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A Comparative Study of Environmental Impact Assessment Reports of Housing Projects of Lucknow City, Uttar Pradesh, India

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ABSTRACT

One of the most pressing issues with regard to the environment is linked to human settlement in world's growing cities and towns. Several agencies use procedures for environmental impact assessment (EIA) of housing projects which might result in significant environmental impacts. The EIA study is necessary to prepare a detailed account of environmental impact of the proposed activity so that appropriate interventions could be taken. An attempt has been made in this paper to compare different elements of EIA in four major housing projects of Lucknow city, Uttar Pradesh, namely Parsvnath City, LDA Gomti Nagar Extension scheme, DLF Garden City and Omaxe residency using checklist method. The study focuses on various parameters such as total area, parking area, rainwater harvesting system, basement area, sewage treatment plant, water quality, solid waste, source of water, depth of ground water, distance from the city centre, nearest sensitive zones and overall settlement density. The review of the EIA of housing projects reveal that some of the newly developed projects are characterized by severe shortage of basic services like potable water, well laid-out drainage system, sewerage network, sanitation facilities, electricity, roads and waste disposal. These in turn result in numerous environmental and health impacts that must be addressed. The green cover and water bodies have been destroyed to give way to the rapidly developing urban settlements at the outskirts. The paper argues that through early planning before the start of the project as well as through all phases of the project's development, if environmental concerns are considered simultaneously with other technical and economic criteria, it may be possible to develop the housing projects with the protection of natural resources of that area.

1) INTRODUCTION

In a span of one decade, between 2001 and 2011, the number of million plus cities in India has increased from 35 to 53, while the number of towns and cities has increased from 5161 to 7935, leading to an overall increase in the proportion of urban population from 27.8% to 31.2 %. Out of this urban population, about 25 % lives in India's largest 10 cities [1]. Urbanization as well as rural-urban migration have accounted for most of the population growth between 2001 and 2011. It is projected that India's urban population would increase from 380 million in 2014 to about 600 million in 2030. Such a massive increase in urban population would also create huge challenges for urban local bodies, mainly in maintaining the environmental quality without any compromise in the human well-being. It is beyond doubt that urban planning, infrastructural development and the resource consumption patterns of the emerging urban space will impact ecosystems both within cities' boundary as well as outside, with implications for the quality of life for people across the country [2].

Problems in the levels of amenities as well as natural resources endowments may arise where housing projects inadequately deal with environmental impacts. One of the

most pressing issues with regard to the environment is linked to human settlement in world's growing cities and towns. Environmental Impact Assessment (EIA) is a process used to predict the environmental consequences of any development projects and recommend suitable mitigation measures to decrease possible adverse impacts [3]. It is defined as the systematic recognition and assessment of the possible impacts of proposed projects, plans, programs or legislative actions relative to the physical, chemical, biological, cultural and socio-economic components from the environment [4]. The environmental impact process was introduced for the purpose of identifying the potential beneficial and adverse impacts of development projects on the environment, taking in order to account environmental, social, cultural, and aesthetic considerations. All of these considerations are critical to determine the viability of a project and to decide if a project should be granted environmental clearance or not. An EIA largely focuses on problems, conflicts, and natural resource constraints, which might affect the viability of a project in question. It also predicts how the project could harm to

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people, their livelihoods, and the other residing nearby developmental activities. After predicting potential impacts, the EIA identifies measures to minimize the impacts and suggests ways to improve the project viability.

In recent years, major housing projects have encountered serious difficulties because insufficient accounts have been taken into consideration while developing the project. Some projects have compromised on the resources front, while some have ignored the possible impacts on the natural environment. The rapid growth in the population in urban areas has increased the demand of land and cost of living, and it also increases the housing load and housing projects activities. This high demand of urban land and housing is often in short supply and out of the economic reach of the majority of the urban households [5, 6]. Any urban areas tend to be crowded as a result of an enormous mushrooming growth of peri-urban areas with people from diverse socio-economic backgrounds and employments [7]. These are the urban poor that are subjected to a life characterized by precarious conditions of nutrition and health, little or poor material possessions [8].

