International Journal of Engineering Technology and Management Sciences
Website: ijetms.in Issue: 6 Volume No.6 October - November – 2022
DOI:10.46647/ijetms.2022.v06i06.032 ISSN: 2581-4621

IMPACT OF CURRENT DEVELOPMENT CONTROL RULES 2034 ON MUMBAI

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RESEARCH SUMMARY
Built Environment refers not only to buildings & structures but also to spaces for interaction such as parks, spaces between buildings, transportation, and, utility network amongst many others. Human beings spend around 90% of their time in a built environment. Chronic diseases are associated with the Built environment. Studies refer to the major findings, of the built environmental attributes, which impacted COVID-19, and transmission speed of diseases, in high-density zones and other effects of the built environment Coronary heart disease and Mental disorders, are also on the rise. Mumbai is a coastal city, with high temperatures & humidity, people are susceptible to fatigue & discomfort caused due to Heat Stress, and Rising temperatures are documented to add to the issues.
Correlation has been attempted with Climatic concerns, paper submittal & Development Control Rules 2034. It is concluded that the current rules may be detrimental to the population at large and a need to review is mandatory.
Limitations: The Study is an interpretation by the Author and does not aim at the document as a whole. A few sections are studied which may have an impact on the Built Environment.
Keywords: infrastructure, built environment, habitable, high rise, higher densities.

I) INTRODUCTION

Development Rules & regulations were introduced to govern a city's urbanization, ensure efficient growth, and maintain standards of Public health, and safety in general. These rules are as per the City u/r w.r.t to climatic, economic & social aspects. Mumbai is characterized by high temperatures and high humidity throughout the year. Wind-aided ventilation and heat removal are some of the effective strategies utilized for achieving comfort conditions. Microclimate plays a significant role in human comfort conditions. The Mental & Physical Health, of individuals is affected by the environment in which they live, as it can harbor pathogens or expose an individual to new pathogens. This impacts disease transmission dynamics [11] Lack of proper Sunshine, light, Poor Ventilation, and congested & unhygienic places are significant contributors to the spread of diseases. Whereas the quality of housing, crowding, noise, indoor air quality, and poor light quality affect Mental Health. Studies conducted have shown a direct relationship with the Built environment.

II) MUMBAI

Mumbai being a coastal city was earmarked for industrialization. Mumbai was unified as one of 7 islands, through a series of reclamations and infills. Mumbai was developed as a port city. The 19th century ended with a Textile manufacturing boom bring along a need for the working-class people. 11) (Pinter-Wollman1)
This resulted in migration from nearby areas to these zones. Mumbai city was unprepared for the heavy influx. The city could not cope with the diverse demands and subsequent housing demands which related social and infrastructural demands. The situation eventually culminated in slum formation. Presently around 55 % of Mumbai residents reside in slum clusters, which are unhygienic, unsafe, and without proper sanitation facilities.
Mumbai is vastly developed, Thermal comfort aids such as orientation to sun/wind directions, green zones, and open spaces were already compromised due to various conditions. The increasing population is matched by increasing F.S.I. A canyon-like feel is created between buildings going higher & taller, and even gives a sense of loss to the people.

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Environmental aspects which directly affect mental health include housing, crowding, noise, indoor air quality, and quality of light. The advent of personalized transport in addition to existing public transport led to a vast increase in traffic, impacting air & noise pollution. Visible outcomes are increased congestion & acute parking issues. Neeri reports[3] indicate that the level of NO2, CO & PM levels are way over the acceptable limit. Chronic disease, such as depression, has been linked to social and physical aspects of the built environment [8].
Some Infrastructure projects introduced in Mumbai are the Mumbai Metro, International Airport, Bullet train corridors, Tunnel Roads & Sea Links & Coastal roads. Mumbai is a home to above 20 million people and needs to be understood over and above being India's economic &commercial capital.

