

Integrating Manufacturing: Strategies and Legal Approaches Dealing With Noise Conflicts in German Urban Planning

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Abstract

This article examines the integration of urban manufacturing into German urban land-use planning, with a focus on mixed-use strategies, legal approaches, and the role of court decisions in resolving conflicts related to noise. Building on the findings of a German working group of inter- and transdisciplinary experts on urban manufacturing, we explore planning strategies within the current legal framework to secure and promote urban manufacturing. The research analyses nine preparatory and 87 binding land-use plans from 23 large German cities, alongside 15 court cases where companies contested municipal binding land-use plans due to noise regulations. The findings reveal that zoning, frequently cited as a tool to protect urban manufacturing, can withstand judicial scrutiny. However, municipalities often fail to adequately address conflicts or comply with procedural requirements, particularly in noise management and immission control. The analysis highlights the potential for both coarse- and fine-grained mixes of uses, suggesting that tailored zoning approaches can enable integration of residential and productive areas. Nevertheless, industrial gentrification remains a significant challenge, as preparatory and binding land-use plans rarely address this issue. These findings contribute to the broader international discourse on sustainable and integrated urban areas, in line with contemporary urban development concepts such as the New Leipzig Charter. The article calls for further empirical research and advocates for stronger legal frameworks to support the coexistence of residential and manufacturing spaces.

Keywords

court decisions; industrial gentrification; land-use planning; mix of uses; planning law; productive city; urban manufacturing

1. Introduction

Since the 1970s, the global division of labour and the relocation of production to countries with lower factor costs have led to the rise of (knowledge-intensive) services and the tertiarisation of cities in the so-called Global North. This trend aligns with broader discussions about the emergence of a post-industrial society (Bell, 1976). As manufacturing jobs and companies declined, Commercial (Gewerbegebiet, GE; § 8 BauNVO) and Industrial Areas (Industriegebiet, GI; § 9 BauNVO) underwent significant transformation. Urban development policies focused on fostering a post-industrial city centred on creative and knowledge-based service industries, although this approach has also been subject to critical scrutiny (see Sassen, 2009).

In recent years, however, various developments have brought renewed attention to the topic of “urban manufacturing”—the (re-)integration of manufacturing into urban settlement structures (Gärtner & Meyer, 2023). Key drivers include the financial crisis, which prompted a shift away from a purely service-oriented economy (Brandt et al., 2017); the recognition that promoting knowledge-based services alone is insufficient for achieving socially equitable structural development (Tripl et al., 2023); advancements enabling lower emission production (Bauer & Lentz, 2014; Herrmann et al., 2015); and the increasing need for local material flows (Fromhold-Eisebith, 2023). New planning paradigms, such as the European mixed-use city, have revived interest in functional land-use mixes, exemplified by the concept of the “productive city” (Bundesministerium des Innern, für Bau und Heimat, 2020). Even finance and tech hubs like New York, London, and San Francisco acknowledge the necessity of accommodating local manufacturing companies and providing spaces for them within the city (Meyer, 2023; Pratt Institute Center for Community and Environmental Development, 2001). These spaces are critical for supplying daily necessities (e.g., food), periodic purchase goods (e.g., clothing, electronic devices), repair and maintenance services (e.g., tradespeople for heating or water tap repairs), and waste processing (Grodach et al., 2023).

However, a further decline in urban manufacturing has been observed in Germany (Brixy et al., 2023) and other countries of the Global North, such as the UK (Ferm & Jones, 2017), Belgium (De Boeck & Ryckewaert, 2020), the US (Leigh & Hoelzel, 2012), and Australia (Martin & Grodach, 2023). While the specific reasons for this decline in Germany remain under-researched, potential factors include offshoring, industrial gentrification, a lack of succession or skilled labour, and reduced competitiveness against new market players. In London, Ferm (2023) identified industrial gentrification as a significant issue, encompassing two forms: direct and indirect. Direct industrial gentrification describes the displacement of manufacturing companies by higher-value land uses, such as housing and offices, which offer higher returns on investment, which can also mean intra-industrial gentrification, referring to displacement within industries themselves (e.g., warehouse or logistics instead of production plant). Indirect industrial gentrification refers to the displacement of manufacturing companies resulting from changes in the surrounding area, such as the construction of new residential buildings, which can limit opportunities for expansion.