In Lucknow city, there are several housing projects that are developed by several real estate projects like Ansal Sushant Golf City, Sahara City, Virindavan sub city, Parsvnath City, LDA, DLF garden city, BBD Green City, Eldeco Eligance, Omaxe City, Omaxe residency etc. This study mainly focuses on four different housing projects of Lucknow city namely Parsvnath City, LDA Gomti Nagar Extension scheme, DLF Garden City, and Omaxe residency which are located in south and south eastern parts of the city. The projects differ in size and scope and are developed by both the government and the private builders. The study focuses on various parameters such as total area, parking area, rainwater harvesting system, basement area, sewage treatment plant, water quality, solid waste, source of water, depth of water, distance from the city centre, nearest sensitive zones, nearest water bodies, nearest forest patches, nearest highway, nearest railway station, nearest village and overall settlement density. The paper argues that through early planning before the start of the projects as well as through all phases of the project's development, if environmental concerns are considered simultaneously with other technical and economic criteria, it may very well be possible to develop the housing project with the protection of natural resources of that area.

1.1 Need of EIA for housing projects:

A high standard of city environmental quality is characterized by clean environment with, safe and attractive streets, parks and open spaces. The intersection and overlap of the natural environment with the built and socio-economic environment constitutes the city environment. It is argued in the literature that the functioning of urban areas should maximise the quality of life of the people that live and work in such areas, without compromising the quality of life of those who reside in peri-urban areas and rural settlements outside their boundaries. Some important components of quality of life in urban neighbourhoods are summarised as follow:-

- Environment: important component of quality of life
- Physical: air quality, water quality, derelict land, open space, noise, litter
- Built: building type, condition, appearance
- Social: education, community participation, services, ans leisure, crime, health, mental health

- Economic: employment and income

EIA is an effort to anticipate measures and weigh the socioeconomic and biophysical changes that may result from a proposed housing project. Best practice EIA identifies environmental risks, lessens conflicts by promoting community participation, minimizes adverse environmental effects, informs decision makers, and promotes environmentally sound projects. EIA of housing projects focuses on the prediction of environmental impact of the different components of the construction activity, ways and means to reduce adverse impacts by shaping the project to suit local environmental conditions, and presents the predictions and options to the decision-makers.

1.2 EIA procedure for housing projects:

EIA is a procedure used to examine the environmental consequences or impacts, both beneficial and adverse, of a proposed development project and to ensure that these effects are taken into account in project design. The housing projects fall under category – 8 (a) of EIA Notification, 2006 (as amended). 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 8(b) of EIA notification deals with townships and area development projects.