III) METHODOLOGY

- **Climate Analysis** – Analysis of Temperature and Humidity readings in Mumbai w.rt. H.S.I. determine the implication of Climate on the residents.
- **Literature Review** - Study of papers/newspaper articles - Specify the impacts which the Built environment has had on its inhabitants
- **Study of DCR 2034** & a comparative analysis with DCR 1991 & Its amendments – To understand the implications of the Micro level built-up spaces w.r.t the change in F.S.I. / Building Heights and its probable impact on Human Health
- Correlation of Climatic concerns with DCR 2035 & literature review
- The conclusion from the above

CLIMATIC ANALYSIS: -
Mumbai lies in the Warm & Humid Climate Zone which is characterized by Little Diurnal temperatures (Daytime 270C- 320C /Night Time 210C- 270C), Sky Conditions are cloudy & RH varies between 55%-75%,
High precipitation around 2000 – 5000 mm annually.
As referred from HSI index[12] below every day in Mumbai is uncomfortable for a few hrs. Most of the year there is a possibility of fatigue & discomfort. As inferred by CSE Report [7]. The Heat Index is increasing every year. If these conditions worsen, there is a likely hood of getting a Heat Stroke.
3) (CSIR & NEERI)
5) (Evans)
8) (Lawrence D. Frank)
12) (Sheetal Pikle)

Winds play an important role in Heat dissipation. Air velocity is an important factor for comfort conditions as people are sensitive to it. Still or stagnant air in indoor environments that are artificially aided may cause people to feel stuffy and lead to a heat build-up & Odours. Moving air in warm or humid conditions can increase heat loss through convection without any change in air temperature. If several towers stand near each other, there is an effect known as "channeling", a wind acceleration created by air having to be squeezed through a narrow space. This is a form of the Ventura effect. Mumbai with higher F.S.I, High rise structures has become a necessity. It even adds to the aspirations of residents. Roads have towering structures on either side & cities are becoming a concrete jungle. Tall structures can alter wind flow & directions and hence can create wind shadow zones in the vicinity, this being a major drawback in comfort conditions making it a necessity to employ mechanical ventilation techniques which may not be affordable to a majority of residents.

LITERATURE REVIEW

This segment tries to form a relationship between various studies.
1. Studying the association between structural factors and tuberculosis in the resettlement colonies in M-East ward, Mumbai _ Doctor's for you Report

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Aim of the Study -To investigate, establish the strength of the association between structural factors of slums resettlement colonies buildings and the incidence pattern of tuberculosis.

12) (Sheetal Pikle)

13 (Somvanshi)