In Germany, the prioritisation of inner-city development projects, particularly in the field of housing, has clearly intensified. This focus on necessary housing development often leads to the rezoning and the displacement of manufacturing from mixed-building neighbourhoods (Schoppengerd et al., 2020). These developments have contributed to the establishment of a regional working group of experts on urban manufacturing in the German state of North Rhine-Westphalia (Baumgart et al., 2024). Supported by the ARL-Forum North Rhine-Westphalia, Academy for Territorial Development in the Leibniz Association (ARL), the working group consisted of both practitioners and scientists. This diverse composition, complemented by additional external expertise, facilitated the generation of valuable synthetic knowledge. The concept of urban manufacturing, as the name suggests, encompasses both territorial (urban) and sectoral (production) dimensions, making it inherently complex and lacking a unified definition. In examining conflicts between housing and manufacturing, as well as planning strategies for realising the mixed-use city, we partially build on the findings of the two-year working group in which the authors participated, which focused on material production. The working group concluded (Baumgart et al., 2024) that the primary challenges for urban manufacturing lie in safeguarding existing urban manufacturing companies and preventing industrial gentrification driven by housing developments. To further explore these processes and discuss strategies for retaining and reintegrating manufacturing, we incorporated empirical data from two additional research projects and conducted secondary analysis regarding our research questions for this article.

One research project examined how cities have addressed inner-city development, including industrial gentrification, by analysing preparatory (*Flächennutzungsplan*) and binding land-use plans (*Bebauungsplan*). This empirical investigation aimed to answer the question: How do preparatory and binding land-use plans address sites for urban manufacturing in contemporary land-use planning? The findings indicate that while the creation of new residential neighbourhoods was often prioritised over the (re-)development of manufacturing sites, conflicts related to noise frequently emerged as significant obstacles to achieving mixed-use cities. To determine whether these conflicts represent genuinely insoluble challenges or are the result of procedural shortcomings, we conducted a review of court decisions regarding binding land-use plans in Germany. The basis was a second study that analysed court decisions in which companies were plaintiffs, with a particular focus on noise-related conflicts that might have led to the annulment of binding land-use plans during judicial review, for example in cases where encroaching residential development could restrict future expansion due to anticipated noise conflicts—an instance of indirect gentrification. This empirical investigation addressed the question: Why, and under what circumstances, have companies invoked the right of defence (*Abwehrrecht*)?

This article aims to explore whether, beyond the general lack of formal instruments to prevent industrial gentrification, the existing German planning law is not being adequately utilised. We hypothesise that this is partly due to noise emissions being perceived as an insurmountable conflict, which reinforces the principle of separating residential and production areas according to § 50 of the Federal Immission Control Act (*Bundes-Immissionsschutzgesetz*, hereafter *BImSchG*; *Trennungsgrundsatz*). Dillmann et al. (2018, p. 186) have noted that concerns relating to immission control are insufficiently addressed and that noise conflicts are inadequately managed in three-quarters of the cases examined.

In the following section, we define urban manufacturing and situate it within the German planning context. We then review concepts and developments discussed in previous literature, highlighting both challenges and potential solutions. Section 3 outlines our methodology, based on the analysis of secondary material, while

Section 4 presents and discusses the results. Finally, Section 5 offers conclusions and identifies areas for further research.

2. Status Quo of Urban Manufacturing and German Planning Law

In this article, we do not distinguish between the terms urban production and urban manufacturing. According to Hill (2025), a distinction could be made: While urban manufacturing refers specifically to the manufacturing sector, urban production may serve as a broader term encompassing the productive city, including construction, resource management, and other foundational sectors. For this study, we follow the definition provided by Brandt et al. (2017)—“urban manufacturing is the making and converting of tangible goods...in densely populated areas” (p. 27)—with one exception: Urban agriculture is excluded. Under German planning law, urban agriculture is regulated separately, as horticultural companies are permitted only in MI and not in GE or GI (see Schoppengerd, 2023). In the following, we further specify the term urban manufacturing and urban production (Section 2.1), provide background on the German planning context (Section 2.2), and address the most pressing current challenge for urban manufacturing: noise protection in relation to encroaching residential development (Section 2.3).