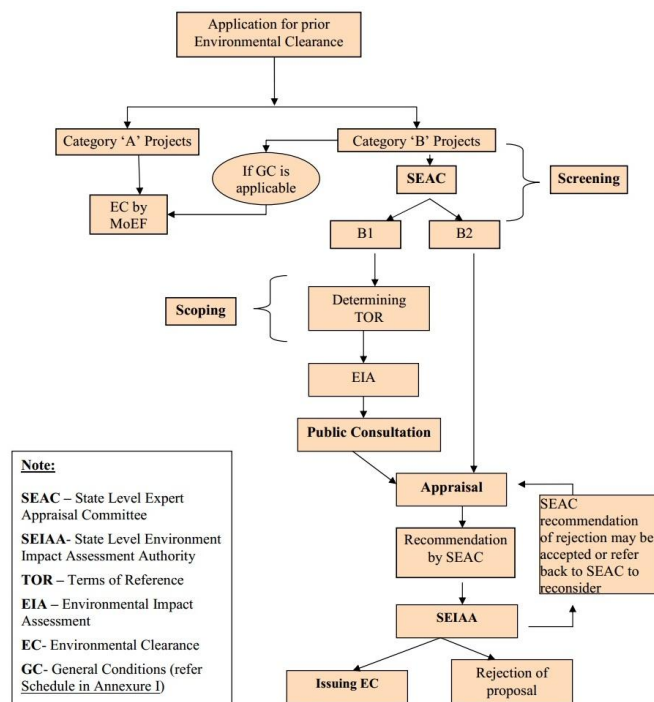


Fig. 1: Schematic flow diagram for environmental clearance for housing projects

The EIA is therefore based on predictions. These impacts can include all relevant aspects of the natural, social, economic, and human environment. The study, therefore, requires a multi-disciplinary approach and should be done very early at the feasibility stage of a project. These are: (a) Project Proposal: Proponent embarking on any major development project shall notify independent assessment agency (IAA) in writing by the submission of a project proposal; (b) Screening: Screening is done to see whether a project requires environmental clearance as per the statutory notifications. At

this stage, the project proponent decides the type of project and also about a requirement of Environmental Clearance; (c) Scoping: Scoping is used to identify the key issues of concern at an early stage in the planning process; (d) Baseline data collection: This refers to the collection of background information on the biophysical, social and economic settings proposed project area; (e) Impact predictions and assessment of alternatives: Impact prediction is a way of mapping the environmental consequences of the significant aspects to the project and its alternatives. For every project, possible alternatives should be identified and environmental attributes compared. Alternatives should cover both project location and process technologies; (f) Preparation of EIA Report: An EIA report provides clear information to the decision-maker on the different environmental scenarios without the project, with the project and with project alternatives; (g) Public hearing: After the completion of EIA report, public must be informed and consulted on a proposed development; (h) Decision-making: Decision-making process involve consultation between the project proponent and the impact assessment authority; (i) Monitoring and clearance conditions: Monitoring has to be done during both construction and operation phases of a project. It is done not just to ensure that the commitments made are complied with but also to observe whether the predictions made in the EIA reports are correct or not. Monitoring also enables the regulatory agency to review the validity of predictions and the conditions of implementation of the Environmental Management Plan (EMP).

1.3 Sustainability, green city and housing projects:

In 1980, first time the term sustainability was by IUCN as World Conservation Strategy followed by the United Nations Food and Agricultural Organization (FAO) in 1988 as sustainability is the handling and conservation of natural resources and the orientation of technological and institutional change so as to ensure the continuous satisfaction of human needs for present and future generations. Sustainability is the capacity of the earth to maintain and support life and to persist as a system [9]. In the other worlds, sustainable development means the capacity to meet the needs of the present without compromising the ability of future generations to meet their own needs. The concept of sustainability is debatably significant to systems from the global to the local scale. Sustainable housing is actually a form of affordable housing, which contains eco-friendly and community-based practices. It is an attempt to reduce a detrimental influence that homes can have on the environment through the way of deciding on greater creating supplies and environmentally friendly designs [10]. A number of studies have evaluated environmental sustainability indicators that support Strategic Environmental Assessment (SEA) and EIA [11]. Several practical applications are also discussed by the urban planners for the urban planning [12]. Green city and infrastructure are a new term but not a new idea [13]. The concept basically links green areas to human habitat for improved health benefits. They are desirable, green cities in the form of private gardens largely depends on the socio-economic status of individuals and thus may not provide enough opportunity for everybody to enjoy benefits to health and well being. Green cities will help the government reach targets to increase levels of physical activity and to provide a significant economic reason to maintain green space. In the Green areas, the stress level was found to be much lower than in built-up areas [14].

Less sickness was reported among prisoners who had greater contact with green areas [15]. Residents of areas with good green infrastructure demonstrated increased longevity, a higher level of physical activity as well as better health among senior citizens [16]. Viewing green spaces from the residence is shown to reduce psycho-physiological stress, intra-familial aggression as well as improving blood pressure, muscle tension and skin conductance [17, 18, 19 and 20].

