State of Regulation: Building standards reforms for jobs and growth

Sargun Kaur¹, Bhuvana Anand¹, and Shubho Roy¹

¹Affiliation not available

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STATE OF REGULATION

Building standards reforms for jobs and growth
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Foreword

Dr Bimal Patel

President
CEPT University, Ahmedabad

I am delighted to write the foreword for this important and timely report on the state of building regulations and standards for industrial land use in India. In keeping with my previous research, the researchers find that building standards are often unnecessarily restrictive. They do not allow for efficient and optimal use of land and discourage compact development.

Building standards are essential for ensuring the safety and sustainability of our built environment, but they can also stifle economic activity if they are too restrictive. Restrictive standards have several unseen consequences, including creating a scarcity of industrial space, discouraging investment and increasing the cost of construction. There is a need for a conscious calculation of whether these costs outweigh the intended benefits. Unlike advanced economies, costs have much higher consequences for a developing nation like India where a marginal improvement in wealth leads to a significant reduction in human suffering. Gold standard regulations may look good on paper, but they hurt a poor country’s ability to use resources effectively.

Inter-state comparisons are a helpful analytical tool for identifying best practices and making incremental changes. I hope states are able to use the findings from this report to guide their reform choices. I urge policymakers to consider this report carefully as part of the reform programmes for economic growth and urbanisation.

Each state has different regulations for different areas. In some states each municipal corporation has its own bye-laws. Wading through so much detail takes an enormous amount of work, and I congratulate the researchers on their effort. In committing to make their datasets and code openly available, they have also created public goods for the field. This is a valuable contribution to furthering our collective knowledge and learning.
Foreword

Dr K P Krishnan
Former Secretary
Government of India

Regulation that furthers public purpose by correcting market failures can potentially impose significant burdens on businesses, especially small and medium-sized enterprises (SMEs). Over-restrictive building standards make development and expansion of businesses difficult and expensive. This report provides a comprehensive analysis of the cost of building regulations in India and its impact on the ease of doing business.

The report finds that building standards in India are significantly more restrictive than in other developing countries. This means that businesses in India have to use less of their land for productive purposes, which increases their costs and makes them less competitive. Were these standards to be modified to say a measure of half of what they are now, India could generate an additional 55 lakh jobs in existing factories alone.

The report’s findings are significant because they make a robust case for building standards reform in states. Liberalising building standards would reduce the cost of doing business, create jobs, and promote economic growth. Standards that are not context-appropriate can often encourage non-compliance and create opportunities for rent-seeking.

The time has come for various state governments to seriously consider the report’s findings and take steps to rationalise building standards. By doing so, state governments can make India a more attractive destination for businesses and create a more prosperous future for all Indians.
Acknowledgements

We embarked on this venture with no expertise in architecture or planning. We learnt as we read literature, talked with experts, and understood the laws. The first paper we read was Dr Bimal Patel’s 2018 analysis. This paper set the direction for our report. We are so grateful to Dr Patel for lighting the way and championing the idea. Dr K P Krishnan, former Secretary, Government of India, was the first person with whom we shared the preliminary findings. Our gratitude to Dr Krishnan for helping us think through the policy salience of this analysis.

Several experts helped us understand the world of building regulations: Manav Jain, Assistant Town Planner at the Government of Punjab, patiently answered all of our questions on the planning of development areas; Sukhchain Singh, Dhruv Batra, Chaitanya Mohindra, and Shweta Modi helped us understand how a building’s footprint is determined; Kshitij Batra at TEAL helped us understand how to calculate the cost of land loss.

Our talented and hardworking team studied literature, pored through pages of regulation, and learnt a new programming language. Bhavna Mundhra co-designed the data architecture, managed data hygiene, and generated the datasets. Thanks to her efforts, we can now scale this report to cover more states and different building uses. Anandhakrishnan S studied each regulation and carefully recorded the raw data on building standards. Rohan Ross led the dispute analysis and Suyog Dandekar surveyed literature for the opportunity cost analysis. Sathyajith MS assisted in data collection. Several colleagues gave us feedback during internal presentations and, during the last stretch, lent a hand at typesetting and designing.

They say we all get by with a little help from our friends. Our shadow colleague Gaurav Vikhe, CPO at Acceleration Robotics, taught us to programme and became our trouble-shooter extraordinaire. Beautiful things would happen, and only later would I learn, ‘Oh, Gaurav helped us figure it out’. Anirudh Burman at Carnegie India brainstormed this idea with us several times; Prithika Hingorani at Artha was the first who understood that this was part of the “urban” story; Desh Gaurav Sekhri at Sports and Society Accelerator helped us frame challenges as opportunities; and our institutional partners, The Convergence Foundation and The Nudge Institute, provided financial support and encouragement.

We urge state governments to consider our findings and recommendations to increase efficiency in the usage of land.
Executive Summary

State of Building Restrictiveness

Many researchers have documented the perils of India’s building regulations. Our regulatory choices have created an artificial scarcity of space, inflated construction costs, and made housing expensive for ordinary people. These same restrictions affect India’s manufacturing capacity by stunting industrial buildings. Building regulations in Indian states lock up productive factory land, costing us money, resources, and jobs. Unlocking existing industrial land can help India increase the footprint of labour-intensive manufacturing.

This edition of the State of Regulation Report compares 10 states on factory land lost to building standards and the opportunity cost of land lost. Based on land lost to four building standards (i.e., ground coverage, setbacks, parking and floor area ratio), we rank states on building restrictiveness. Haryana overall is the least restrictive state for constructing a factory. Tamil Nadu and Telangana follow closely. Odisha, Bihar, and Delhi are the most restrictive states for factories of all sizes.

India’s efforts to facilitate doing business have focused on process reforms in states. We also need to encourage states to reform standards, as that will have a year after year pay out. Small changes in building standards can lead to a reduction in the cost of doing business and an increase in job opportunities. In addition, building regulation reform is critical for livelihood friendly cities. States can use this report to identify corrections in regulations to unlock factory land and improve economic outcomes.
Key Findings

States publish building regulations that define standards for constructing different building types. This report analyses four building standards applicable to industrial buildings across 10 states. The key findings are:

1. A factory in India is likely to lose 50% of land, or more, to building standards.

2. Haryana overall is the least restrictive state for constructing a factory. Tamil Nadu and Telangana follow closely.

3. Odisha, Bihar, and Delhi are the most restrictive states for factories of all sizes.

4. Our entrepreneurs are paying full price for half use.

5. A large factory can generate 130 to 255 more jobs by halving the land lost.

6. Standards penalise small factories more than they do large factories. Still, large and mega factories end up losing 55% of their plot on average across states.

7. Out of the four standards, factories lose the most amount of buildable footprint to setbacks and parking. In Bihar, a small factory can lose up to 77% of land to setbacks alone. A 500-employee factory in Maharashtra needs estimated space for 67 cars, 304 two-wheelers, and 6 trucks.

8. Only five out of 10 states recognise that ground coverage is a redundant standard. In other states, this redundant standard can lead to a deadweight loss of land due to overlaps with parking and setbacks.

9. On average, factories across states are only allowed to create floor space up to 1.3 times the plot size.

10. Our standards often surpass standards set by countries which are 10X India’s GDP.
Introduction

The case for using industrial land efficiently

India is pursuing the goal of becoming a developed country by 2047. To become prosperous, the nation needs to enable businesses, create jobs, and spur innovation.

While the country has become the world’s fifth-largest economy, many critical barriers to growth still need to be overcome. Restrictions on the use of capital, labour, and land keep India from successfully navigating the “structural shift from farms to factories” (The Hindu 2023b). Regulatory and governance reforms in all three areas are important for our dreams of prosperity (Haidar 2012; Panagariya 2020). The first generation of reforms in 1991 allowed us to triple our share of global GDP from 1.1% to 3.5%. But we need to embark on a second generation of “politically and socially contentious reforms” including in land use for industry and labour engagement (Joumard, Sila, and Morgavi 2015; Trade Promotion Council of India 2019).

On land issues, the policy debate has almost exclusively focused on land administration and acquisition. India’s land markets are fraught with buying and selling challenges, particularly in converting agricultural land into industrial uses (Burman 2022; Hoda 2020). Some states have instituted land reforms to facilitate easier transfer of agricultural land for nonfarm uses (Bhatia 2021). But, these efforts are not without controversy and come with their own political economy considerations.

In pursuing the more contentious land reforms, we have been ignoring how efficiently we use existing industrial land. Building regulations in India lock up factory land, restricting an enterprise’s ability to allocate capital to the most productive use. Maybe using what we have more efficiently will reduce the friction between agriculture and industry. This report
aims to bring focus to the industrial use of land and unpack how building standards affect an industrial plot and productivity in different states.

Policymakers need to pay attention to the usage of land. Literature shows that the usage of land in India is sub-optimal. High minimums for standards, like setbacks, open spaces, and parking and low maximums for standards. like height, lead to wastage of productive land (Byahut, Patel, and Mehta 2020; Ikeda and Washington 2015; Patel, Byahut, and Bhatha 2018). Standards create an artificial scarcity of land, increase the cost of construction and inflate rents/prices (Byahut, Patel, and Mehta 2020; Rajagopalan and Tabarrok 2019). What and how much a user can build on a piece of land matters. Using land optimally allows the builder to increase output, generate more income, and create more jobs. It also has other payouts, most interestingly, reducing the welfare costs on workers by rationalising the distance between the place of work and stay.

While researchers have documented how our regulations hurt optimum land use in creating housing, there is no unit-level analysis of how building regulations affect a factory. We need to examine regulations carefully to increase the efficient use of existing industrial land. This has a payout for encouraging compact development and effective labour markets (Bertaud 2015; Brueckner 2009; Brueckner and Sridhar 2012; Carlino, Chatterjee, and Hunt 2007; Ciccone and Hall 1996). Reform areas will become apparent when we benchmark against other countries and evaluate the opportunity cost of options.

What can you expect from the report?