2.1. Status Quo of Urban Manufacturing

Meyer and Schonlau (2024) emphasise the heterogeneity of urban manufacturing, which includes trendy consumer goods (e.g., coffee roasting, 3D printing), traditional crafts, and industries (e.g., mechanical engineering, metal production). They classify urban manufacturing across sectors using NACE codes—such as agriculture (NACE A), manufacturing (NACE C), waste treatment (NACE E38), construction (NACE F), repair services (NACE G45.2 & S95), selected retail trades (NACE G47.76, G47.77 & G47.78.1), and independent artists and restorers (NACE R90.03.3 & R90.03.4)—to identify optimal locations for companies (Meyer & Schonlau, 2024). Brixy et al. (2023) conducted the first comprehensive analysis of the development of urban manufacturing in Germany between 2000 and 2017. The study revealed a 16.5% decline in urban manufacturing companies all over Germany, and a significant decline, with a reduction of 24%, in the unitary authority cities. This trend is particularly striking given that urban manufacturing companies accounted for only 4.1% of all companies in these cities in 2017 (6.7% in 2000), the lowest proportion compared to urban counties (8.2% in 2017), rural counties with incipient urbanisation (8.9% in 2017), and sparsely populated rural counties (9.9% in 2017; Meyer et al., 2024). The low proportion of urban manufacturing in these cities could be attributed to higher land prices and rents (direct gentrification) or conflicts arising from encroaching residential developments (indirect industrial gentrification). Furthermore, building regulations for changes in business use in large cities may have led to the displacement of more tangible industries (Meyer, 2023). However, the specific causes have not been thoroughly examined. Studies from the UK (Ferm & Jones, 2017), the US (Leigh & Hoelzel, 2012), Belgium (De Boeck & Ryckewaert, 2020), and Australia (Martin & Grodach, 2023) point to factors such as (intra-)industrial gentrification and the persistent emphasis on the post-industrial city. In the review of court decisions we refer to the NACE codes of urban manufacturing by Meyer and Schonlau (2024).

2.2. German Planning Law and Noise Regulation

In Germany, a range of informal, formal, and cooperative instruments is available to preserve existing urban manufacturing locations and protect them from encroaching residential development (Meyer et al., 2024). This article focuses primarily on formal instruments. Both international literature (De Boeck & Ryckewaert, 2020; Ferm, 2023; Martin & Grodach, 2023) and German research (Baumgart et al., 2024; Meyer et al., 2024) agree that zoning systems allow a coarse-grained mix of uses. In Germany, the main formal instruments are preparatory and binding land-use plans, which operate at the municipal level. All municipalities are required to develop a preparatory land-use plan in accordance with § 5 of the German Building Code (Baugesetzbuch, hereafter BauGB), covering the entire municipal area and reflecting intended urban development in line with foreseeable needs. However, binding land-use plans (§ 9 BauGB) are typically created only for specific areas within a municipality. § 9 BauGB defines the content that may be regulated in binding land-use plans, and these regulations are further specified in the German Building Utilisation Ordinance (Baunutzungsverordnung, hereafter BauNVO). BauNVO establishes specific land-use areas, ranging from Residential-Only Areas (Reines Wohngebiet, WR; § 3 BauNVO) to Mixed-use Areas (Mischgebiet, MI; § 6 BauNVO) and GI, detailing which activities are permitted in each area (see Table 1). In municipal areas lacking a binding land-use plan, § 34 BauGB applies. In § 34-Areas, the permissibility of companies is determined based on the type and extent of building use and the character of the surrounding development.

For final building approval within areas covered by a binding land-use plan or regulated under § 34 BauGB, compliance with planning law is assessed alongside building regulations, such as fire safety and environmental protection. A key factor for the approval of companies is adherence to permissible industrial noise levels. These levels are assessed in accordance with the Technical Instructions on Noise Abatement (Sechste Allgemeine Verwaltungsvorschrift zum Bundes-Immissionsschutzgesetz - Technische Anleitung zum Schutz gegen Lärm, hereafter TA Lärm), which assigns maximum allowable immissions to areas requiring protection, depending on the area types specified in the BauNVO (see Table 1). For example, in MI, only activities that do not exert a disruptive effect on residential use are permitted. By contrast, GI can accommodate significantly disruptive companies and should therefore primarily serve as locations for such activities. While GE and MI allow for a variety of business activities—and may explicitly exclude “retail”—they have not yet explicitly designated “manufacturing” as a use to be promoted.

The TA Lärm specifies the relevant measurement point as “0.5 m outside, in front of the centre of the open window of the most noise-affected sensitive room” (Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit, 2017). Consequently, traditional passive noise protection measures, such as soundproof windows, have limited applicability in mitigating industrial noise (Lamker et al., 2017). However, this approach partially extends protection to outdoor living areas, including balconies and gardens.

Table 1. Permissibility of companies by disruption and noise level by specific land-use area.