2) STUDY AREA

The present study has been carried out with reference to a rapidly growing city – Lucknow, which is the capital city of India's biggest and fastest growing State – Uttar Pradesh. Among its vastly populated world of towns and cities the state of Uttar Pradesh is most populous, having a population of 199.6 million as per the Census of India, 2011. It is the second largest state-economy in India contributing 8.17% to India's total GDP between 2004 and 2009.

Lucknow is the capital city of Uttar Pradesh with a population of 4.5 million and a geographical area of about 3100 sq. km out of which the city occupies about 300 sq. km. It is surrounded on the eastern side by district Barabanki, on the western side by the district Unnao, on the southern side by Raebareli and on the northern side by Sitapur and Hardoi districts. The city is on the north western shore of Gomti river, which flows through it. The city has seen a steady increase in population arising from natural growth, incorporation of peri-urban areas in 1980's and large-scale migration. The population growth projected in the Master Plan 2021 varies between 3.51 to 4.37 per cent per year over different 5-year periods until 2021, somewhat higher than for average growth rate of cities of similar size in the country and state. As any other fast growing developing Indian mega city, Lucknow faces an uncontrolled urban sprawl. The rapidly growing urban population in the city and high rate of migration spills into the peri-urban and rural areas surrounding the city boundaries. The selected study area includes four different sites of housing projects of Lucknow city namely Parsvnath City, LDA Gomti Nagar Extension scheme, DLF Garden City, and Omaxe residency (Fig.2). A short description about the housing projects are provided below:-

1. Parsvnath (Township): This site is located on Faizabad road near village Uttardhanua. The township spreads over an area of 34.8 acres (1,40,844,8 sq.m), adjacent to NH-28 which connects Lucknow to Barabanki.

2. LDA Gomti Nagar extension : This site is located towards the east of the existing city at a distance of about 6 Km. from the central business district Hazratganj. The "East West Corridor" (Connecting Lucknow-Kanpur Highway, Lucknow-Raibareli Highway, Lucknow-Sultanpur Highway & Lucknow-Faizabad Highway) passes through the township.

3. DLF Garden City : It is located on Raebareli Road near Purseni village, Mohanlalganj. This site is totally open area in which the construction is in process. It poses sensitive area SGPGI on Raebareli Road.

4. Omaxe Residency : It is situated near Sarsawan village near Arjunganj. The proposed site for group housing is well connected to surrounding areas through national highway, namely NH-56 connecting Lucknow to Gosaiganj, NH-25 connecting Lucknow to Kanpur, NH-24B connecting Gosaiganj to Barabanki.