MUMBAI H.S.I

Mnt.	Parametres.	0.00	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00	17.00	18.00	19.00	20.00	21.00	22.00	23.00
January	Temp.- C	20.5	19.9	19.8	19.4	19.6	19.2	20	21.3	23.8	26.2	28.7	29.8	30.2	29.4	28.9	27.8	27.3	26.2	25.4	24.3	23.6	22.5	21.9	20.9
	Temp.- F	68.9	67.82	67.64	66.92	67.28	66.56	68	70.34	74.84	79.16	83.66	85.64	86.36	84.92	84.02	82.04	81.14	79.16	77.72	75.74	74.48	72.5	71.42	69.62
	Hum.	74	76	74	75	73	75	71	65	54	46	40	40	40	45	47	51	53	57	60	65	67	71	71	74
	D. Rad.	0	0	0	0	0	0	0	0	251	655	867	828	666	398	226	172	152	96	0	0	0	0	0	0
February	Temp.- C	20.7	20.2	20.1	19.6	19.6	19.3	20.2	21.6	24.5	27.1	29.6	30.6	30.9	30.1	29.6	28.7	28.3	27.2	26.4	25	24	22.8	22.1	21.2
	Temp.- F	69.26	68.36	68.18	67.28	67.28	66.74	68.36	70.88	76.1	80.78	85.28	87.08	87.62	86.18	85.28	83.66	82.94	80.96	79.52	77	75.2	73.04	71.78	70.16
	Hum.	70	73	71	73	72	74	69	62	50	43	37	38	39	44	46	48	47	50	52	58	60	65	66	70
	D. Rad.	0	0	0	0	0	0	0	0	363	788	959	849	708	352	280	210	266	160	30	0	0	0	0	0
March	Temp.- C	24.1	23.4	23	22.4	22.4	22.6	23.7	25.3	27.6	29.6	31.3	31.8	31.8	31.4	31.1	30.4	30	29	28	26.8	26.1	25.3	25	24.4
	Temp.- F	75.38	74.12	73.4	72.32	72.32	72.68	74.66	77.54	81.68	85.28	88.34	89.24	89.24	88.52	87.98	86.72	86	84.2	82.4	80.24	78.98	77.54	77	75.92
	Hum.	76	80	80	84	85	86	80	73	62	55	49	49	50	52	52	53	54	58	62	68	71	74	74	77
	D. Rad.	0	0	0	0	0	0	0	6	369	640	706	570	424	277	235	201	231	141	38	0	0	0	0	0
April	Temp.- C	26.4	25.8	25.3	24.8	25.1	25.6	26.9	28.4	30	31.3	32.1	32.3	32.3	31.9	31.7	31.3	30.9	30.1	29.2	28.4	27.8	27.3	27.3	26.9
	Temp.- F	79.52	78.44	77.54	76.64	77.18	78.08	80.42	83.12	86	88.34	89.78	90.14	90.14	89.42	89.06	88.34	87.62	86.18	84.56	83.12	82.04	81.14	81.14	80.42
	Hum.	81	84	86	88	86	84	77	72	65	61	59	59	59	60	61	61	62	65	69	73	76	78	79	80
	D. Rad.	0	0	0	0	0	0	0	62	349	473	447	323	258	199	188	180	194	124	40	0	0	0	0	0
may	Temp.- C	28.6	28.3	27.9	27.7	27.9	28.4	29.2	30.1	30.9	31.6	32	32.4	32.5	32.5	32.2	31.8	31.2	30.5	29.8	29.3	29	28.9	28.9	28.8
	Temp.- F	83.48	82.94	82.22	81.86	82.22	83.12	84.56	86.18	87.62	88.88	89.6	90.32	90.5	90.5	89.96	89.24	88.16	86.9	85.64	84.74	84.2	84.02	84.02	83.84
	Hum.	77	78	79	80	79	77	73	70	66	64	63	62	62	62	63	64	66	69	71	74	75	76	76	76
	D. Rad.	0	0	0	0	0	0	0	138	311	333	319	256	191	212	164	179	145	130	57	0	0	0	0	0
June	Temp.- C	20.6	20	19.8	19.2	19.2	19.3	20.4	22	24.8	27.5	29.9	31.1	31.5	30.8	30	28.8	27.9	26.7	25.8	24.6	23.8	22.8	22.1	21.2
	Temp.- F	69.08	68	67.64	66.56	66.56	66.74	68.72	71.6	76.64	81.5	85.82	87.98	88.7	87.44	86	83.84	82.22	80.06	78.44	76.28	74.84	73.04	71.78	70.16
	Hum.	74	76	74	75	75	75	71	62	51	43	37	36	37	41	44	48	51	56	60	65	67	71	71	74
	D. Rad.	0	0	0	0	0	0	0	0	356	752	944	880	672	414	225	152	129	54	0	0	0	0	0	0
July	Temp.- C	26.8	26.5	26.4	26.2	26.4	26.5	26.9	27.4	28.1	28.7	29.2	29.4	29.5	29.4	29.3	29	28.7	28.2	27.8	27.3	27.2	27.1	27.1	27
	Temp.- F	80.24	79.7	79.52	79.16	79.52	79.7	80.42	81.32	82.58	83.66	84.56	84.92	85.1	84.92	84.74	84.2	83.66	82.76	82.04	81.14	80.96	80.78	80.78	80.6
	Hum.	88	89	89	89	89	88	87	83	83	81	79	78	78	78	78	79	80	82	83	85	86	87	87	88
	D. Rad.	0	0	0	0	0	0	0	48	175	206	221	176	140	165	132	106	108	92	59	0	0	0	0	0
August	Temp.- C	26.3	26.3	26.3	26.2	26.2	26.2	26.4	26.7	27.2	27.7	28.2	28.6	28.7	28.7	28.6	28.3	27.9	27.5	27.2	26.8	26.6	26.4	26.4	26.3
	Temp.- F	79.34	79.34	79.34	79.16	79.16	79.16	79.52	80.06	80.96	81.86	82.76	83.48	83.66	83.66	83.48	82.94	82.22	81.5	80.96	80.24	79.88	79.52	79.52	79.34
	Hum.	86	86	87	87	88	88	87	86	85	83	81	79	78	77	77	78	79	81	82	84	86	87	87	86
	D. Rad.	0	0	0	0	0	0	0	21	126	180	208	185	154	180	142	126	119	102	47	0	0	0	0	0
September	Temp.- C	26	25.8	25.6	25.4	25.4	25.8	26.2	21.1	27.8	28.7	29.3	29.8	29.8	30	29.7	29.2	28.6	28.1	27.5	27.1	26.7	26.5	26.3	26.2
	Temp.- F	78.8	78.44	78.08	77.72	77.72	78.44	79.16	69.98	82.04	83.66	84.74	85.64	85.64	86	85.46	84.56	83.48	82.58	81.5	80.78	80.06	79.7	79.34	79.16
	Hum.	86	87	88	88	89	88	86	83	79	76	73	72	71	71	72	73	75	76	77	79	81	83	85	85
	D. Rad.	0	0	0	0	0	0	0	13	176	223	230	202	221	170	151	118	127	84	15	0	0	0	0	0
October	Temp.- C	25.5	25.1	24.9	24.7	24.7	25.1	25.9	27	28.4	29.8	31	31.7	32	31.9	31.5	30.9	30.2	29.3	28.6	27.8	27.2	26.6	26.2	25.9
	Temp.- F	77.9	77.18	76.82	76.46	76.46	77.18	78.62	80.6	83.12	85.64	87.8	89.06	89.6	89.42	88.7	87.62	86.36	84.74	83.48	82.04	80.96	79.88	79.16	78.62
	Hum.	87	88	89	89	88	86	84	79	75	70	66	63	62	63	65	67	71	74	76	79	81	83	84	86
	D. Rad.	0	0	0	0	0	0	0	8	225	344	376	389	330	193	146	124	105	55	0	0	0	0	0	0
november	Temp.- C	23.4	23.1	22.9	22.7	22.5	22.9	24	25.6	27.8	29.8	31.6	32.7	32.7	32.2	31.3	30.2	29.3	28.4	27.6	26.7	25.6	24.7	24	23.4
	Temp.- F	74.12	73.58	73.22	72.86	72.5	73.22	75.2	78.08	82.04	85.64	88.88	90.86	90.86	89.96	88.34	86.36	84.74	83.12	81.68	80.06	78.08	76.46	75.2	74.12
	Hum.	77	78	77	77	78	76	72	65	57	50	45	43	44	46	50	55	59	63	66	70	72	74	76	78
	D. Rad.	0	0	0	0	0	0	0	2	402	672	672	680	520	349	209	133	86	50	0	0	0	0	0	0
December	Temp.- C	20.9	20.3	19.9	19.3	19.2	19.4	20.6	22.4	25.2	27.9	30.3	31.6	31.9	31.3	30.4	29.2	28.2	27	26	24.9	24	23	22.2	21.4
	Temp.- F	69.62	68.54	67.82	66.74	66.56	66.92	69.08	72.32	77.36	82.22	86.54	88.88	89.42	88.34	86.72	84.56	82.76	80.6	78.8	76.82	75.2	73.4	71.96	70.52
	Hum.	74	76	75	76	76	76	71	63	51	43	37	37	38	42	45	49	52	57	60	65	65	71	71	74
	D. Rad.	0	0	0	0	0	0	0	0	378	760	962	883	667	427	232	148	121	47	0	0	0	0	0	0