Specific Land-use Areas (§ 1 BauNVO)	Possibility of General Permissibility of Types and Companies by Disruption	Possibility of Exceptional Permissibility	Noise Level (Day)	Noise Level (Night)
Industrial Area (Industriegebiet, GI)	Exclusively significantly disruptive (<i>erheblich belästigend</i>) commercial companies not permitted in other land-use areas		70 dB(A)	70 dB(A)
Commercial Area (Gewerbegebiet, GE)	Commercial companies which are not seriously disruptive (<i>nicht erheblich belästigend</i>)		65 dB(A)	50 dB(A)
Mixed-use Area (Mischgebiet, MI)	Other commercial companies that do not exert a disruptive effect (<i>nicht wesentlich störend</i>) on residential use; horticultural companies		60 dB(A)	45 dB(A)
Urban Area (Urbanes Gebiet, MU; since 2017)	Other commercial companies that do not exert a disruptive effect on residential use		63 dB(A)	45 dB(A)
Village Area (Dorfgebiet, MD)	Other commercial companies that do not exert a disruptive effect on residential use, and artisanal companies serving the area		60 dB(A)	45 dB(A)
Rural Residential Area (Dörfliches Wohngebiet, MDW; since 2021)	Secondary agricultural and forestry companies, and other commercial companies that do not exert a disruptive effect on residential use	Agricultural and forestry economic establishments, related dwellings and residential buildings, and horticultural companies	There are neither immission limit values nor immission guide values	
Core Area (Kerngebiet, MK)	Other commercial companies that do not exert a disruptive effect on residential use		60 dB(A)	45 dB(A)
Special Residential Area (Besonderes Wohngebiet, WB)	Shops, other commercial companies, and companies and facilities compatible with the residential use		There are neither immission limit values nor immission guide values	
General Residential Area (Allgemeines Wohngebiet, WA)	Shops serving the needs of the area; non-disruptive (<i>nicht störend</i>) artisanal companies	Other non-disruptive commercial companies and horticultural companies	55 dB(A)	40 dB(A)

Table 1. (Cont.) Permissibility of companies by disruption and noise level by specific land-use area.

Specific Land-use Areas (§ 1 BauNVO)	Possibility of General Permissibility of Types and Companies by Disruption	Possibility of Exceptional Permissibility	Noise Level (Day)	Noise Level (Night)
Small Residential Estate Area (Kleinsiedlungsgebiet, WS)	Shops serving the needs of the area; non-disruptive artisanal companies	Other non-disruptive commercial companies	55 dB(A)	40 dB(A)
Residential-Only Area (Reines Wohngebiet, WR)		Shops and artisanal companies for daily needs that do not exert a disruptive effect on residential use	50 dB(A)	35 dB(A)
Special Area (Sondergebiet, SO)		Potentially usable for training centres of artisanal trades, provided the area significantly differs from §§ 2–10 BauNVO	There are neither immission limit values nor immission guide values	

Sources: Own representation based on the BauNVO and on Lärmkontor (2023), Marschall (2022, p. 10), and Spannowsky (2019).

In response to persistent concerns that a mixed-use city could not be effectively planned using the existing area types—e.g., the existing MI has been deemed inadequate due to requirements for an equal mixing ratio, permitted density, and noise levels—a new area type, the MU (§ 6a BauNVO), was introduced in 2017. The MU was developed to encourage high-density, fine-grained mixed-use development, accommodating residential purposes alongside commercial companies and social, cultural, and other facilities that do not disrupt residential use. With a daytime noise immission limit of 63 dB(A) according to the TA Lärm, this threshold is 3 dB(A) higher than the immission limit for MK (§ 7 BauNVO), MD (§ 5 BauNVO), and MI (§ 6 BauNVO), which, prior to the introduction of the MU, marked the maximum level ensuring healthy living conditions (Köppen & Mitschang, 2019, p. 763; Marschall, 2022). This higher threshold represents, for the first time, a weakening of the traditional principle of separation (Berkemann, 2021). Furthermore, unlike MI, the MU does not require an equivalent mixing ratio. Under § 6a (4) No. 4 BauNVO, provisions can be made in MU to favour commercial uses by designating a specific proportion of permissible floor space or a defined floor area per building site within the binding land-use plan (Spannowsky, 2019, p. 70). Additionally, there is the possibility of converting GE into mixed-building neighbourhoods (including MD, MDW, MI, MK, and MU), where residential use may significantly dominate (Spannowsky, 2019, p. 102).

However, concerns have been raised that an imbalance between residential and commercial uses could promote industrial gentrification in the absence of specific provisions (Schoppengerd et al., 2020, p. 12). For example, a binding land-use plan might stipulate that residential use on a ground floor facing the street is either prohibited or only exceptionally permitted. Despite the intention to achieve a greater mix of uses, including manufacturing, the MU has not yet succeeded in this goal. Manufacturing companies have been reluctant to relocate to these areas, while developers and landowners continue to prioritise the conversion of commercial or industrial spaces into higher-value commercial or residential properties (Beibl, 2021).