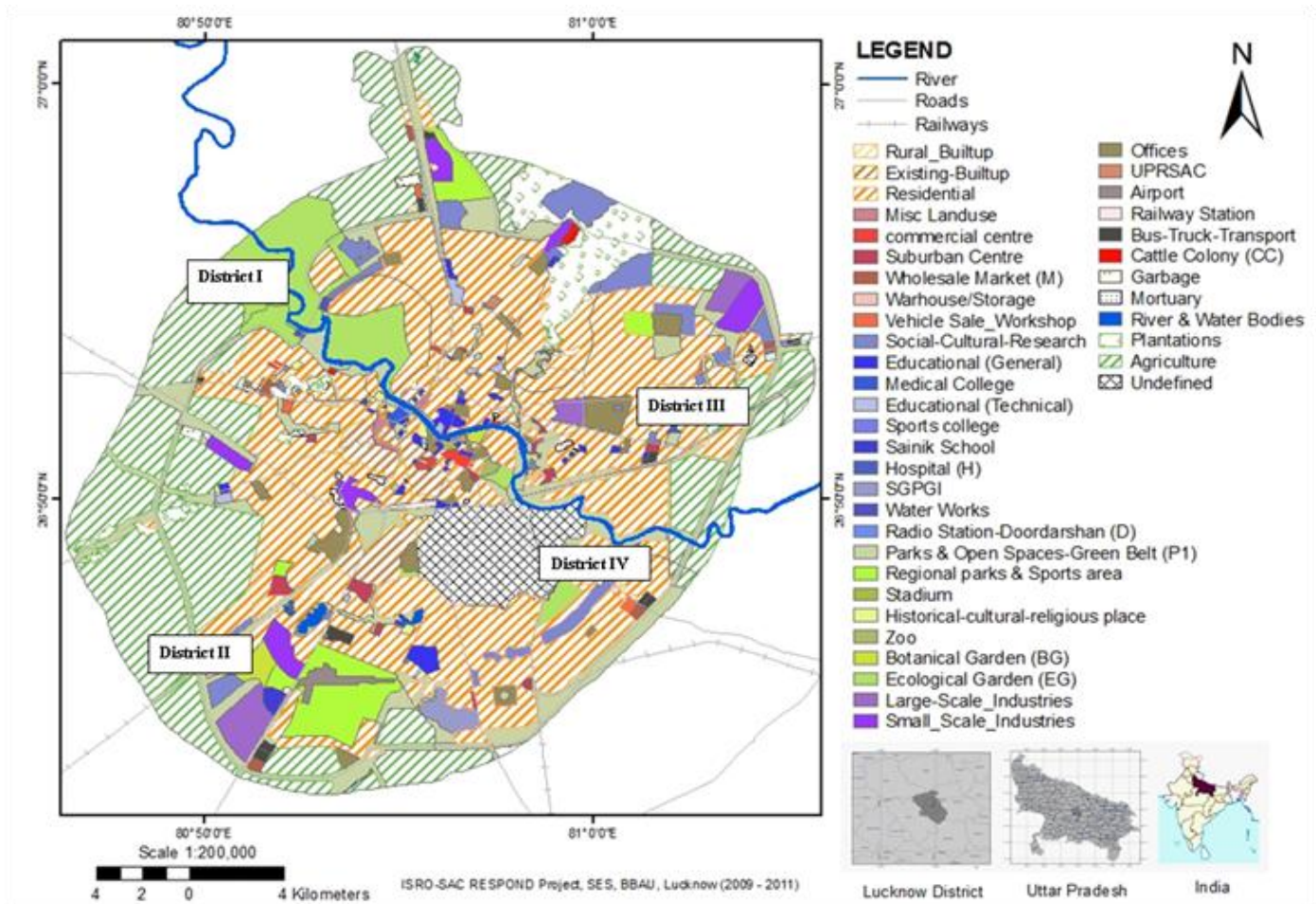


Fig. 2. Proposed development of new settlements as planned under the Master Plan 2001 of Lucknow, Uttar Pradesh



Fig. 3. Location map of the study area of housing projects in Lucknow

3) METHODOLOGY

The checklist matrix has been used for the evaluation of the housing projects supported by extensive field checks and surveys. The selected sites were namely Omaxe Residency, DLF Garden City, Parsvnath City, and LDA Gomti Nagar Extension housing project scheme in Lucknow city. After the

site visit, the environmental clearance reports were collected from State Pollution Control Board, Lucknow. These EIA reports of different housing projects were critically reviewed with ground observations using different housing projects parameters. The review checklist consists of a questionnaire comprising the following six sections:

1. Description of the project
2. Consideration of alternatives
3. Description of the environment likely to be affected by the project
4. Description of the likely significant effects of the project
5. Description of mitigation measures
6. Non-technical summary

4) RESULT AND DISCUSSION

This comparative study of housing projects was administered via personal surveys, and details study of all EIA reports of selected study area was made to prepare a comparative table of responses in a standard format covering various parameters of housing projects as shown in table 1. All housing projects sites have a green belt area and parking area. They have also installed sewage-treatment plants which are in operation except DLF and Parsvnath city, rain water harvesting system (ground based) and none of the projects have a basement parking system. All the projects have ground water as a source of water and the water table of all the projects sites lies average over the range of 20-25 feet from the ground surface, and among all the housing projects sites, two sites viz. DLF Garden city and Parsvnath city is currently unoccupied and proposed to be inhabited.