Figure 1 – H.S.I Index [12]

Study Design - The study design consisted of a household survey in the three colonies (MHADA - LIG) together with information on various indicators of TB.

Findings: - The LIG settlements, in Mumbai, are characterized by a lack of airflow, leading to poor indoor air quality, higher indoor temperature, and lack of sanitation and hygiene. These colonies/compounds do not have adequate access to sunshine and open sky in their buildings. The findings suggest that relaxation in building standards for slum rehabilitation and redevelopment is detrimental to the health of the poor who inhabit these homes and must be amended.

Recommendations: -

- Exceptions made in DCR 33(10) – Appendix 4, Sections 6.11 and 6.14 on marginal open space and area between SRA buildings to be amended as per General
- Regulations pertaining to minimum density in SRA buildings should also be removed.
- General DCR 42 be revised for adequate light & Ventilation for all parts of the room. One or more apertures excluding the door are to be considered.
- Operable area not less than 1/6th of the floor area of the room as per NBC

DOI:10.46647/ijetms.2022.v06i06.032 ISSN: 2581-4621

- No concessions to compromise the L/V for SRA & Low-income Housing

1. Impact assessment of the construction of tall buildings in a big town on the urban climate and the air pollution: Ali Makhelouf, Senior Lecturer, Architecture Department, University of Chief, Algeria

Study: - This study is based on a 4-year series of measurements of the influence of the high-rise district in Paris, France on climatic factors and air-polluting patterns.

Objective:- To understand the influence of the construction of buildings of great heights and climatic factors on the distribution of air pollution.