2.3. Noise Protection for Encroaching Residential Buildings

Immission control requirements affect not only the approval of new businesses but also the safeguarding of existing businesses. Changes to neighbourhoods, such as new residential developments, can impose restrictions on existing commercial uses. Commercial operations are considered facilities under § 3 BImSchG. While most businesses do not require special licences under the BImSchG, they must operate in accordance with the state of the art and consistently comply with applicable standard levels (§ 22 BImSchG). In such cases, authorities may impose additional measures (§ 24 BImSchG) to ensure compliance with immission control requirements for protected objects (Sparwasser & Heilshorn, 2020, Section 1).

This dynamic adjustment obligation represents a significant distinction between building permission for commercial facilities and residential buildings, as residential uses benefit from comprehensive protection as existing structures (Schimpfermann & Stühler, 2018, Section 184). When residential developments encroach on MI or GE, the planning law principle of mutual consideration (*Rücksichtnahmegebot*) must be respected (Pützenbacher, 2024, Section 90). In general, industrial noise conflicts must therefore be addressed during building permit procedures. However, it should be the task of urban land-use planning to resolve the noise conflict in accordance with the principle of conflict management (*Grundsatz der Konfliktbewältigung*) in the binding land-use plan (Dillmann et al., 2018, p. 187).

Furthermore, the general principle of separation applies to residential developments encroaching on MI or GE requiring consideration of economic and environmental interests (§ 50 BImSchG; § 1 BauGB). Additionally, the TA Lärm must be indirectly applied, as full compatibility with planning standards is a prerequisite for building permits. The precise application of the TA Lärm and the extent to which passive noise protection measures (e.g., soundproof windows, facade insulation, shielding of outdoor living areas) are inadmissible remain subjects of a controversial debate (Oerder & Beutling, 2013; Reidt, 2020).

Current ambiguities in the legal framework and discourse regarding the TA Lärm cause significant uncertainty in the practical application of industrial noise regulations in municipal urban land-use planning. Inadequate consideration of these issues may adversely affect companies, granting them the right to take legal action under § 47 of the German Administrative Court Code (Verwaltungsgerichtsordnung, hereafter VwGO) to challenge binding land-use plans in court. How companies utilise these rights of action is not well-documented and is explored further in Sections 3 and 4.

2.4. Interim Conclusion

In summary, the German planning law framework presents various challenges for the protection and promotion of mixed-use developments and urban manufacturing. One issue is that disruptive companies are not permitted in MI, which risks the disintegration of urban manufacturing even in MU. Additionally, the complex regulations on noise protection and the measurement point defined by the TA Lärm necessitate careful consideration of potential immission conflicts in practice, particularly between GE and WA. When residential buildings encroach on GE, additional operational requirements may be imposed on manufacturing sites, thereby posing further challenges to their viability.

3. Methodology

To examine whether preparatory or binding land-use plans address industrial gentrification, potential conflicts affecting its development, and possible planning strategies to overcome these challenges, we re-analysed documents of land-use plans from an existing research project as a first step (see Section 3.1; Eichholz & Schoppengerd, 2022). In a second step, we assessed whether such conflicts can be resolved by reviewing court decisions on urban land-use planning in Germany (see Section 3.2). The methodological approach is described below.

3.1. Analysing Nine Preparatory Land-Use Plans and 87 Binding Land-Use Plans

To explore how cities have managed the industrial gentrification to date, we analysed nine preparatory land-use plans (2007–2018) and 87 binding land-use plans from 23 large German cities, all focused on inner-city development (2011–2021). These plans were selected and examined as part of a research project investigating conflicts of interest in inner-city development and potential solutions in urban land-use planning. Additionally, qualitative expert interviews were conducted with urban planning officials in five of these cities. The research project focused on large cities with populations exceeding 100,000 inhabitants, as these cities are more likely to undertake significant inner-city development projects.

For the preparatory land-use plans, all newly drafted plans in major German cities between 2007 and the conclusion of the research in 2018 were analysed. The nine cities included in the preparatory land-use plan analysis formed the basis for selecting the binding land-use plans. This selection was supplemented by additional cities experiencing growth or having implemented significant inner-city development projects in recent years. The final selection ensured representation of at least one large city per federal state. Based on these criteria, 14 additional large cities were included. The primary criterion for selecting the binding land-use plans in each of the 23 cities was their location within inner-city areas. Binding land-use plans were chosen if they covered at least one hectare and were as recent as possible. The selection also accounted for plans defining different types of land use. Altogether, this resulted in a total of 87 binding land-use plans. The number of plans analysed per city varied depending on the availability of potentially suitable plans (Eichholz & Schoppengerd, 2022).