Table 1. Comparative Study of Environmental Impacts Assessment Reports of Housing Projects, Lucknow City, Uttar Pradesh, India

Sl. No.	Parameters	DLF garden city	Omaxe Residency	Parsvnath city	LDA Gomti Nagar Extension Scheme
1.	Location	Village- Pursaini Tehsil- Mohanlalganj District- Lucknow Raibareilly Road	Village-Sarsawan Tehsil-Lucknow District-Lucknow Amar shaheed path sultanpur road	Gram- Uttardhanua Faizabad Road,	Village-Ugarion, LDA Gomtinagar Amar shaheed path sultanpur road
2.	Nearest railway station	Mohanlal Ganj (20.4 km)	Gomtinagar Railway Station (9.9km)	Gomtinagar Railway Station (9.5km)	Gomti Nagar Railway Station (5.1km)
3.	Project costs	706.28 crore	98.66 crore	150.31 crore	68.45 crore
4.	Power requirement	0.132 MVA	3 MVA	3.245MVA	57.8 MVA
5.	Size of area	445.76 acre (180.3927 hectare)	13.88 acre (5.62 hectare)	34.8 acre (14.0831 hectare)	1174 acre (475 hectare)
6.	Green Area(%)	37.899 acre (8.5%)	1.98 acre (14.26%)	20.88 acre (60%)	376.0944 acre (32.035%)
7.	Parking facilities	Provided	Provided	Provided	Provided
8.	Water requirement	4.04 MLD	0.568 MLD	0.976 MLD	32.77 MLD
9.	Solid waste generation	28.34 MT/day	2.45 MT/day	3.9 MT/day	150 MT/day
10.	Source of supply water	Ground water	Ground water	Ground water	Ground water
11.	Quantity of sewage generated (MLD)	2.19 MLD	0.403 MLD	0.805 MLD	57.638 MLD
12.	STP Facility	Provided	Provided	Provided	Provided
13.	Rainwater harvesting system	Ground based	Ground based	Ground based	Ground based
14.	Basement system	Basement not provided	Basement not provided	Basement not provided	Basement not provided
15.	Distance from the city centre (Hazratganj)	17.5km	16km	16km	5km
16.	Nearest city/town	SGPGI	Ansal Sushant Golf City	BBD Green City	Omaxe City
17.	Water depth (mbgl)	25 feet (7.62 meter)	20 feet (6.096 metre)	20 feet (6.096 meter)	25 feet (7.62 meter)
18.	Nearest village	Pursaini	Chiraiyama, Arjunganj	Uttardhanua	Ugarion
19.	Nearest water bodies.	Irrigation canal	Gomti River	Indra Canal	Gomti River
20.	Nearest highway	Raebareli Road	Amar Shaheed Path Sultanpur Road	Faizabad Road	Amar Shaheed Path Sultanpur Road
21.	Nearest sensitive zone	SGPGI (12.8 km)	Ansal Sushant Golf City (10.9 km)	BBD College, BBD Green City (1.8 km)	Kendriya Vidyalaya, (3.7 km)
22.	Nearest forest	None	None	Kukrail Reserve Forest	None
23.	Nearest airport	Amausi (13.8km)	Amausi (17.6km)	Amausi (28.2km)	Amausi (16.5km)

TABLE 2-Comparative checklists for Environmental Impact Assessment of Housing Projects in the Study area (as per form – 1 A for construction projects listed under item 8 of the schedule):

S. No.	1. Air environment	Omaxe Residency, Gomti Nagar, Lucknow	Parsvanath Developers, Faizabad road Lucknow	LDA Gomti Nagar Extension, Lucknow	DLF Garden City, Raibareli Road, Lucknow
	Information/checklist confirmation				
1	Emissions from combustion of fossil fuels from stationary or mobile sources.	√	√	√	√
2	Emission from construction activities including plant & equipment.	√	√	√	√
3	Dust or odours from handling of materials including construction materials, sewage & waste.	√	√	√	√