This report presents an inter-state comparison of restrictions on constructing industrial buildings and the cost of such restrictions. The report considers four building standards—ground coverage, setbacks, parking, and floor space index—across 10 states. States are then ranked on building restrictiveness for factories of different sizes based on these four standards. In addition, the report also estimates the unit-level opportunity cost of these standards in terms of the rupee value of land lost and the number of jobs lost.

The research team read over 2,752 pages of 15 building regulations and subordinate legislations to record data on the four building standards. Discussions with architects, engineers, town planners, and government officials helped clarify how the standards work and how much of a plot can actually be built on. The report is based on: (i) a raw dataset

1. The land loss estimates presented in this report are conservative as they are based on only four standards. Other standards like open space reserve, means of access, height constraints also restrict growth of buildings.
that captures the standards as-is across 15 regulations; (ii) an analysed dataset that lays out the land lost and opportunity cost calculations for micro, small, medium, large, and mega factories; and (iii) a case catalogue of 31 construction-related disputes decided in the Supreme Court over the last 10 years.

The datasets have been made publicly available so researchers, policy advisors, and governments can use the data to inform and make decisions. We welcome feedback on the data and methodology and look forward to improving their coverage. In the coming months, in partnership with other researchers, we will expand this analysis to cover more states and residential and commercial land uses. We will also share a digital calculator on our website to help with quick estimation of the impact of different standards.

**Why does the report matter?**

Land use is largely regulated by state-level building and construction laws. The analysis and data in this report can help state governments review current regulations systematically and consider alternatives. Over the last few years, states have begun to recognise the importance of releasing unbuilt land through revising building bye-laws. But these efforts are unsystematic and reactive. For example, the Haryana Building Code, 2017 has been amended 10 times since its promulgation (Housing Board 2018). At least five of these amendments institute more liberal standards. Some states have introduced sector-specific relaxations. For example, Gujarat and Uttar Pradesh have promised relaxation of building standards for IT office spaces and warehouses and logistics parks (Government of Uttar Pradesh 2022; Government of Gujarat 2022). Creating exemptions sector by sector gives only selective relief. There is value in a more comprehensive review based on costs and benefits.

In our estimation, this report is the first attempt at an opportunity cost assessment of regulations for industrial buildings. Regulators often set standards focusing more on intended benefits and disregarding the opportunity cost. While some building regulations may provide benefits to all parties, they come with costs attached. Restricted usage and reduced utility of land are the unquantified costs. Disregarding costs can impose a premium on society, like fewer jobs, lower income, and wasted resources (Masur and Posner 2012; Nichols and Zeckhauser 1988; Sunstein 2019; Viscusi and Gayer 2002).

Reducing the opportunity cost of building standards can encourage livelihood-friendly land use, particularly in and around cities. Optimising industrial land use can supplement the various initiatives announced by the government to increase manufacturing activity in the country and aid in our urbanisation goals.
Findings

Building restrictiveness in Indian states

States draft building regulations to control building and construction activity. Some states have a common building code for the entire state, while others have separate codes for different jurisdictions. Every regulation lays out standards related to structural safety, construction material, open space, fire safety, and amenities. These standards are based on whether the plot is located inside municipal areas, in development areas, or in specially designated areas in a state. Standards are also peculiar to the use of the building, whether residential, commercial, or industrial and the size of the plot.

The location of the plot of land, the use type, the size of the plot of land, and the interaction of building standards together restrict the ultimate built-form. These restrictions manifest in the horizontal dimension and the vertical plane. Ultimately, they result in land left unbuilt and floor space left uncreated.

This report focuses on measuring the restrictiveness of building regulations as they apply to industrial buildings in development areas. The report attempts to estimate how much factory land is lost in complying with building regulations. Industrial buildings are critical to India’s growth story, and development areas typically have a higher concentration of factories.

2. Typically, a state has three different areas—areas governed by municipal authorities, i.e. cities or towns, areas governed by development authorities, i.e. peri-urban areas, and areas marked as industrial estates. Building regulations for municipal areas are formulated under the state Municipal Act; rules for development areas are formulated under the state Town and Country Planning Act; and rules for industrial estates are formulated under the state Industrial Development Act or the Town and Country Planning Act. Punjab, for example, has two different building regulations for municipal and development areas. Haryana and Gujarat, for example, have a uniform building code for the state.
While we focus on factories in development areas, the report also briefly discusses factories in municipal and industrial areas. 15 regulations across 10 states were studied to compare the footprint available for construction and the opportunity cost of the land left unbuilt.

Our analysis uses five hypothetical factory plot sizes (micro, small, medium, large, and mega) located in development areas (i.e., peri-urban areas). For each factory plot size, four standards are considered: ground coverage that limits plot usage on the ground floor; setbacks that determine the size of margins to be left on all sides of the factory; parking spaces to be built for employees and loading; and floor area ratio (FAR) that determines the floor space that can be built on a given plot. Together, these four standards specify how much factory land is left unbuilt. A complete discussion of the methodology is available in Appendix.

**Figure 2.1: Measuring factory land lost in development areas**

<table>
<thead>
<tr>
<th>Locations examined</th>
<th>Development areas near Tier 1, Tier 2, Tier 3 cities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bihar</td>
<td>Odisha</td>
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<tr>
<td>Delhi</td>
<td>Punjab</td>
</tr>
<tr>
<td>Gujarat</td>
<td>Tamil Nadu</td>
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<tr>
<td>Haryana</td>
<td>Telangana</td>
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<tr>
<td>Maharashtra</td>
<td>Uttar Pradesh</td>
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</table>

<table>
<thead>
<tr>
<th>Factories modeled</th>
<th>Standards applied</th>
</tr>
</thead>
<tbody>
<tr>
<td>Micro 150 sqm plot 0-9 workers</td>
<td>Ground coverage</td>
</tr>
<tr>
<td>Small 300 sqm plot 10-49 workers</td>
<td>Setbacks</td>
</tr>
<tr>
<td>Medium 1,000 sqm plot 50-300 workers</td>
<td>Parking</td>
</tr>
<tr>
<td>Large 5,000 sqm plot &gt; 300 workers</td>
<td>Floor Area Ratio</td>
</tr>
<tr>
<td>Mega 10,000 sqm plot &gt; 300 workers</td>
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Land lost to building standards in development areas

Building restrictiveness is the land lost when the four standards are applied together. A factory in a development area in India will likely lose 50% of its land, or more, to the four building standards. Haryana is the only state where a factory of any size built up to code loses less than half the plot. Figure 2.2 gives a snapshot of land lost in 10 states.

Figure 2.2: Land lost per state in toto
Regulations are so extreme that in some cases next to no land is left for the factory after complying with all the four standards. For example, a micro factory (150 sqm) in Maharashtra loses 142 sqm (94%) after complying. This is not the only case of extreme land loss due to regulations. In fact, in Bihar, Delhi, Gujarat, Odisha, and Punjab, micro and small factories are left with a negative building footprint, meaning that they lose 100% of the ground floor to building standards. In these states, micro and small factories probably violate building regulations.

Luckily, states treat large and mega factories better than smaller ones; large and mega factories are left with a larger building footprint after complying with all standards. On average, small factories lose 83% of their plots to the four standards, while large factories lose 60%. For example, in Punjab, standards for large players are less exacting and allow more building footprint. Even with a 60X increase in plot size, the standard remains the same, with the result that the smaller factory loses 100% of the land, while the larger one only loses 45%.

State rankings on land lost

To compare states, we rank them based on land lost to four standards (Figure 2.3). Higher-ranking states are less restrictive and allow factories a larger footprint. Haryana is, overall, the least restrictive state for constructing a factory. Delhi, Odisha, and Bihar are the most restrictive states for factories of all sizes.

Tamil Nadu jumps to the top of the chart because it sets liberal standards for larger factories. Haryana, Telangana, and UP set standards that are relatively size-agnostic. Gujarat drops in the rankings because even as it is more liberal towards larger factories, it is not as forgiving as Tamil Nadu.

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3. For each state, we take an average of land lost by micro, small, medium, large, and mega factories to building standards. States are then ranked from high to low based on average land lost.
Land lost to Ground Coverage

States use ground coverage regulations to limit how much of a factory plot can be constructed on. These regulations are intended to control density and encourage groundwater recharge (Patel, Byahut, and Bhatha 2018). However, these restrictions may now be anachronistic, considering that other standards already control density and newer technologies help with water recharge (MyGov 2019; Patel, Byahut, and Bhatha 2018; Tejankar et al. 2016).

Factories stand to lose substantial portions of land to ground coverage. In four out of ten states, the factory building can cover no more than 40–60% of the plot. Overall, the most restrictive state on ground coverage is Bihar. Delhi and Uttar Pradesh reduce coverage for factories with larger plots; coverage is plot-size agnostic in the remaining states. Some states impose no limits on ground coverage. Tamil Nadu and Odisha allow all low-rise factories 100% coverage, and Maharashtra, Gujarat, and Telangana impose no limits on any factory.  

Figure 2.4: Ground coverage allowed in different states

Telangana does something different. It implicitly recognises that ground coverage may be redundant given other standards. It allows factories to use as much plot as possible given other constraints like setbacks.  This ensures that factories do not waste any portion of land that is neither used to construct the building nor used to comply with any standard. Contrastingly, in Haryana, a medium-sized factory may not be able to utilise the area left over after complying with setbacks and parking.

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4. Ground coverage for high-rise factories in Tamil Nadu is 50% and in Odisha is 40–50%.
5. 'Permissible Plinth Area’ means the plinth area permissible which is calculated as per the required setbacks without transfer of setbacks and with reference to height and plot size as given in the Table-III & IV of these rules (Government of Andhra Pradesh 2012).
Land lost to Setbacks

States limit the horizontal expansion of buildings by asking builders to leave margins from the plot boundary. These margins are mandated to minimise the risk of fire spread between buildings and ensure adequate ventilation and light (Edwards and Torcellini 2002; Ciccone and Hall 1996; Horne 1969). However, regulations do not account for modernisation in technology and manufacturing processes. Automatic fire-fighting equipment and fire-resistant building materials can help reduce the risk of fire hazards without locking up productive land (Lee, Lee, and Je 2021). Besides, natural light and ventilation may be counter-productive in certain factories like chemicals, pharmaceuticals, and electronics.