3.2. Review of Court Decisions Regarding Noise, When Companies Were Plaintiffs in a Judicial Review

The second methodological step was based on an analysis of court decisions related to noise conflicts as judicial review (*Normenkontrollverfahren*) that could lead to the failure of binding land-use plans during the judicial review of standards. In an abstract judicial review (*abstrakte Normenkontrolle*) based on § 47 VwGO, the validity of a development plan is reviewed independently of any specific cause. In contrast, a concrete judicial review (*konkrete Normenkontrolle*) takes place in the context of a specific legal dispute, e.g., planning permissions.

The analysis focused on court decisions (judgments and rulings) on binding land-use plans pursuant to § 47 VGO. These decisions were issued by the Higher Administrative Courts (Oberverwaltungsgerichte, hereafter OVG) or the Administrative Court of Appeal (Verwaltungsgerichtshof, hereafter VGH) between 1 November 2016 and 31 October 2021. The decisions were subjected to a structured document analysis.

The search for relevant decisions in abstract judicial review proceedings was conducted across all case law databases of the OVG and VGH in Germany's federal states, as stipulated in § 2 VwGO. Using the available automatic search functions, publicly accessible databases (of the courts of the federal states and the online legal database Beck-Online published by C. H. Beck) were queried with defined search terms such as "Normenkontrolle," "abstraktes Normenkontrollverfahren," "Bebauungsplan," and "Bauleitplan" to gather the largest possible dataset of relevant decisions.

In the initial step, a total of 1,073 decisions were identified across all federal states. The dataset was subsequently refined to exclude irrelevant statutes, such as those addressing change restrictions, misappropriation statutes, conservation ordinances, outdoor area statutes, and legal ordinances for landscape conservation areas, which were not directly related to binding land-use plans. This approach aligns with the survey methodology used by Dillmann et al. (2018).

Finally, the remaining decisions were screened for the keyword "Lärm" (noise) within the text of each decision to ensure a focused analysis of noise-related conflicts. This refinement reduced the dataset to 157 court decisions for detailed analysis. For our study on the integration of urban manufacturing, mixed-use strategies, and legal approaches in German urban planning, the decisions were filtered based on the plaintiff for the judicial review. Only decisions in which companies according to the abovementioned NACE codes (Meyer & Schonlau, 2024) were the plaintiffs were included in the analysis.

This approach enabled the examination of 15 decisions to identify conflicts related to the integration of urban manufacturing within binding land-use plans. The companies involved came from diverse industry sectors, including waste management and disposal, chemical production, electronics, heating and sanitation, arts and crafts, agricultural machinery production, locksmiths, and others.

Once the data were collected, the court decisions were analysed using Mayring's qualitative content analysis (Mayring, 2016). The material was analysed using a category system based on § 313 German Code of Civil Procedure (Zivilprozessordnung), which ensures that court decisions in Germany are structured in a largely similar way. It comprises the following categories: court, headnote, operative part, facts of the case, description of the dispute between the plaintiff and the defendant with cause of action, and the court's decision and ruling (see Table 2). Further content-related provisions were derived from the description and decision, for example regarding the planning area and main conflicts.

4. Empirical Results

First, this section presents the empirical results of the analysis of the preparatory and binding land-use plans and then discusses the results of the court decisions.

4.1. Land-Use Plans

In urban land-use planning, there are different planning approaches, ranging from the regulation of the types of use in the preparatory land-use plans to detailed regulations, e.g., details of noise protection in the binding land-use plans. This section (4.1) describes in more detail which regulations are applied in the land-use plans.

4.1.1. Preparatory Land-Use Plans: MI vs. GE

The analysis of plans revealed a significant emphasis on creating new residential and mixed-building neighbourhoods in urban inner-city redevelopment, compared to the development of pure GE. In particular, preparatory land-use plans show a trend of converting formerly GE within inner cities into WA or MI, thereby reducing the available space for disruptive industries. However, due to the inconsistent reporting in the preparatory land-use plans, the total volume of converted land could not be directly compared, and these plans do not distinguish the location of the land within the municipality. Qualitative analysis of the justifications underlying the decision, however, reveals a clear trend: GE in the city centre are declining, while new designations are increasingly located on the city's outskirts.