Discussions & conclusion - High-rises create microclimates by reinforcing the phenomenon of urban heat islands. Upper floors benefit from a lower concentration of pollution (including noise pollution) compared with lower floors, where the pollution concentration is generally quite high. These studies can be related to impacts in other metropolitan cities

2. Noise Pollution & its controls: -IyyankiV.Muralikrishna, Val Manickam, in Environmental Management, 2017. Science Direct

Study – To Determine the impact of increased Sound.

Observation: - Increased sound is a noise as well as annoyance.

Points that can be related or considered from above studied

a) Methods of Highway designing such as highway design &Planning: - Green zones as buffers / Sound Barriers / Earth berms.

b) The closeness of dwellings to the highway

c) Environmental Noise and Health

He has inferred from studies that there is a definitive link between noise &hypertension (Davis and Kamp,2012) Results found by Jarup et al.(2008) found a significant increase in the risk of hypertension per 10 dB increase in road traffic noise.

The data collected is related to European countries however the impact zones and the issues related can be related to other cities

3. Achieving Thermal Comfort For A Slum Rehabilitation Housing Scheme Using Natural Ventilation In Mumbai, India. PLEA 2015

Study – The study aims to establish the Thermal Comfort range of the occupants in a naturally ventilated Slum Rehabilitation

Findings: - The Study concluded that passive design strategies need to be the primary focus to achieve thermal comfort for the occupants in densely populated areas schemes such as SRA schemes. Simulations proved that building materials along with wind can assist in achieving a decrease in temperature. This in turn aids thermal comfort during the day (peak radiation time). However, the wind is necessary for heat removal at night.

Some Inferences derived from the preliminary study, are:

a) Mandatory open spaces and green spaces for SRA / High development zones and regular schemes should be revised.

b) A material palate for the building envelope for every zone has to be prepared and mandated by our governing bodies.

c) A study of the type, location, and operable opening sizes for all fenestrations. The design has to be site-specific and should not be generalized.

d) Internal areas need to be planned for optimizing daylight within.

e) Wind analysis should be mandatory for all structures.

4. Studies conducted by Wezha Hawez Baiz et.al on the impacts of High-Rise Building on Urban Areas

Air pollution: Depending upon the wind flow CO from cars will not get dissipated and make the volume of the pollution bigger at lower levels

Sunshine: - Sunshine on the upper floors of a Sky Scraper is easily available because of its height, but the impact of the building on the surrounding areas causes shadows, and sunshine is not felt on lower floors

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Wind flow - The tall building can create wind flow past adjoining/adjacent buildings or can cause wind shadow on the inner side. Tall buildings can change the direction of the wind in urban planning (H. Hayati, M.H. Sayadi, 2012). The relation between wind shadow with building height and depth is detailed in Source: (Sleeper 1981). "The negative impact of high-rise buildings out-weighted of positive impact, the social relationship in high-rise buildings is more impersonal. High-rise buildings will make more crimes and fears in under-ground floors ", (Adedoyin, 2013)

UNDERSTANDING THE CURRENT DCR – 2034

Limitations: The Study is limited to only some sections of the DCR 2034, which have a direct impact on the Built Environment and Topic of Study

A few Salient features

a) F.S. I in DCR 1991 was computed on Net plot area in DCR 2035 is on Gross Plot Area. Net Plot area means an area obtained after the deduction of the area under DP reservations and DP roads from gross plot area.

b) Tenement density has been increased from **500 / Ha to 650 / Ha _ SRA**

c) F.S. I is variable up to 4.00. No change in the Fungible area component

d) Open spaces for Light and Ventilation revised

Caluclations for Suburbs			
Sale building = Basic Zonal F.S.I + Premium F.S.I.+ T.D.R.			Remarks
	DCR 1991	DCR 2034	
	Net Area	Gross Area	
Area of Plot _X	1000.00	1000.00	
Recreational Ground _ RG. 15%	850.000	0.00	dcr 2034(Physical Provision)
Base F.S.I / Zonal F.S.I	850.000	1000.00	
Premium 0.5 X	500.000	500.000	
TDR 0.5 X	500.000	500.000	On Plot Area
Y	**1850.00**	**2000.00**	
Fungible (35%) _0.35Y	647.50	700.00	
	2497.50	**2700.00**	8- 9% Increase
Road Setback	---	Additional Road Setback	< 8- 9% Increase

Table 1 by Author

Table 1- Basic Comparative for DCR 1991 & DCR 2035, Net Area vs Gross Area

Note: - Fungible F.S.I.: Dcr 35(4)

1). Residential user: 35 % 2) Industrial user: 20 % 3) Commercial user: 20 %

Will further impact, Occupant Load / Water Supply / Drainage, Car Park. etc.