Odisha and Tamil Nadu are the most restrictive states on setbacks for micro and small factories. The most restrictive states on setbacks for medium factories are Maharashtra, Bihar, and Gujarat. Bihar and Delhi are the most restrictive states on setbacks for large and mega factories. Haryana sets the most liberal setback requirements across India. Haryana only mandates front and rear setbacks for factories and sets low values even there.

Setbacks are more punishing for micro and small factories such that in five out of 10 states, these factories lose 60–90% of land to just this standard. In general, smaller players are likely to lose more usable land than larger players. For example, in Tamil Nadu, a 300 sqm plot will lose 65% of land compared to a plot 16 times larger that will lose only 19%.
Land lost to Parking

States mandate that builders carve out land for off-street parking to prevent congestion on the streets. However, research shows that mandating parking minimums may actually lead to more congestion (Manville and Shoup 2018). In addition, India’s parking requirements do not account for the actual demand for parking. Data shows that fewer than a third of Indian workers use modes of transport, like cars, cycles, and scooters, i.e. that require parking (Census of India 2011).

Factories across India lose ~12–70% of their land to meet parking minimums. Parking minimums play out in two ways: the number of vehicle spaces and the area per vehicle. The most restrictive states on both these counts are Delhi, Odisha, and Bihar. The least restrictive states are Haryana, Uttar Pradesh, and Tamil Nadu. Figure 2.6 shows the parking minimums for a medium-sized factory in different states.

Figure 2.6: Parking requirements for a medium factory in different states

Less restrictive states optimise on parking requirements in different ways. Haryana requires the fewest spots per 100 sqm of floor area. Maharashtra and Gujarat set area per vehicle at half the value of other states. Tamil Nadu recognises that parking requirements for workers may be different than those for managerial staff.

Some states allow factories to use the setback area selectively for parking. Gujarat (2017) and Odisha (2020) allow factories to use setbacks for parking provided a minimum distance is kept free around the building. Tamil Nadu allows the use of the setback area, but only for parking cycles (2019).

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6. We assumed an FAR of 1.5 uniformly for ease of calculation. Parking is a function of the floor area.
7. The size of cars and trucks varies across states in the figure due to states mandating different area per vehicle requirements.
Land lost to Floor Area Ratio

States limit the floor area (FAR) that can be created on a given piece of land, effectively restricting the vertical expansion of factories. These restrictions intend to control density, prevent traffic congestion, and ease the supply of utilities such as water and electricity. However, regulation of FAR may be causing the opposite effect. Low FAR may in fact lead to sprawl contributing to increasing the congestion on roads and the cost of providing utilities (Brueckner 2009; Vishwanath et al. 2013).

The first three standards (ground coverage, parking, and setbacks) control the horizontal plane of the building. The vertical plane of buildings is regulated by FAR (also called Floor Space Index or FSI). Limits on the vertical plane matter because the loss of the ground floor footprint can be compensated by creating more floor space vertically. Even if factories are not suited to being high-rise, still the decision to innovate on floor space should be based on operational and financial considerations.

On average, factories across states are only allowed to create floor space up to 1.3 times the plot size. Counterintuitively, smaller factories in Bihar and Uttar Pradesh are allowed to create more floor space than larger factories. This stunts the ability of the factory owners to make up for the land lost on the ground floor. Only two states—Punjab and Telangana—institute no limits on FAR. In some states, factories can purchase additional FAR but with strong riders. In Odisha, for instance, factories can purchase additional FAR only if the road abutting their plot is wider than 60 m. For context, a three-lane national highway would be 36 m wide.

As they stand, FAR limits in India are also inimical to the proliferation of flatted factories. Flatted factories are tall stacked manufacturing facilities with high worker density. Flatted factories in Uttar Pradesh and Delhi are allowed an FAR of 1.5 and 2, respectively.
Land lost to building standards in municipal areas and industrial estates

**Municipal areas:** In most states, the building standards applicable to industrial buildings within city limits are similar to those outside city limits; i.e. factories in municipal areas will face restrictiveness along the same lines as development areas. However, setback requirements and parking minimums inside city limits are far more liberal than outside.

Consider a few examples. In Gujarat and Punjab, setbacks for larger factories in municipal areas range from 3 m to 4.5 m and 1.8 m to 2.25 m, respectively, whereas setbacks for similar factories in development areas in these states range from 4.5 m to 7.5 m. As a result, land lost to setbacks for factories in development areas is nearly double that inside city limits. In Tamil Nadu, setbacks for smaller factories in municipal areas range from 0 to 2 m, whereas setbacks for similar factories in development areas range from 2 m to 6 m. Similarly, in Maharashtra, car parking requirements for factories inside municipal areas range from 1.5 to 100 spots, whereas car parking requirements for similar factories in development areas range from 2.25 to 150 spots.

**Industrial estates:** In addition to development areas and municipal areas, there is a third type of geography—industrial areas. States declare these separate areas to encourage the clustering of industries. However, the building standards applicable inside these industrial areas are the same or more restrictive than in development areas.

Consider a few examples. In Maharashtra, setbacks for larger factories in industrial areas range from 7.8 m to 12.8 m, whereas setbacks for similar factories in development areas in these states are 6 m. As a result, land lost to setbacks for factories in industrial areas is much higher than inside development areas. Similarly, in Uttar Pradesh, car parking requirements for factories inside industrial areas range from 2.25 to 150 spots, whereas car parking requirements for similar factories in development areas range from 1 to 75 spots. As a result, land lost to parking for factories in industrial areas is nearly double that inside development areas.

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8. Of the 10 states covered in this report, researchers were only able to find municipal-level specifications for eight states. For Odisha and Uttar Pradesh, we were unable to find area-specific municipal bye-laws.

9. Of the 10 states covered in this report, researchers were only able to find industrial area-specific bye-laws for three states, i.e. Punjab, Maharashtra, and Uttar Pradesh.
Comparison with Asian countries

Southeast and East Asian countries have long been models of economic development for India. Japan is one of the leaders in the export of electronics equipment and automobiles. Approximately 40% of Malaysia’s jobs are linked to their export activities (The World Bank 2022). The Philippines employs 21 times more workers in the electronics sector compared to India (Indian Council for Research on International Economic Relations 2022). Singapore and Hong Kong are gateway countries to enter the Asian market (Acclime 2022). Indian states can learn from the regulatory approach to building regulations followed in these countries.10

Factories in some Indian states lose more land to ground coverage as compared to Southeast and East Asian countries. In Bihar, Delhi, and Uttar Pradesh, this loss extends to 60% of the plot. In comparison, in Hong Kong, a country with nearly 20 times our per capita income, a factory will not lose any proportion of the plot, and in the Philippines, a country with 1.5 times our per capita income, only 30% of the plot.

States in India also render more factory land unproductive due to setbacks. In the Philippines, rear and side setbacks are minimal. Factories in Singapore do not have to leave side setbacks if the adjoining plots also house factories. This simple difference means that a mega factory in Maharashtra loses ~2X more land to setbacks than one in the Philippines and ~5X more than one in Singapore.

Parking requirements in Indian states are also far more exacting than Asian countries. Factories on a 10,000 sqm plot in Hong Kong, Philippines, or Singapore will have to construct 15–25 car parking spaces each. In comparison, factories even in the best-performing state in India—Haryana—would have to provide at least twice this number.

Most states in our study allow lower FAR for industries than manufacturing hubs in South and East Asia. Factories in Japan are allowed to build floor area four times the plot area. In contrast, factories in India’s leading manufacturing states—Gujarat and Maharashtra—are allowed an FAR of only 1.

10. We studied 5 countries in South and Southeast Asia. The regulations consulted are:
   Japan: Building Standards Act (Act No. 201 of 1950);
   Hong Kong: Hong Kong Planning Standards and Guidelines, 2007;
   Malaysia: Volume 2, Part 1, Draft Kuala Lumpur City Plan, 2008;
### Table 2.1: Ground coverage, setback requirements, parking minimums, and floor area ratio for a mega factory

<table>
<thead>
<tr>
<th>Region</th>
<th>Ground coverage (%)</th>
<th>Setbacks</th>
<th>Parking spaces</th>
<th>Floor Area Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Front (m)</td>
<td>Rear (m)</td>
<td>Side 1 (m)</td>
</tr>
<tr>
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<td>80</td>
<td>12.2</td>
<td>7.6</td>
<td>7.6</td>
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<tr>
<td>Philippines</td>
<td>70</td>
<td>05.0</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
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<td>100¹</td>
<td>4.5</td>
<td>0/4.5²</td>
<td>0/4.5</td>
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<tr>
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<td>7.5</td>
<td>4.5</td>
</tr>
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<td>9.0</td>
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<td>6.0</td>
<td>6.0</td>
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<td>Odisha</td>
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<td>4.5</td>
<td>4.5</td>
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<td>4.5</td>
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<td>3.0</td>
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<td>6.0</td>
<td>6.0</td>
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<tr>
<td>Uttar Pradesh</td>
<td>40</td>
<td>09.0</td>
<td>9.0</td>
<td>4.5</td>
</tr>
</tbody>
</table>

**Notes:**

1. Singapore’s Urban Redevelopment Authority does not specify coverage for factories (1 and 2).
2. 0/4.5 indicates that where a factory abuts another, it does not have to leave side/rear setbacks.
3. For Tamil Nadu, we have assumed that the entire space for a factory is a workshop floor. Hence, there are no car spaces for sample factories.
3

Contextualising findings

Court cases as a proxy for builder grievances

Builders and occupiers challenged building regulations and authority actions at least 31 times before the Supreme Court in the last decade. Disputants typically fought over three types of regulations: building bye-laws, land use norms, and adjacent rules governing environment and heritage conservation. In 19 cases, disputes were about applying building regulations. In 10 cases, disputes were about regulations governing land use and environment and heritage conservation. Two cases involved petitioners challenging the constitutionality of legal provisions. These cases give insights into the scarcity created by building and land-use regulations. Regulations affect small and large players and different land uses alike.