4.1.2. Binding Land-Use Plans: Focusing Residential Development

Among the 87 binding land-use plans, 63 designated new WA (§ 4 BauNVO), 33 MI, two MU, 14 GE, four restricted GE, and three GI. Despite the focus on residential development, some strategies to preserve urban manufacturing were evident. Many plans designated more than one area type. Of the 44 plans limited to a single area type, 32 were WA. Plans combining multiple area types—e.g., MI and GE or WA and GE—enabled a coarse-grained mix of uses, allowing disruptive companies to integrate into neighbourhoods while mitigating displacement risks. For instance, in Hamburg, a GE was chosen over an MI to protect industrial operations from stricter noise limits imposed in MI:

If a MI is designated for the entire planning area, the existing residential use would consequently have to accept the immission guide values permitted in MI. In return, only companies that do not exert a disruptive effect would be permitted. With this plan variant, there would be a risk of displacement of the proportionately desired commercial use and thus the dissolution of the existing mix of uses. (Bezirksamt Altona, 2015, p. 7)

4.1.3. Industrial Noise as a Central Issue

To analyse which noise conflicts occur in planning practice and how they are resolved, all explanatory reports of the preparatory and binding land-use plans were evaluated. In addition to the plans themselves, conflicts and possible solutions were identified. Conflicts related to industrial noise remain a key challenge in urban redevelopment. Due to the city-wide perspective, noise was addressed in all preparatory land-use plans, but it was also often a topic in the binding land-use plans. Noise conflicts were cited in 90% of the examined binding land-use plans, with industrial noise mentioned in 49%, second only to traffic noise (73%). These conflicts were more frequently addressed in plans designating GE (73%) than WA (36%). These conflicts arise both around existing industrial sites and in the designation of new GE. These varying problem situations are also mirrored in diverse approaches to solutions in planning practice.

Preparatory land-use plans frequently address noise issues through zoning strategies, such as:

- Gradual zoning transitions (e.g., from GE to MI to WA as buffers), for example the transformation of old harbour areas into urban city districts with residential uses and the simultaneous preservation of existing commercial uses in some areas (Bremen);

- Reclassifying high-emission areas (e.g., converting GE into MI), for example in the case of former GE with WA in the surrounding neighbourhood (Recklinghausen);
- Transforming sensitive areas (e.g., from WA to MI), for example in urban areas where a mix of uses is intended (Bremen);
- Creating buffers to sensitive areas (e.g., green strips or traffic routes), for example the development of a green belt between a GE and a nearby WA (Hamm);
- Differentiating between GI and GE instead of the general land use areas, for example GE with usage restrictions due to their proximity to existing WA (Potsdam).

When conflicts could not be resolved at the preparatory land-use plan level, they were deferred to binding land-use plans. For example, some preparatory land-use plans, like the one in Göttingen, explicitly highlight neighbouring conflicts by using tools such as “immission lines” to address the proximity of industrial and residential uses. In the analysed binding land-use plans, 37 out of 87 included small-scale measures to resolve noise conflicts. Active noise protection measures, such as emission quotas for permitted industrial noise or exclusions for disruptive uses (§ 9 (1) No. 1 BauGB in conjunction with § 1 BauNVO), were particularly applied when planning new commercial development areas. Such regulations offer good immission protection for neighbouring uses worthy of protection, but at the same time limit the emission values in companies and mean that further disruptive companies can no longer be permitted in the areas. Passive noise protection measures for industrial noise were implemented in 25 of the analysed plans. Instead of classic soundproof windows, non-openable or specialised windows were specified according to § 9 (1) No. 24 BauGB (Lamker et al., 2017). The use of specific window constructions, commonly referred to as “Hamburg windows,” is particularly prevalent in plans from Hamburg. Additionally, regulations concerning ventilation systems and the design of residential buildings are stipulated in accordance with § 9 (1) No. 24 BauGB.

4.1.4. Industrial Gentrification in Land-Use Planning

Unlike noise conflicts, industrial gentrification—frequently discussed in our working group—was rarely addressed in the plans, and only a few planning approaches exist to tackle it. In addition to the designation of GE described earlier, the analysis identified measures aimed at limiting industrial gentrification, such as protecting manufacturing companies from displacement by higher-value uses. In five of the analysed plans, restrictions on retail or amusement arcades were justified by concerns that these affluent uses could displace the commercial or industrial sector. In most cases, the plans also included special provisions allowing manufacturing companies to sell their own goods. Such restrictions can be implemented within the framework of the BauNVO, as these types of use are explicitly defined in the BauNVO and do not constitute the central uses of the respective area type.