Table 1 indicates the difference in Project Scope in the same Plot Area. The table demonstrates that due to the change in DCR s (Without a change in F.S.I.) has increased the Buildable areas (i.e. tenements) by around 10%. The infrastructure of the city has not been updated in keeping with the increased population density. The visible impact is directly felt on Traffic w.r.t congestion This has impacted **civic infrastructure likewise.**

DCPR 27 – Layout Open Space: -30% of open space to be on Mother Earth is mandatory, Water percolation to sub-strata will be minimum as the space may /or may not be green space. The 30% of open space may be permeable /non-permeable as per the building requirement.

DCPR 33(10) _VIII Rehabilitation of Free Sale Component (SRA)

Tenement density has been increased from 500 / Ha to 650 / Ha to overcome the local planning constraints & viability. Tenement density norms determine the number of people that can live in a given area. Building control norms determine the amount of light, airy open space that inhabitants have access to, as well as the form and character of the built environment. The above revision in DCR

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Website: ijetms.in Issue: 6 Volume No.6 October - November – 2022
DOI:10.46647/ijetms.2022.v06i06.032 ISSN: 2581-4621

_2034 will harm the residents. Norms for SRA Development are vastly compromised w.r.t to traditional building norms hence increasing the tenement density can be detrimental to the Mental & Physical health of the Inhabitants.

NOTE :- Drawing Below

Obstruction angle -The angle between the horizontal and the line joining the highest point of an object in a flight's path to the nearest point of the appropriate runway. Beyond an angle of 70, the light is compromised

If the obstruction angle is:

> Less than 25 – a conventional window design should give reasonable results

> Between 25 and 45 – enlarged windows /changes to room layouts should be considered for adequate daylight

> Between 45 and 65 – adequate daylight would not be provided unless very large windows are used

> More than 65 – it is often impossible to provide direct daylight.