S. No.	2. Water and land environment	Omaxe Residency, Gomti Nagar, Lucknow	Parsvanath Developers, Faizabad road Lucknow	LDA Gomti Nagar Extension, Lucknow	DLF Garden City, Raibareli Road, Lucknow
	Information/checklist confirmation				
1	From handling storage use of hazardous materials	×	√	√	√
2	From discharge of sewage or other effluents to water or the land	√	×	×	√
3	By deposition of pollutants emitted to air into the land or into water	×	×	×	×
4	Is there a risk of long term build up of pollutants in the environment from these sources	×	×	×	×

S. No.	3. Noise environment	Omaxe Residency, Gomti Nagar, Lucknow	Parsvanath Developers, Faizabad road Lucknow	LDA Gomti Nagar Extension, Lucknow	DLF Garden City, Raibareli Road, Lucknow
	Information/checklist confirmation				
1	From operation of equipment e.g. engines, ventilation plant, crushers.	√	√	√	√
2	From industrial or similar processes.	×	×	×	×
3	From construction or demolition.	√	√	√	√
4	From blasting or pilling	×	×	×	×
5	From construction or operational traffic	√	√	√	×
6	From lighting or cooling system	√	√	×	×

S. No.	4. Environmental sensitivity	Omaxe Residency, Gomti Nagar, Lucknow	Parsvanath Developers, Faizabad road Lucknow	LDA Gomti Nagar Extension, Lucknow	DLF Garden City, Raibareli Road, Lucknow
	Information/checklist confirmation				
1	Areas protected under international conventions national or local legislation for their ecological value	×	√	×	×
2	Areas which are important or sensitive for ecological reasons, wetlands, water courses or other water bodies, coastal zone biosphere biosphere, mountains, forests	√	√	√	×
3	Areas used by protected important or sensitive species of flora and fauna for breeding, nesting, foraging, residing over wintering migration	×	×	×	×
4	Inland coastal marine or underground waters	×	√	×	√
5	State national boundaries	×	×	√	×
6	Densely populated area	√	√	×	×
7	Areas occupied by sensitive man made land uses	√	√	√	√

S. No.	5. Risk assessment	Omaxe Residency, Gomti Nagar, Lucknow	Parsvanath Developers, Faizabad road Lucknow	LDA Gomti Nagar Extension, Lucknow	DLF Garden City, Raibareli Road, Lucknow
	Information/checklist confirmation				
1	From explosions and spillages, fires etc, from storage handling, use of production of hazardous substances From any other causes	√	√	×	×
2	From any other causes	×	×	×	×
3	Could the projects affected by natural disasters causing environmental damage (e.g;floods, earthquakes, landslides, cloud burst etc.	√	√	√	√

S. No.	6. Solid waste management	Omaxe residency, Gomti Nagar, Lucknow	Parsvanath Developers, faizabad road Lucknow	LDA gomti Nagar Extension ,lucknow	DLF Garden City, Raibareli Road Lucknow
	Information/checklist confirmation				
1.	Municipal waste domestic or commercial wastage	√	√	√	√
2.	Hazardous wastage	√	√	×	×
3.	Sewage sludge or other sludge from effluent Treatment	√	×	√	√
4.	Construction or demolition wastes	√	√	×	√

S. No.	6. Solid waste management	Omaxe residency, Gomti Nagar, Lucknow	Parsvanath Developers, faizabad road Lucknow	LDA gomti Nagar Extension ,lucknow	DLF Garden City, Raibareli Road Lucknow
	Information/checklist confirmation				
1.	Municipal waste domestic or commercial wastage	√	√	√	√
2.	Hazardous wastage	√	√	×	×
3.	Sewage sludge or other sludge from effluent Treatment	√	×	√	√
4.	Construction or demolition wastes	√	√	×	√