In 30 cases, private parties initiated the judicial challenge. All private party challenges were against the actions of a government authority. Builders and property owners initiated 21 of these cases, while parties without any direct stake in the property initiated 10 of these cases. 14 cases contested if buildings were up to code and five contested the approval process. The cases highlight concerns with the regulatory and administrative processes.

In 13 disputes, the Supreme Court decided in favour of the private parties—allowing them to construct, deeming the constructed buildings legal, and disallowing the authorities from demolishing them. In 11 disputes, the Supreme Court decided in favour of the authorities—disallowing builders to construct, deeming constructed buildings illegal, allowing the authorities to demolish the constructed buildings, and upholding legal provisions challenged by private parties. In six disputes, the Court returned the cases to the executive authority or the High Court or ordered that petitioners file afresh. In one case, the private party and the authority settled the dispute themselves.
The chapter explores the disputes arising from building regulations and authorities’ enforcement of these regulations. In the 31 disputes, builders face constraints not explicit in the law and are expected to comply with regulations retroactively. Sometimes, the authorities withdraw the builders’ construction permissions even when the facts of the cases have not changed. Disputes rise to the Supreme Court, causing protracted delays in determining the building’s fate.

**Sometimes authorities expand or interpret standards arbitrarily**

Building and construction authorities such as municipal corporations, development authorities, and land and building departments often introduce qualifiers to standards during enforcement. As these qualifiers are not explicit in the rules, builders can never be fully confident of compliance.

One example of this confusion is observed in the case of setback regulations. Under these regulations, builders have to leave land free on all sides of the buildings but more land must be kept free on the front side of the building. In one case from Madhya Pradesh, the Indore Municipal Corporation attempted to expand the common understanding of a front setback during enforcement. The Corporation argued that since a side entrance had shutters, it too should count as the “front”. This requirement was neither mentioned in the Rules nor made clear during the approval of the building plan.

Another example of confusion about building standards arises from regulations governing the height of a building. Height is critical in determining how much floor space is available as also what fire certification requirements apply. In one case from Delhi, a building was denied exemption from fire certification despite qualifying as low-rise under S.O. 2894 (E) (2013). The South Delhi Municipal Corporation did not approve the building plan for eight years on the grounds that the Fire Department would not issue a provisional certificate. The Fire Department argued the building did not meet the requirements for a low-rise building and therefore required fire certification.

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11. Indore Municipal Corporation and Ors. Vs. Hemalata and Ors. 2010
12. Rule 2(44) of the Madhya Pradesh Bhumi Vikas Rules 1984 defines “front open space” as “an open space across the front of a plot between the building line and the front boundary of the plot”.
13. Under S.O. 2894 (E) amending amending Master Plan for Delhi - 2021, para 4.4.3 (Terms and Conditions) is modified as follows: “Maximum height of the building shall be 15 m in plots without stilt parking and 17.5 m in plots with stilt parking. Such residential buildings shall not be considered as high-rise buildings. For purpose of fire and life safety requirements, clearance of Fire Department will be obtained by the individual plot owner.”
Department refused to issue the certificate because it did not have tall ladders.

Operating in a rule of law framework is contingent on predictability (May 2018). Such predictability was absent in the way the Indore Municipal Corporation and the South Delhi Municipal Corporation expanded the standards. In fact, the Supreme Court deemed their actions as “without basis” and “preposterous”. Firms across states already stand to lose half their plots to standards. To add to this, firms can never be compliant because of unwritten expectations.

**Sometimes standards are applied retroactively**

Regulations keep changing which makes it difficult for builders to plan and execute construction. For example, the Haryana Building Code 2017 has been amended 10 times between 2017 and 2023 (Housing Board 2018). For a builder to make a compliant decision, they would need to know what the regulations are on the decision date. In five cases, builders contested the retroactive application of regulations.

In addition to frequently changing regulations, builders have to contend with restrictive standards. One example of excessive restrictions is the limit on building heights. The height of a building depends on restrictions on FAR and the number of floors. Indian states typically set low FAR or limit the number of floors for different types of buildings. For instance, the average FAR in Indian states is four times lower than in Japan.\(^{14}\)

Sometimes, builders have to face a combination of restrictive standards that are frequently changed. Builders are typically allowed to purchase additional FAR for a premium. In two cases from Chennai in Tamil Nadu, builders who had applied for “Premium FAR” were in for a surprise.\(^ {15}\) When the applications were under consideration, the premium rates were amended, and the builders were asked to pay the difference. In one case, the charges went up by 200%.\(^ {16}\) The Supreme Court ruled that the builders must pay charges as applicable on the date of approval. This judgement leaves builders uncertain about what they might be charged for any application. Builders cannot compute costs with certainty when a project is being planned.

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14. On average, factories in India are allowed to construct floor area 1.3 times the plot, while countries like Japan allow factories to construct floor area four times the plot.

15. Chennai Metropolitan Development Authority Vs. D. Rajan Dev and Ors. 2019; Chennai Metropolitan Development Authority and Ors. Vs. Prestige Estates Project Ltd. 2019

16. Here, the CMDA initially calculated the Premium FSI fee to be ₹44,75,88,000. The builder was then asked to submit an additional ₹90,76,75,000.
Some building authorities set limits on the number of floors for special buildings. Three parking tower builders in Mumbai were allowed to construct 13, 9, and 5 floors before the regulations governing parking towers were amended. The amendment restricted the permissible floors for parking towers to four. The Municipal Corporation of Greater Mumbai sent stop-work notices to all three projects, despite the fact that the builders had obtained permission before the law was amended. One of these builders had already spent Rs 165 crores on construction.

Such unpredictable changes undermine the rule of law because the rule of law requires that laws be promulgated well before individuals are held responsible for complying with them (Kramer 2007). A person subject to the law can determine their conduct only if they know the constraints. In the cases from Chennai, the authority’s actions imply that building application costs can significantly change after the application is submitted. In the cases from Mumbai, the authority deemed the buildings illegal because of policy changes made during construction. At any given point, a building may become illegal due to standards created after construction, with no opportunity for grandfathering.

**Sometimes authorities renege on commitments**

In addition to frequent and unpredictable changes to the law, authorities often use discretionary powers without considering the impact on the regulated. Laws delegate powers to grant permissions and benefits to the executive authority. However, laws may or may not define procedures the executive must follow or consequences when permissions and benefits are granted mistakenly. When authorities make mistakes they do not have to pay for, they tend to rectify them by reneging on commitments.

The problem of reneging commitments appears in three cases from Maharashtra and one case from Uttar Pradesh. In one case in Pune, authorities had promised Transferable Development Rights (TDR) as compensation for acquiring land belonging to a housing society “for a public purpose”. The authorities subsequently rejected the application for TDR, citing

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18. Per Municipal Corporation of Greater Mumbai and Ors. Vs. Kohinoor CTNL Infrastructure Company Private Limited and Ors. 2013, the amendment "sought to limit the height of public parking to ground plus 4 upper floors and 2 basements".
19. TDRs allow a property owner to sell the development rights to a particular parcel of land to another parcel. These development rights are in addition to the maximum FAR allowed by the applicable regulations.
that the land was not zoned for public purposes in the development plan. The Supreme Court noted that the authorities attempted to “disown and challenge” their own regulations by rejecting the housing society’s application. In another similar case from Pune, the authorities incorrectly committed that TDR amounting to 100% of FAR would be granted when the zoning only permitted TDR amounting to 4% of FAR. The Supreme Court noted that for 18 years, the property owners were left “high and dry” given all the “back and forth” in the courts.\textsuperscript{20} Similarly, in Noida, the building authority stated that it would allow commercial use on residential plots despite the fact the authority did not have the power to make such a change in land use. The authority’s statement prompted a pre-emptive run of property owners leasing their plots to commercial enterprises.\textsuperscript{21}

\section*{What follows is not trivial}

As the cases above show, Indian construction law fails to provide clarity and certainty. As a result, builders and users cannot plan effectively. Builders and authorities differ on how building standards apply, which regulations to follow, and what permissions are granted. As these questions of facts remain unanswered, builders are at risk of being non-compliant. When non-compliance comes to the notice of the authorities, buildings are ordered to be demolished, and occupiers are asked to vacate. If a building is deemed illegal, the building may be demolished by the building authority. In some instances, property owners can lose their residences due to violations made by the builder. In a case from Mumbai, the builders constructed a housing society violating the sanctioned plans and proceeded to sell flats, despite notices from the Greater Mumbai Corporation. Once residents took possession, the Corporation issued a demolition notice to the residents. The Supreme Court upheld the Corporation’s demolition order. By then, the residents had already lived in the society for over a decade.\textsuperscript{22}

The problem is so well understood that laws now make provisions for forgiving violations. Regularisation and compounding provisions are standard tools that are almost an admission


\textsuperscript{21} R.K. Mittal and Ors. Vs. State of Uttar Pradesh and Ors. 2011

\textsuperscript{22} Esha Ekta Apartments Co-Operative Housing Society Ltd. And Ors. Vs. Municipal Corporation of Mumbai and Ors. 2013
that the rules do not quite work. Building bye-laws often introduce provisions for what type of violations will be regularised or compounded. Of the laws analysed in Chapter 2, 12 include explicit provisions. In 8 of these 12, regularisation or compounding is permitted as long as the construction meets standards.\(^{23}\)

Detailed discussions of regularisation may have induced expectations of eventual “implicit bargains” (Searchinger 1986). Builders may treat construction plans as indicative while still staying within the bounds of standards or take liberties with the standards themselves to maximise the use of the plot, expecting that violations will be regularised. One such regularisation happened in a 2012 case from Kolkata, where the builder filed for regularisation of an unauthorised construction under Rule 25(2)(b) of the Kolkata Municipal Corporation Building Rules 1990.\(^{24}\) This is contrary to the Supreme Court’s exhortation that regularisation should be a “rare exception” applied only in the case of “marginal or insignificant accidental violations”.\(^{25}\)

Real estate embroiled in litigation results in the protracted delay of property utilisation. In the 31 disputes studied, litigants spent over a decade each in court. Protracted court disputes mean property owners are deprived of benefits they could otherwise enjoy. From residential and commercial leasing to development and investment, delays in property utilisation lead to lost opportunities and unrealised economic potential.