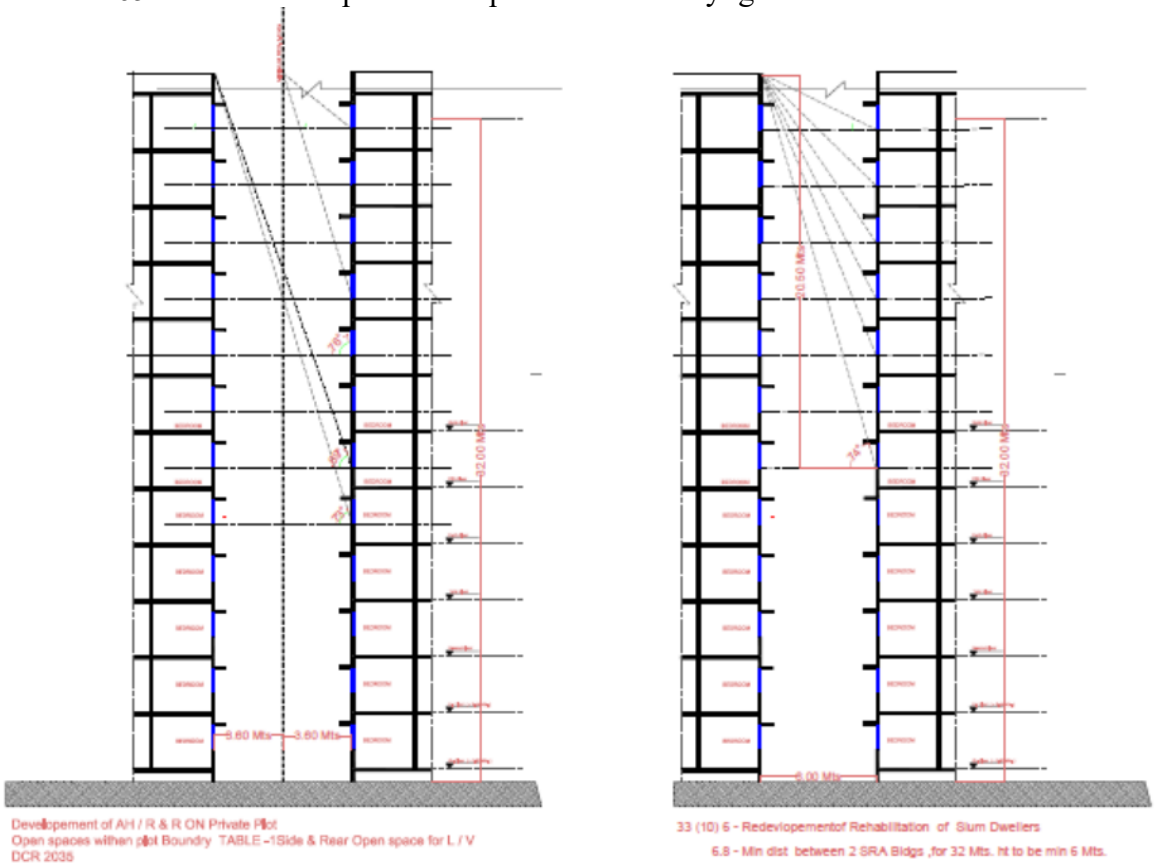

Figure 3–Development of AH / R & R on a private plot. Minimum Open Spaces as per DCR 2035
Figure 4 –Minimum distance between 2 SRA Buildings

Drawing by Author

DCPR 37 – Requirements of parts of Building: -

If 2 or more Structures with Basements / Podiums along the same road are developed, common spaces between the structures will be reduced to 6 Mts.(3 Mts each).

- Effectively pollution will rise above the Podium level.
- Pollution levels in the particular plot will add up considering the adjoining road,
- Lower floors of all structures will be highly affected
- Circulation space around the building will act as vehicular pathways adding to the non - permeability on ground level.
- Open spaces so designed will be on the Podium level and not on ground level.

International Journal of Engineering Technology and Management Sciences
Website: ijetms.in Issue: 6 Volume No.6 October - November – 2022
DOI:10.46647/ijetms.2022.v06i06.032 ISSN: 2581-4621

• The volume of traffic will increase; road network needs to be planned to accommodate increased traffic & congestion

The infrastructure of the city is not being updated with the same pace with which new project are being introduced or the rate of population increase.

Fire Break out incidences in the city are reported every day. The City is in the process of getting equipped for fire Incidences but decrease in Open spaces can be a major hindrance.

Variables such an time considered for reaching the Structure with Evacuation time for rescuer can be a major concern .

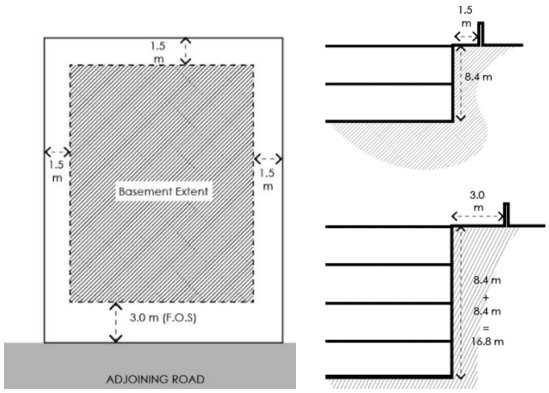

Fig 5 - 33 (7) – Basements.

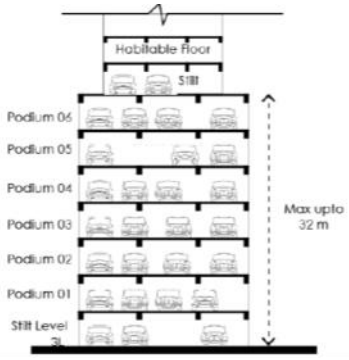

Fig 6 - 33(31) Podiums permissible

Provisions – If basement ht. increases, for every 8.4 Mts depth Open space increases by 1.5 Mts.
Podium for plots more than 1000 sq. Mts. Max Ht permissible is 32 Mts.

Figure Credit :- PEATA Seminar, Operative DCPR 2034 dt **12.11.2018**
(Post Sanction of E.Ps & Corrigendum dated 12.11.2018)

DCPR 41(2) – Front, Side, and Rear Open Space - In Relation to the height of the building for Light & Ventilation, Open Spaces have been redefined w.r.t the Roads abutting the site.

Light /Ventilation _1000 Sq. Mts Plot (Table 2)

Buildings up to 32 Mts – Commercial Building is H/5 for & Residential is 3.6

Buildings (32.0Mts – 70.0Mts) is H/5, max 12.0 Mts & Residential is 3.6 (Upto 32 Mts.)