S. No.	8. Vegetation	Omaxe Residency, Gomti Nagar, Lucknow	Parsvanath Developers, Faizabad road Lucknow	LDA Gomti Nagar Extension, Lucknow	DLF Garden City, Raibareli Road, Lucknow
	Information/checklist confirmation				
1.	Is there any threat to of project to the biodiversity?	×	×	×	×
2.	Will the construction involve extensive clearing or modification of vegetation?	×	×	√	√

S. No.	9. Fauna	Omaxe Residency, Gomti Nagar, Lucknow	Parsvanath Developers, Faizabad road Lucknow	LDA Gomti Nagar Extension, Lucknow	DLF Garden City, Raibareli Road, Lucknow
	Information/checklist confirmation				
1.	Is there likely to be any displacement of fauna – both terrestrial and aquatic or creation of barrier for there movement?	×	×	√	√
2.	Is there any direct or indirect impacts on avifauna of the area?	×	×	√	√

S. No.	10. Socio-economic status	Omaxe Residency, Gomti Nagar, Lucknow	Parsvanath Developers, Faizabad road Lucknow	LDA Gomti Nagar Extension, Lucknow	DLF Garden City, Raibareli Road, Lucknow
	Information/checklist confirmation				
1.	Will the proposal results in any change to the demographic structure of local population?	×	×	×	×
2.	Will the project cause adverse effects on local communities, disturbance to sacred sites or other cultural values?	×	×	×	×

Note : Here √ indicate YES and × indicate NO

It was observed that building bye-laws relating to the provisions of vacant areas/spaces as outlined in clause 1.3 of the building bye-laws, 2008 of UP were not adhered to. There is also non-compliance to the norm of open spaces, as the space for parks and recreational areas are limited. As per the government order in November 1999, regarding model costing plan for housing development by the land development authorities and housing boards, cost would include external development including construction of STPs and garbage disposal places. Garbage generated by these colonies is collected by private and informal groups, who ultimately dispose them in open and vacant land due to the absence of any landfills. Similarly LDA has not developed common rain water harvesting (RWH) system which is required for plots of less than 300 square meter area. The site visits also revealed that actual plantation in the parks do not match with the plan as per the environmental clearance report and the schedule of the compliance criteria. Some of the housing projects began their construction activities before getting their prior stipulated environmental clearance.

5) CONCLUSION

Planned approach is essential for integration between urban development, environmental conservation and overall wellbeing of people. Thus, creation and maintenance of housing projects that are in tune with the natural environment and resource use is an important component of sustainable urban systems. The comparative study of this paper shows the ground reality of various parameters in the selected housing projects. The housing project should have rainwater harvesting system, proper parking facilities, adequate green area and contain the plants/trees that absorb the high level sound/noise, wastewater treatment facility and sound waste management facility.

The upcoming projects in the city of Lucknow can no doubt add to new housing areas with green spaces, gardens, constructed wetlands, permeable pavement, and integrated rainwater harvesting systems, but the situation on the ground depicts a different picture. The review of the EIA of housing projects reveal that some of the newly developed projects are characterized by severe shortage of basic services like potable water, well laid-out drainage system, sewerage network, sanitation facilities, electricity, roads and waste disposal. These in turn result in to numerous environmental and health impacts that must be addressed. The green cover and water bodies have been destroyed to give way to the rapidly developing urban settlements at the outskirts. Urban green infrastructure comprise of all natural, semi-natural and artificial networks of multifunctional ecological systems within, around and between urban areas, at all spatial scales [21, 22]. The burden of resource use in upcoming buildings or urban housing projects can be minimized in many ways. Properly designed housing projects can provide numerous services such as purification of air and water, pollution control, mitigation of floods and droughts, re-generation of soil fertility, moderation of temperature extremes, climate change mitigation and enhancing the landscape quality.

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