how raw water and wastewater is proposed to be treated

8) Whether a rainwater harvesting plant is required, if yes, how and where it is going to be constructed.

9) What measures are proposed to reduce energy and water consumption

10) Whether solar panels are provided.

11) How vegetation, flora, and fauna will be conserved during and after construction.

12) How the environment will be conserved after the project is completed, i.e. during the operation phase.

7. CONCLUSION

From the study conducted by us in our project, we can conclude that-

• While development is inevitable and essential to improving the quality of life, meet basic human needs and secure better prospects for the citizens of developing countries, it is also equally essential to ensure that the development takes place on a sustainable basis.

• Even though development is required, it is neither scientific nor rational to accept the argument that developing countries of today, as was done by the developed countries, should develop and progress first and having developed, work to rectify the environmental disruptions that may have been caused during the development process. This argument is not only unacceptable from an ethical point of view but is also economically incorrect.

• India and other developing countries who cannot afford to make mistakes with the long-term sustainability of their development plans, should learn a lesson from these countries and ensure that while they develop their country's infrastructure, they also protect the environment.

• Today the need of the hour is to find innovative ways for carrying out the EIA process under limited costs, time, and available expertise. At the same time, EIA should be standardized for respective countries so that a common framework is followed.

• Presently, in India EC is the only environmental tool that legally ensures that any new project is launched/installed/set up in such a way that it causes the least damage to the environment.

• Hence, the proper formulation and implementation of EC is a must in a rapidly developing India.

8.ANNEXURES

ANNEXURE I

Schedule 1-Some of the list of Projects Requiring Environmental Clearance from the Central Government.

1. Nuclear Power and related projects such as Heavy Water Plants, Nuclear Fuel Complex, Rare Earths.

2. River Valley projects including hydel power, major irrigation and their combination including flood control.

3. Ports, Harbors, Airports (except minor ports and harbors)

4. Petroleum Refineries including crude and product pipelines.

5. Chemical Fertilizers (Nitrogenous and Phosphatic other than single super - phosphate).

ANNEXURE II

Schedule 3-Composition of the Expert Committees for Environmental Impact Assessment.

1. The Committees will consist of experts in the following disciplines:

a. Eco-system management b. Air/Water Pollution Control c. Water Resource Management d. Flora/Fauna conservation and management e. Land Use Planning f. Social Sciences/Rehabilitation g. Project Appraisal h. Ecology i. Environment Health j. Subject Area Specialists k. Representatives of NGOs/persons concerned with environmental issues

2. The Chairman will be an outstanding and experienced ecologist or environmentalist or technical professional with wide managerial experience in the relevant development sector.

3. The representative of Impact Assessment Agency will act as a Member Secretary.

4. Chairman and Members will serve in their individual capacities except those specifically nominated as representatives.

5. The Membership of a Committee shall not exceed 15.

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