\(^{23}\) (Government of Telangana 2015; Government of Tamil Nadu 2017; Government of Punjab 2018; Government of Haryana 2022; Government of Maharashtra 2022; Government of India 2022; Government of Gujarat 2023; Government of Odisha 2019)

\(^{24}\) Dipak Kumar Mukherjee Vs Kolkata Municipal Corporation and Ors. 2012. Rule 25(2)(b) of the Kolkata Municipal Corporation Building Rules 1990: “if during the erection or execution of work any external deviation beyond the sanctioned covered space is intended to be made and which does not violate the provisions of the Act or the said Rules, the person erecting such construction, prior to carrying out such erection or execution of works, submit, in accordance with the provisions of the said rules, a revised plan incorporating the deviation intended to be carried out, for obtaining necessary sanction thereof.” Rule 25(3): “Any departure made during the execution of any work or at any time thereafter without sanction shall be deemed to be in contravention of the provisions of the Act and these rules and shall be dealt with accordingly.”

Discussion

Opportunity cost of building standards

As Chapter 2 shows, an Indian factory owner pays full price to use only half the plot of land. The money spent on the lost ground floor space matters because the ground floor is the most valuable real estate for factory owners. Constructing vertically means more money spent on construction material, structural stability, and compliance.

Putting a rupee value on unbuilt land at the factory level gives us an estimation of the opportunity cost of building standards. In addition, the factory owner is also not able to generate returns from the unbuilt land; the fallow land cannot be used to accommodate machines and workers. Counting the potential jobs that could have been created on this unbuilt land gives an extended estimation of the opportunity costs of these building standards.

Studies have explored the cost of labour regulations (Ahsan and Pagés 2009; Almeida and Carneiro 2009) and environmental protection regulations (Albrizio, Kozluk, and Zipperer 2017; Bhattacharya 2019; Porter and Linde 1995). However, little is said about the cost of land use regulations, specifically building standards, for the Indian economy. There is no indication of what it costs India to set stringent building standards. This report aims to evaluate the economic cost, specifically the loss of employment due to compliance with building standards in India. Job creation is hurt when productive land is lost, which in turn hurts the government’s plan to build a $5 trillion economy. Manufacturers lose productive land that could have been used to accommodate additional workers and machinery.
Consider a hypothetical factory on a 5,000 sqm plot in Koregaon, Maharashtra. This location is 30 km away from Pune’s city centre and falls under the Pune Metropolitan Regional Development Authority. Once the four building standards are applied, the factory is required to leave 3,029 sqm (61%) of the plot area unbuilt. This hypothetical factory is allowed a base FAR of 1 under Maharashtra building regulations. Under the same regulations, this factory can purchase an additional FAR of 0.4. We round off the FAR to 1.5 for simplifying calculations. This hypothetical factory will also not be able to utilise the setbacks area for parking spaces. The building has to leave minimum open space around the building to utilise setbacks to park vehicles.

What is the rupee value of the unbuilt land and how many workers/machines could have been accommodated on that land?

**Figure 4.1: Illustration of land lost to each standard by a factory in Maharashtra**

<table>
<thead>
<tr>
<th>Assumptions made</th>
<th>Law: UDCPR 2020 Maharashtra</th>
<th>Location: Pune Dvpt Area Koregaon</th>
<th>Size: 5k sqm, 9 m tall Large</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standards as is</td>
<td>Ground coverage: 100% Land lost = 0</td>
<td>Setbacks: 6, 6, 6 m Land lost = 1,533 sqm</td>
<td>Parking: 225 W2, 75 C, 1 T Land lost = 1,476 sqm</td>
</tr>
<tr>
<td>Opportunity costs</td>
<td>Footprint left: 39% Land lost = 3,029 sqm</td>
<td>Opportunity cost Rupee value of land lost = ?</td>
<td>Opportunity cost Number of jobs lost = ?</td>
</tr>
</tbody>
</table>
Wasted expenditure in 10 states: At the factory level

The unbuilt land on the ground floor is wasted expenditure. To arrive at systematic unit-level estimates of the wasted expenditure, land left unbuilt in factories is multiplied by circle rates. In our hypothetical factory’s case, the circle rate for the area is ₹2,100 per sqm. The factory owner spends ₹1.05 crores (5,000 sqm × ₹2,100) to buy land, of which ₹63.6 lakhs (3,029 sqm × ₹2,100) can be estimated as wasted expenditure. This estimate is probably conservative because circle rates are typically lower than market rates (FinFIRST 2023).

Table 4.1 below shows an estimate of expenditure on unbuilt land incurred by factory owners for plots of different sizes located in sample development areas. Building standards lead to a loss of ₹2.67 lakhs in a micro factory to ₹316.80 lakhs in a mega factory.\(^{26,27}\)

Research shows that the high cost of land hinders expanding production capacity in India (McKinsey Global Institute 2020). Traditionally, authorities tend to earmark areas situated away from city centres for industrial growth. These yet-to-be-serviced or partially-serviced areas are already at a disadvantage in infrastructure and utilities (Yasin et al. 2021). Reducing the usable footprint on this land adds to the cost of doing business.

These regulations may be driving an irrational location of factories. Theory predicts that factories should go where land prices are lower. However, restrictive regulations in cheaper areas may drive factories to more expensive locations. For example, the land price in DLF Industrial Area, Faridabad, Haryana, is ₹14,352 per sqm, and in Ganesh Nagar, Ludhiana East, Punjab, is ₹13,200 per sqm (Government of Haryana 2023; Government of Punjab 2022). But Faridabad is less restrictive than Ludhiana. Therefore, a medium factory will lose ₹57.4 Lakhs in Faridabad (Haryana) and ₹1.07 crores in Ludhiana (Punjab). As a result, Faridabad becomes a more attractive investment location than Ludhiana, even as land prices are slightly higher in Faridabad.

\(^{26}\) Locations selected for the estimation are: Bihar (Kanjhia, Bhagalpur district), Delhi (Zakir Nagar Okhla, New Delhi), Gujarat (Kathwada, Ahmedabad district), Haryana (Rajapur, Panipat district), Maharashtra (Koregaon, Pune district), Odisha (Alakar, Khordha district), Punjab (Khasi Kalan, Ludhiana district), Tamil Nadu (Sulur, Coimbatore district), Telangana (Madikonda, Warangal district), Uttar Pradesh (Mohiuddinpur Lalsana Shesh, Meerut district). Of the list, 3 are near tier-1 cities, 5 are near tier-2 cities, and 2 are near tier-3 cities. For Telangana, researchers were unable to access circle rates for industrial land in development areas and applied the circle rate as prescribed by Telangana State Industrial Infrastructure Corporation Limited.\(^{27}\) We do not consider Delhi for upper bound estimates as the circle rates of land make it an outlier.
<table>
<thead>
<tr>
<th>State</th>
<th>Circle Rate (₹ per sqm)</th>
<th>Micro 150 sqm</th>
<th>Small 300 sqm</th>
<th>Medium 1,000 sqm</th>
<th>Large 5,000 sqm</th>
<th>Mega 10,000 sqm</th>
</tr>
</thead>
<tbody>
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<td>BH</td>
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<td>004.15</td>
<td>008.30</td>
<td>0022.05</td>
<td>0086.42</td>
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<tr>
<td></td>
<td></td>
<td>(150)</td>
<td>(300)</td>
<td>(800)</td>
<td>(3,100)</td>
<td>(6,000)</td>
</tr>
<tr>
<td>DL</td>
<td>1,13,280</td>
<td>169.92</td>
<td>339.84</td>
<td>1,132.80</td>
<td>5,383.07</td>
<td>9,978.51</td>
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<tr>
<td></td>
<td></td>
<td>(150)</td>
<td>(300)</td>
<td>(1,000)</td>
<td>(4,750)</td>
<td>(8,800)</td>
</tr>
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<td>005.13</td>
<td>0013.72</td>
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<td>0078.03</td>
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<td>(258)</td>
<td>(690)</td>
<td>(2,250)</td>
<td>(3,900)</td>
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<td>0031.68</td>
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<td>(141)</td>
<td>(400)</td>
<td>(2,000)</td>
<td>(4,000)</td>
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</tr>
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<td>009.00</td>
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<td>0135.65</td>
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<td>(150)</td>
<td>(300)</td>
<td>(820)</td>
<td>(3,000)</td>
<td>(4,500)</td>
</tr>
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<td>(243)</td>
<td>(550)</td>
<td>(1,750)</td>
<td>(2,900)</td>
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<td>007.60</td>
<td>0024.93</td>
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<td>0170.68</td>
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<td>(96)</td>
<td>(225)</td>
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<td>(2,950)</td>
<td>(5,100)</td>
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<td>0174.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(110)</td>
<td>(186)</td>
<td>(710)</td>
<td>(3,000)</td>
<td>(6,000)</td>
</tr>
</tbody>
</table>
Jobs lost in 10 states: At the factory level

Restricting the factory footprint reduces the land available to a factory owner which in turn reduces the number of workers that can be employed. To arrive at systematic unit-level estimates of additional jobs that could be created, half the unbuilt land is divided by a multiple of the legal per-worker space requirement. Section 16 of the Factories Act 1948 mandates that a factory provide 3.38 sqm floor area per worker.28

Consider the same hypothetical factory in Koregaon, Maharashtra, where the factory must leave 3,029 sqm (61%) of the plot area unbuilt. Even if the land required to be left unbuilt is halved, our hypothetical factory could increase the factory footprint by 1,514.5 sqm. Let us assume this manufacturer has one machine for each worker, and the area required per worker equals the area required per machine. Therefore, for employing each worker, the factory needs 6.76 sqm (3.38 sqm \times 2). Even if Maharashtra were to halve the land lost through regulatory reform, our hypothetical factory could create room for 224 more workers (1,514.5 \div 6.76 sqm per worker).