The impact on the Habitable area on the lower floor will be 2-fold as open spaces are reduced & Height increased. Tenants at lower levels will be deprived of Adequate light and ventilation will be and will be in proximity to increased traffic & pollution.

OPEN SPACE REQUIREMENTS				
Sale Component of all schemes & Rehab Component in 30 & 32 Schemes				
Ht. Of BLDG.	**Front Open Space**	**Side & Rear Open spaces (Plots > 1000 Sq.Mts)**		
		Light & Ventilation		**Dead Wall**
		Res.	Comm.	
Upto 32 Mts	6.0 Mts. + 1 Setback abv	3.6 Mts.	4.5 Mts / Sub. of	3.6 Mts
32.0 Mts to 70.0 Mts	9.0 Mts from Access Road	H/4 Max 12.0 Mts /6.0 Mts min		6.0 Mts
70.0 Mts to120.0Mts	9.0 Mts. + 2 Setback abv	H/4 Max 16.0 Mts		9.0 Mts
> 120.0 Mts	9.0 Mts. + 3 Setback abv	20.0 Mts		9.0 Mts
Setback in provision with 41(1)a,41(2)(i)a,43(1)				

Table 2 by Author

Below is a part of DCR 1991 Explaining the open spaces provided in earlier DCR 1991.

DCR 1991 – 29 Open Space Requirements — side and rear open space in relation to the height of the building for light and ventilation: -

(1) Residential and Commercial zones: -

DOI:10.46647/ijetms.2022.v06i06.032 ISSN: 2581-4621

(a) Building having length/depth up to 40 in: —The open spaces on all sides except the front side of a building shall be of a width not **less than a third of the height of that building above the ground level,** rounded to the nearest decimeter subject to a maximum of 20 m., the minimum being 3.6 m. for a residential building and 4.5 m. for a commercial building.

CORRELATION

- As per Climatic understanding, Wind is an essential element required for comfort predominantly for the LIG as they cannot afford mechanical ventilation options.
- The Mandatory open spaces for L/V and Dead walls for Rehab / Sale buildings have been lowered than DCR 1991 & SRA have been revised only for higher floors .
- The density for Low rise housing has been increased from 500 / acre – 650 /acre. With Increased FSI the buildings will become taller and mandatory open spaces lesserOpen spaces in the tenements at the lower level will not derive optimal L/V (Fig 3&4and will be susceptible to higher pollution levels. Tenements at the lower level have a compromised living.
- These can lead to health issues as elaborated by various authors in their papers.
- Increase in Pollution levels & traffic congestion caused by Vehicles.
- Infrastructure such as water supply & drainage needs to be updated .
- DCR 2034 has recommended an increase in FSI which is ranging from 2 – 4+.
- Fire hazards may increase.
- Mechanical Ventilation will be preferred leading to higher electrical consumption

CONCLUSIONS.

The Development Rules addressed the issue of Housing for the underprivileged. It's termed as Affordable housing and guidelines for implementation of these in terms of F. S.I (Basic + additional) and infrastructure needs are elaborated. Mumbai is amongst the costliest city in the country. The living cost here is higher compared to other major cities like Bangalore, Pune, and Delhi. Can these affordable housing schemes work out favourably for not-so-wealthy buyers? Various areas which have amenities such as cow sheds have been shifted out of Mumbai to make way for affordable housing schemes. This has a direct impact on the cost of the commodity. Milk and Milk products form a part of everyday food for Mumbaikars. Can the public afford it then, in the same abundance as they do today?

How will the rules impact the Mental & Physical health of the public? The increased population will need increased basic services such as water & drainage. Drainage System in Mumbai needs upgradation, lessons have been learnt from the deluge of 2005, however have not been implemented. The runoff from this concretized space will cause flooding, which needs regulation & attempts to minimize the same. Can such situations be successfully tackled with the general public's interest not compromised?

Mumbai is getting ready for more & more people to settle down but can the development not be considered in not so developed areas and improvise them, other than suffocating Mumbai? Are metropolitan cities the only development solution, when situation can get worst in terms of Physical & Mental parameters for the very people who are the residents?

Which brings back the core question with which this research started.

Are the Built environments planned to contribute to the betterment of public health?

Are they designed for the containment of both chronic and infectious diseases?

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