28. Section 16 of Factories Act 1948 mandates that a factory provide 14.2 cubic metres of space for every worker employed. To determine whether a factory has provided this space, no account can be taken of the space that is provided above 4.2 metres from the floor of the room. This means that factories must provide at least 3.38 square metres of floor space for every worker employed in a new factory.
Table 4.2 shows an estimate of the additional jobs factory owners in different states could have created if they could use more of their plot. Even if the land loss on account of regulations was halved, medium-sized factories could generate between 30–74 more jobs per unit.

**Table 4.2: Jobs that can be created in factories if land lost were reduced by half**

<table>
<thead>
<tr>
<th>State</th>
<th>Micro 150 sqm</th>
<th>Small 300 sqm</th>
<th>Medium 1,000 sqm</th>
<th>Large 5,000 sqm</th>
<th>Mega 10,000 sqm</th>
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<tbody>
<tr>
<td>BH</td>
<td>11</td>
<td>22</td>
<td>59</td>
<td>231</td>
<td>444</td>
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<td>22</td>
<td>74</td>
<td>352</td>
<td>652</td>
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<tr>
<td>GJ</td>
<td>11</td>
<td>19</td>
<td>51</td>
<td>167</td>
<td>289</td>
</tr>
<tr>
<td>HR</td>
<td>05</td>
<td>11</td>
<td>30</td>
<td>148</td>
<td>296</td>
</tr>
<tr>
<td>MH</td>
<td>11</td>
<td>18</td>
<td>68</td>
<td>224</td>
<td>373</td>
</tr>
<tr>
<td>OD</td>
<td>11</td>
<td>22</td>
<td>70</td>
<td>255</td>
<td>460</td>
</tr>
<tr>
<td>PB</td>
<td>11</td>
<td>22</td>
<td>61</td>
<td>221</td>
<td>335</td>
</tr>
<tr>
<td>TN</td>
<td>11</td>
<td>18</td>
<td>41</td>
<td>129</td>
<td>218</td>
</tr>
<tr>
<td>TS</td>
<td>07</td>
<td>17</td>
<td>55</td>
<td>217</td>
<td>376</td>
</tr>
<tr>
<td>UP</td>
<td>08</td>
<td>14</td>
<td>53</td>
<td>222</td>
<td>444</td>
</tr>
</tbody>
</table>

A modification in one standard can allow a factory to accommodate many more workers. For example, our hypothetical factory could increase its footprint from 1,971 sqm to 3,101 sqm if Maharashtra mimicked the setback standards in Haryana. The additional floor space generated could accommodate an additional 167 workers.

Job loss at the factory level can compound growth opportunities lost at the state level. According to The Annual Survey of Industries, 2020, there are 2,514 large-scale factories in Maharashtra. Through regulatory reform, these factories could generate employment for 5.6 lakh more workers and create more than ₹500 crores in monthly wages. We are yet to analyse the relationship between land use restrictions and industrial employment across study states; this is a subject for further examination.

29. In this case, front and rear setback requirements will be reduced from 6 m to 3 m and the two side setback requirements will be removed.

30. In Maharashtra, minimum wages are based on industry types. We chose minimum wages for a semi-skilled worker in cement and cement-based industries as this is the lowest of the rates. The monthly minimum wages for semi-skilled workers in these industries in the state are ₹9,846 (Government of Maharashtra 2023).
Implications for competitiveness

The Government of India knows that the cost of doing business in India is high. To address this, the Department for Promotion of Industry and Internal Trade (DPIIT) has published a cost of regulation framework to “calculate regulatory burden in terms of time and cost to businesses related to policies at Central and State level” (Department for Promotion of Industry and Internal Trade 2023). This framework measures compliance costs primarily in terms of the money and time required for the administrative steps in any regulation.  

However, this framework does not account for the cost imposed by standards themselves. As an illustration, the government has been proactive in reducing the time taken to get a building permit. In Punjab, the government reduced building permit timelines from 135 days to 75 days (Government of Punjab 2020). However, this effort ignores the fact that a large factory loses 60% of its land to regulation. The time saved in approvals is a one-time saving and will definitely help firms, but the unused land is a lost opportunity for economic activity that plays out year after year.

Moreover, some standards put in place by the Union government are even more punishing than state regulations. Take for example the National Building Code (NBC) of India 2016. NBC is the guiding instrument for construction in India. State governments are increasingly adopting standards from NBC on design, fire safety, structural safety, and ventilation, and we are in danger of further gold-plating our standards. For example, Punjab Urban Planning and Development Building Rules 2021 refer to NBC 70 times. In addition, conflicts between NBC and state regulations are also leading to legal disputes.  

<p>| Table 4.3: References to NBC in state regulations |</p>
<table>
<thead>
<tr>
<th>State</th>
<th># of references</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bihar</td>
<td>14</td>
</tr>
<tr>
<td>Delhi</td>
<td>4</td>
</tr>
<tr>
<td>Gujarat</td>
<td>22</td>
</tr>
<tr>
<td>Haryana</td>
<td>33</td>
</tr>
<tr>
<td>Maharashtra</td>
<td>16</td>
</tr>
<tr>
<td>Odisha</td>
<td>28</td>
</tr>
<tr>
<td>Punjab</td>
<td>70</td>
</tr>
<tr>
<td>Tamil Nadu</td>
<td>19</td>
</tr>
<tr>
<td>Telangana</td>
<td>9</td>
</tr>
<tr>
<td>Uttar Pradesh</td>
<td>38</td>
</tr>
</tbody>
</table>

31. These costs are broken into five components—time costs, substantive costs, intermediary costs, delay costs, and statutory costs.
32. CM Dinesh Mani vs State of Kerala and ors. 2015; Peevees Projects (P) Ltd. vs Director General, Fire and Rescue Services Head Quarters, Housing Board Junction and Ors. 2017
NBC, overall, prescribes more restrictive standards than states, resulting in a higher footprint loss. Of the four standards, NBC is exemplar only on one, i.e. ground coverage. The footprint lost to NBC compliance is nearly double the average loss of land in the least restrictive state—Haryana. In fact, the national code is more restrictive than 6 out of 10 states studied in this report. The higher loss of footprint also increases the opportunity cost of compliance with the National Building Code (Refer Table 4.4).

Table 4.4: Cost of compliance with National Building Code and Haryana regulations

<table>
<thead>
<tr>
<th>Factory</th>
<th>Land lost (%)</th>
<th>Cost of land lost (₹ in Lakhs)</th>
<th>Jobs lost (# of workers)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NBC</td>
<td>HR</td>
<td>NBC</td>
</tr>
<tr>
<td>Micro</td>
<td>NA</td>
<td>41</td>
<td>NA</td>
</tr>
<tr>
<td>Small</td>
<td>100</td>
<td>47</td>
<td>023.7</td>
</tr>
<tr>
<td>Medium</td>
<td>082</td>
<td>40</td>
<td>064.9</td>
</tr>
<tr>
<td>Large</td>
<td>060</td>
<td>40</td>
<td>237.6</td>
</tr>
<tr>
<td>Mega</td>
<td>054</td>
<td>40</td>
<td>427.6</td>
</tr>
</tbody>
</table>

Note: The circle rate for Razapur, Panipat district, Haryana (₹7,920 per sqm) was used.

India may be losing out on global competitiveness because of this blind spot in our country’s approach to measuring the costs of standards. According to the Global Competitiveness Report 2019, India ranked 68 out of 141 economies (World Economic Forum 2019). In addition to administrative ease, India needs to pay attention to substantive restrictions. From 2014 to 2019, India improved its Ease of Doing Business Rank by 79 ranks (The World Bank 2014, 2019). However, our share in the global apparel market stayed constant at 4.2%. In contrast, Vietnam and Bangladesh did not improve their global ranks, but were able to increase their shares of the international trade in garments (Foundation for Economic Development 2022).33

This indicates that India may not be able to succeed only by improving administrative ease and the country must reform the substantive restrictions that impose costs on the national economy.

33. Vietnam improved by 23 ranks (from 93 to 70) and Bangladesh improved by 4 ranks (from 172 to 168). Vietnam’s share in garment exports rose from 3.9% to 7% and Bangladesh’s went up from 5.7% to 9%.
**Implication for urbanisation**

Historically, Indian city planners have had an implicit bias toward low-density development (Clarke Annez et al. 2010; Patel, Byahut, and Bhatha 2018; Gray 2022). Through building regulations, planners have stunted the growth of cities—vertically and horizontally. This preference for low-density development has translated into urban sprawl (Brueckner 2009).

Urban sprawl hurts ordinary Indians in three ways. First, it leads to poorer quality of life for a large proportion of the population. This is because urban infrastructure deteriorates as the distance from the city centre increases. Where 93% of residents have access to drainage facilities in the core area of an Indian city, only 70% have that same access in an area 5 km away (Vishwanath et al. 2013). The second harm is that it increases commute distance and time for workers. For example, the average commute time in Mumbai is double that in Hong Kong and Singapore, areas with higher densities, and Bangalore residents lose 1.5% to 4.5% of their household income to commuting (Bertaud and Brueckner 2005; Dhar et al. 2019). Finally, citizens are harmed by urban sprawl because it increases home prices (Bertaud 2010; Patel, Byahut, and Bhatha 2018; Payne 2005). For example, in Mumbai, restrictive regulations have disturbed the supply of formal housing so that 54% of the population stays in slums (Gandhi 2012; Patel, Byahut, and Bhatha 2018).

Undoing urban sprawl will involve creating opportunities for affordable housing closer to where people work. It will also involve creating opportunities for entrepreneurs to build places of work in or closer to cities. Low-density industrial buildings hurt India’s urbanisation, just like low-density housing. Workers and goods will have to move longer distances and face more congestion. Revisiting our bias against placing industrial buildings near cities is now feasible given that many modern manufacturing units are non-polluting and can be located near city centres.

India is rapidly urbanising; we expect to add 416 million people to our cities by 2050 (NITI Aayog and Asian Development Bank 2022). The government aims to focus on developing new cities that are inclusive, systematically planned, and productive (NITI Aayog 2021; The Hindu 2023a). Reforming our development control regulations from the point of view of cities as places where people work is critical to enabling this vision.
Conclusion

We need to create room to Make in India. Indian factories lose 40–70% of land to restrictive building and construction regulations. The complexities in building standards and land use regulations create an environment where compliance with the rules is almost impossible, and it takes years to determine the fate of a building. Firm productivity takes a hit as land remains underutilised and resources get locked in compliance activities. This impact is felt both at the factory level, where wasted capital expenditure hampers growth and at the state level, where job creation opportunities are stifled.

Standard setting must be careful and context-appropriate, not deterrent. Thinking from the perspective of the user can help make our regulatory choices more pragmatic and enforceable. The report acknowledges the importance of safety that these standards aim to achieve. But, the report also highlights instances where standards are excessively conservative and come at an economic cost that cannot be disregarded. The conventional planning approach of safety at all costs and beauty over practicality makes it impossible to use land optimally or to live comfortably.

Realising India’s big dream of prosperity requires that we maintain a competitive edge in the global marketplace and hasten job creation and economic growth. Moreover, India is urbanising rapidly. Developed and livelihood-friendly cities can facilitate India’s desired goal of becoming a $5 trillion economy. Using existing industrial land optimally is critical to these pursuits.

The Union government and state governments must undertake a comprehensive review and revision of building standards and land use regulations. The Government of India has encouraged states to reform construction permit processes and measure the cost of regulation for compliances. The Union Government can use these initiatives to encourage states to also reform building standards. The Union Government has also recently constituted a High Level
Committee that envisions economic growth as a key pillar for city development (ThePrint 2023). The Committee should examine building standards in and around cities to reduce the distance between working and living.

This report presents a reform agenda to the Union Government and state governments and aims to contribute to the knowledge on land use in India. The inter-state comparison can help adopt appropriate policies and encourage states to undertake reform following the lead of other states. Encouraging the freedom to build can help unlock productive land, boost businesses, and generate jobs for ordinary Indians.
Bibliography


List of judgements


Peevees Projects (P) Ltd. vs Director General, Fire and Rescue Services Head Quarters, Housing Board Junction and Ors., No. W.P. (C) Nos. 24986 of 2016 (W) (Aug. 21, 2017), accessed December 7, 2023, https://hckinfo.kerala.gov.in/digicourt/Casedetailsearch/fileviewcitation?token=MjE1NzAwMjQ5ODYyMDE2XzEucGRm&lookups=b3JkZXJzLzIwMTY=&citationno=MjAxNzpLRVI6MzQ3OTg=.


Appendix

Conceptual framework

This edition of the State of Regulation report catalogues restrictions on the usage of land and the built form of a factory building. The report seeks to encourage a review of building standards, taking into account both the costs and benefits of such standards.

Regulations impose unseen costs that are often ignored while evaluating their merit (Mamaysky, Yang, and Calomiris 2020). A sound cost analysis reveals the flip side and helps improve regulation-making (Rose and Walker 2013). In our estimation, no attempt has been made to present the cost of building regulations on factories in India. We need to examine building regulations carefully to increase the efficient use of existing industrial land.

This report borrows from the approach used by Patel et al., who analyse the impact of relaxing mandatory building standards on low-cost housing in Ahmedabad, Gujarat. In their 2018 paper, they designed two building layouts—one per prevalent regulations and another per modified regulations. They find that “rationalising regulations can reduce housing cost by 34% and increase supply by as much as 75% without significantly lowering quality or compromising safety”. While Patel et al. (2018) focus on affordable housing, this report focusses on building standards applicable to factories in Indian states. Promoting manufacturing has been an explicit goal of policy-makers. Understanding the effect of different regulations on manufacturing units can help identify opportunities for correction.

Building regulations come under the broad category of land use restrictions. Such restrictions not only distort the supply of housing but also disrupt economic activity within a region. They can act as barriers to entry for firms by curtailing the supply of space for industrial or commercial usage (Bertrand and Kramarz 2002; Nishida 2014; Suzuki 2013). Furthermore, restrictive land use regulations can also push an industry out of traditional hubs, thereby disrupting the regional economy (Osman 2020). There is a case to be made for liberalising land-use regulations for fostering economic growth. For instance, a study on the impact of land-use restrictions on the U.S. economy suggests that deregulation would lead to an increase in GDP and productivity (Herkenhoff, Ohanian, and Prescott 2018).
Data analysis

This report focuses on four standards—ground coverage, setbacks, parking, and floor area ratio. Our conversations with architects and town planners revealed that these four standards are primary determinants of a building’s footprint. The report calculates land lost to individual standards, land lost to standards when applied together, and the opportunity costs of total land lost. Land loss means how much plot area has to be left unbuilt after complying with the four standards, either individually or in toto. Opportunity costs mean the rupee value of the land lost and the additional workers that could have been accommodated on the unbuilt land.

Typically, a state has three different areas—areas governed by municipal authorities, i.e. cities or towns; areas governed by development authorities, i.e. peri-urban areas; and areas marked as industrial estates. The report focuses on factories in development areas. For land lost, building regulations as applicable to development areas in these 10 states were sourced from websites of state government departments, repositories such as Manupatra and Bare Acts Live, and an internet search. To calculate the rupee value of land lost in development areas in these 10 states, we use government-instituted circle rates. In addition to the 10 regulations, we study five regulations that apply to only municipal areas and industrial areas. To calculate the additional workers that could be accommodated in the land lost, we use the Factories Act 1948. Table A.1 lists all regulations studied, the types of areas they apply to, and in the case of development areas, the actual area used for land value calculations.

To contextualise findings, the report also presents an analysis of 31 legal disputes that serve as a proxy for how building regulations affect builders. These 31 disputes involved at least one law regulating construction and at least one government authority that regulates construction. These disputes were shortlisted for analysis through a keyword search of 49 unique terms run on a legal repository. To the best of our knowledge, the sources cited are reliable and current. Table A.4 lists the cases studied.

Building standards depend on approximately 14 features of a factory, including its size. Hence, we model sample factories of different sizes: micro, small, medium, large, and mega. The assumptions of the features of each type of factory are outlined in Table A.2. We programmed all 14 assumptions using Python. After programming the assumptions, we programmed formulae to calculate land lost to individual standards, land lost to standards when applied together, and the opportunity costs of total land lost. All formulae used are explained in Table A.3.
Datasets: The standards, as written in the law, were catalogued in a simplified manner for easy analysis. This is available in Dataset 1: Raw Data. Assumptions, standards, and calculation formulae as coded in Python then generated values for land lost to individual standards, land lost in toto, and the opportunity costs of total land lost. This is available in Dataset 2: Analysed Data. The dispute analysis of 31 cases is available as Dataset 3: Case Catalogue. All three datasets can be accessed on our GitHub.

Source material: Source material includes three types of documents: the regulations studied in the report (both Indian and international), the source files for circle rates used in the report, and the 31 Supreme Court judgements analysed in the report. The source documents are named using the following convention: <type of file_authority_title of the document_year published> [Types of files = BuildingRegulations/CircleRates/Judgments. Authority = StateNameShorthand/SupremeCourt]. The source material can be accessed on our GitHub.

Limitations of the report

Any measure of the kind proposed in this report is only an approximation of the underlying reality. The following limitations of the methodology are salient:

1. This is a de jure analysis. An analysis like this can only elucidate the meaning of legal texts and does not predict how these laws will be implemented or the real-life impact of such implementation on individual entities. The report does not take into account the actual size of factories, the actual loss of land in individual cases, or variations in topography and climatic conditions.

2. Factory buildings adhere to 100+ building standards. This report only studies four of these standards. We chose these four standards after consultations with architects and town planners and based on literature.

3. This report does not mean to provide architectural or structural advice. The analysis is meant to serve as a policy playbook and guide choices on regulation.

4. This report tries to model one sample regulation from each state. However, states may specify different standards for different regions and give exempting powers to authorities. For example, in Gujarat, the Comprehensive Control Development Rules allow Local Area Plans to specify different building standards for Central Business Districts. Similarly, in Maharashtra, the City and Industrial Development Corporation (CIDCO) may decide the amount of additional FAR that can be granted to plots.
### Table A1: Regulations studied and locations selected for circle rates

<table>
<thead>
<tr>
<th>State</th>
<th>Development</th>
<th>Regulations studied</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><em>(Circle rate used: Kanjhi, Bhagalpur)</em></td>
<td><em>(Circle rate used: Kanjhi, Bhagalpur)</em></td>
</tr>
<tr>
<td></td>
<td><em>(Circle rate used: Zakir Nagar Okhla, New Delhi)</em></td>
<td>Master Plan for Delhi 2021</td>
</tr>
<tr>
<td>GJ</td>
<td>Gujarat Comprehensive Development Control Regulations 2017</td>
<td>Gujarat Comprehensive Development Control Regulations 2017</td>
</tr>
<tr>
<td></td>
<td><em>(Circle rate used: Kathwada, Ahmedabad)</em></td>
<td><em>(Circle rate used: Kathwada, Ahmedabad)</em></td>
</tr>
<tr>
<td>HR</td>
<td>Haryana Building Code 2017</td>
<td>Haryana Building Code 2017</td>
</tr>
<tr>
<td></td>
<td><em>(Circle rate used: Razapur, Panipat)</em></td>
<td><em>(Circle rate used: Razapur, Panipat)</em></td>
</tr>
<tr>
<td>MH</td>
<td>Unified Development Control and Promotion Regulations for Maharashtra State</td>
<td>UDCPR 2020</td>
</tr>
<tr>
<td></td>
<td><em>(UDCPR) 2020)</em></td>
<td><em>(UDCPR) 2020)</em></td>
</tr>
<tr>
<td>OD</td>
<td>Odisha Development Authorities (Planning and Building Standards) Rules 2020</td>
<td>Revised Development Control Regulations 2009</td>
</tr>
<tr>
<td></td>
<td><em>(Circle rate used: Alakar, Khordha)</em></td>
<td><em>(Circle rate used: Alakar, Khordha)</em></td>
</tr>
<tr>
<td>PB</td>
<td>Punjab Urban Planning and Development Building Rules 2021</td>
<td>Punjab Municipal Building Bye-laws 2018</td>
</tr>
<tr>
<td></td>
<td><em>(Circle rate used: Khasi Kalan, Ludhiana)</em></td>
<td>Punjab Urban Planning and Development Building Rules 2021</td>
</tr>
<tr>
<td>TN</td>
<td>Tamil Nadu Combined Development and Building Rules 2019</td>
<td>Second Master Plan for Chennai</td>
</tr>
<tr>
<td></td>
<td><em>(Circle rate used: Sulur, Coimbatore)</em></td>
<td>Metropolitan Area 2026</td>
</tr>
<tr>
<td></td>
<td><em>(Circle rate used: Madikonda, Warangal)</em></td>
<td><em>(Circle rate used: Madikonda, Warangal)</em></td>
</tr>
<tr>
<td></td>
<td><em>(City rate used: Mohiuddinpur Lalsana Shesh, Meerut)</em></td>
<td><em>(City rate used: Mohiuddinpur Lalsana Shesh, Meerut)</em></td>
</tr>
</tbody>
</table>

Notes:
1. Sample development areas selected are 10-30 km away from city centres. Of the list, three are near tier1 cities, five are near tier2 cities, and two are near tier3 cities.
2. For Telangana, researchers were unable to access circle rates for industrial land in development areas. Hence, we consider the circle rate as prescribed by Telangana State Industrial Infrastructure Corporation Limited.
### Table A2: Assumptions for sample factories

<table>
<thead>
<tr>
<th>Feature</th>
<th>Micro</th>
<th>Small</th>
<th>Medium</th>
<th>Large</th>
<th>Mega</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Assumptions common to all states</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plot area (sqm)</td>
<td>150</td>
<td>300</td>
<td>1,000</td>
<td>5,000</td>
<td>10,000</td>
<td>States vary standards basis the plot size. We consider the common thresholds for plot areas where states change the applicable standard. For eg, six states have different standards for a factory on an area &lt;300 sqm and &gt;300 sqm.</td>
</tr>
<tr>
<td>Building height (m)</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>In some states, factories on plots under 300 sqm are not allowed to go above 10 m in height. Standards vary based on the height of the building. Assuming height &lt;10 m allowed us to model the simplest case.</td>
</tr>
<tr>
<td>Floor Area Ratio</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
<td>To facilitate comparison of maximum footprint allowed across states, we keep the FAR fixed at 1.5 for all states in all datasets. 1.5 is the median of all FAR values referred to by the regulations studied.</td>
</tr>
<tr>
<td>Maximum # of workers in a factory</td>
<td>22</td>
<td>44</td>
<td>148</td>
<td>740</td>
<td>1,480</td>
<td>We calculate this as plot area ÷ (space per worker + space per machine). Per Factories Act 1948 space per worker is 3.38 sqm. We assume one machine per worker, and area per worker equals area per machine. This matches with the classification of enterprises based on employment size used by the International Labour Organisation</td>
</tr>
<tr>
<td><strong>Assumptions peculiar to some states</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plot width (m)</td>
<td>12</td>
<td>17</td>
<td>32</td>
<td>71</td>
<td>100</td>
<td>We assume that all sample plots are square in shape as this is the easiest shape to model. States vary standards basis the width of the abutting road. Common thresholds for abutting road width are 3.5 m, 7 m, 9 m, 12 m, 15 m, and 18 m. States like Maharashtra do not allow factories to be constructed if the abutting road width is &lt; 9 m. Hence, we assume the next threshold—12 m for smaller factories and 18 m for larger factories.</td>
</tr>
<tr>
<td>Road width (m)</td>
<td>12</td>
<td>12</td>
<td>18</td>
<td>18</td>
<td>18</td>
<td>States specify different standards for factories manufacturing different goods like textiles, sports, and knitwear. Of these, states also specify standards for a ‘general’ factory. We choose the case of general factories to not restrict the analysis to a specific type of factory.</td>
</tr>
<tr>
<td>Type of factory</td>
<td>General</td>
<td>General</td>
<td>General</td>
<td>General</td>
<td>General</td>
<td></td>
</tr>
</tbody>
</table>

*Prosperiti | State of Regulation: Building standards reforms for jobs and growth | 2023*
### Table A2: Assumptions for sample factories

<table>
<thead>
<tr>
<th>Feature</th>
<th>Micro</th>
<th>Small</th>
<th>Medium</th>
<th>Large</th>
<th>Mega</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Building depth (m)</strong></td>
<td>&lt;40</td>
<td>&lt;40</td>
<td>&lt;40</td>
<td>&gt;40</td>
<td>&gt;40</td>
<td>We assume large and mega factories have building depth &gt;40 m as out of five sample factories, two will need to account for plot width &gt;40 m. 40 m matters because two states (Maharashtra and Telangana) change setbacks where building depth is more.</td>
</tr>
<tr>
<td><strong>Area of any one floor (sqm)</strong></td>
<td>&lt;500</td>
<td>&lt;500</td>
<td>&lt;500</td>
<td>&gt;500</td>
<td>&gt;500</td>
<td>We accounted for this because one state in our study (Maharashtra) links standards with floor area on any one floor.</td>
</tr>
<tr>
<td><strong>Industry type based on pollution</strong></td>
<td>Orange</td>
<td>Orange</td>
<td>Orange</td>
<td>Orange</td>
<td>Orange</td>
<td>We accounted for this because one state in our study (Tamil Nadu) links standards with pollution classification. We classify our hypothetical factories as ‘Orange’ because these factories are neither the most polluting factories nor the least.</td>
</tr>
<tr>
<td><strong>Location classification</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>In states with a common building code, locations are not classified as municipal, development or industrial. Instead, different phrases are used. Where standards are linked to phrases like “new”, “non-core”, “proposed to be developed”, “non-congested”, and “anirmit”, we assume these factories are located in development areas. Where standards are linked to phrases like “old”, “core”, “developed”, “congested”, and “anirmit”, we assume these factories are located in municipal areas.</td>
</tr>
<tr>
<td><strong>Type of parking</strong></td>
<td>Open/</td>
<td>Open/</td>
<td>Open/</td>
<td>Open/</td>
<td>Open/</td>
<td>Parking could be of different types like basement, mechanical, and stilt. We take the case of the simplest parking type, i.e. open/surface, which does not involve any additional construction cost.</td>
</tr>
<tr>
<td><strong>Type of construction</strong></td>
<td>Plotted</td>
<td>Plotted</td>
<td>Plotted</td>
<td>Plotted</td>
<td>Plotted</td>
<td>Factories are of two types—plotted and flatted. Plotted are single detached units, and flatted are a collection of units stacked one above the other. We assume single-detached units (plotted factories) run by an entrepreneur.</td>
</tr>
<tr>
<td><strong>Electrical power (Horsepower)</strong></td>
<td>&lt;30</td>
<td>30–200</td>
<td>30–200</td>
<td>&gt;200</td>
<td>&gt;200</td>
<td>In Chennai, Tamil Nadu, setbacks change on the basis of electrical power consumed by the industry. The law specifies three thresholds: &lt;30 horsepower, 30–200 horsepower, and &gt;200 horsepower. We vary it based on the size of the plot.</td>
</tr>
<tr>
<td><strong>Population</strong></td>
<td>2,00,000–10,00,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NBC 2016 prescribes parking requirements on the basis of the population. We assume the parking requirements attached to “Population Between 200,000 and 1,000,000” (Annex A, Table 9, Norms for off-street parking spaces, Part-3, NBC 2016).</td>
</tr>
</tbody>
</table>
### Table A 3: Formulae for land lost to standards and opportunity costs of land lost

<table>
<thead>
<tr>
<th>#</th>
<th>Calculation</th>
<th>Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Land lost to individual standards</strong>: Land lost to ground coverage, setbacks, and parking are exclusive of each other.</td>
<td></td>
</tr>
<tr>
<td>(1)</td>
<td>To ground coverage</td>
<td>((100% \text{ Ground coverage allowed}) \times \text{plot area})</td>
</tr>
<tr>
<td>(2)</td>
<td>To setbacks</td>
<td>((\text{Plot width} - \text{Front setback} - \text{Rear setback}) \times (\text{Plot length} - \text{Side 1 setback} - \text{Side 2 setback}))</td>
</tr>
</tbody>
</table>
| (3) | To parking                                                                                     | **In 7 states**: Number of parking spaces per unit of Floor Area \times area required per parking space, where, Floor Area = \text{Plot area} \times \text{FAR}  
**In 3 states**: % of plot required as parking \times \text{plot area} |
|     | **Land lost to standards in toto**: Land lost in toto is determined by land lost to each standard individually and the overlaps between standards. A part of setbacks and/or parking may be accommodated in the land lost to ground coverage restriction or a part of parking may be accommodated in the land left for setbacks. |                                                                                               |
| (4) | To all standards                                                                              | \(\text{Plot area} - (1) - (2) - (3) + \text{Land saved by overlaps of ground coverage, setbacks, and parking}\)  
**Where,**  
Overlap of ground coverage and setbacks = Max(Land lost to ground coverage, Land lost to setbacks)  
Overlap of ground coverage and parking = Max(Land lost to ground coverage, Land lost to parking)  
Overlap of setbacks and parking = Area lost to setbacks − Minimum area to be left around the building |
|     | **Opportunity costs of land lost to standards**: We estimate the opportunity costs in two ways: cost of land lost per circle rate and the number of jobs lost. |                                                                                               |
| (5) | Cost of land lost                                                                             | \(\text{Land lost}(5) \times \text{Rs circle rate/sqm}\)                                |
| (6) | Jobs lost                                                                                    | \(\text{Land lost}(5) \div \text{space required per worker and machinery}\)               |
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