4.1.5. Summary

In summary, the analysis demonstrates that planning law provides tools to manage noise conflicts in mixed-building neighbourhoods and to integrate disruptive companies into the urban context by incorporating small GE. However, these strategies are not yet widely adopted and are sometimes highly complex. Consequently, uncertainties persist in planning practice, particularly regarding the use of passive noise protection, which is further complicated by an unclear legal framework. Furthermore, few mechanisms exist to prevent industrial gentrification, particularly intra-commercial gentrification.

4.2. Court Decisions

Almost half of all stipulations violating the requirement of certainty under construction planning law, which result in the failure of binding land-use plans during administrative court judicial review proceedings, are related to immission control (Dillmann et al., 2018, p. 184). Judicial statistics highlight that immission control is a key challenge in such cases (Marschall, 2022).

Manufacturing companies are repeatedly confronted with conflicts in the context of urban land-use planning, prompting them to initiate legal action against binding land-use plans as part of judicial review procedures to avoid the risk of indirect industrial gentrification. These conflicts often emerge at the intersection of companies' operational interests and those of local authorities. The main reasons for such legal disputes are analysed below. First, the court decisions are categorised according to the types of company operations involved. Next, the designated land-use categories in the contested binding land-use plans are presented, offering an overview of the planning law context in the analysed cases (see Table 2). The plaintiffs in the analysed court proceedings are companies from various sectors, including waste management, chemical production, and others. Their business operations are directly affected by the contested binding land-use plans. The overriding reasons for the companies' complaints regarding their rights of defence include economic restrictions imposed by the plans; insufficient consideration of economic interests in urban land-use planning; unclear or contradictory regulations; and conflicts between immission control regulations and economic development objectives. All of the companies argued that their private rights of use were impaired by the plans and that their competitiveness was jeopardised as a result.

Table 2. Fifteen cases of court decisions on land-use plans in which companies were plaintiffs—the respondent was the municipality in all cases, and “plan” means “new binding land-use plan.”

Case	Plaintiffs	Cause of Action	Party to the Court Proceedings	Specific Land-Use Area	Court	Court Decision
1	Waste management company, recycling plant	The company maintains an area for recycling via heritable building rights and argued that its private interests (noise emissions) were not sufficiently considered when noise contingency measures were set.	Operator of event grounds	Not provided	OVG Berlin-Brandenburg	Plan invalid
2	Waste management company, recycling plant	The company, operating a depot, contested the conversion of an industrial estate to residential development, fearing restrictions due to existing noise pollution.	Neighbouring property owner (metalworking and equestrian business)	MI, SO (from GE)	OVG Lower Saxony	Plan invalid

Table 2. (Cont.) Fifteen cases of court decisions on land-use plans in which companies were plaintiffs—the respondent was the municipality in all cases, and “plan” means “new binding land-use plan.”

Case	Plaintiffs	Cause of Action	Party to the Court Proceedings	Specific Land-Use Area	Court	Court Decision
3	Chemical company	The company's site adjoins a newly planned residential and GE and objected to the plan requiring protective measures against its possible noise emissions, which could hinder the planned site expansion and restrict production.		MI, GE	OVG Rhineland-Palatinate	Plan valid
4	Electrical installation company	The company opposed restrictions on commercial activities, citing economic disadvantages, as the new regulations limited its development and utilisation options, and insufficient consideration of its interests.	Real estate developer for residential buildings	WR, MI	OVG North Rhine-Westphalia	Plan invalid
5	Waste management company, recycling plant	The company and the landowner contested the new designation of a “special area for waste disposal,” arguing that the plan restricts their operational development and utilisation options.		SO	VGH Baden-Württemberg	Plan invalid
6	Heating and sanitation company	The company claimed that noise emissions were the main source of conflict, significantly restricting its operations under the new regulations.	Operator of a planned care home	Not provided	OVG Berlin-Brandenburg	Plan valid
7	Multiple owners of residential and commercial properties	Owners fear unacceptable exposure to traffic noise and air pollutants. A procedural error is alleged, as the environmental assessment did not take sufficient account of significant noise pollution in the surrounding area.	Operator, residential buildings, and other uses	Not provided	OVG Hamburg	Plan valid (procedural error correctable)

Table 2. (Cont.) Fifteen cases of court decisions on land-use plans in which companies were plaintiffs—the respondent was the municipality in all cases, and “plan” means “new binding land-use plan.”

Case	Plaintiffs	Cause of Action	Party to the Court Proceedings	Specific Land-Use Area	Court	Court Decision
8	Neighbouring property owner	The owner argued that noise contingency was insufficiently publicised, the interests of the owners were not sufficiently considered, and the environmental assessment contained significant deficiencies.		GE, MI	OVG Hamburg	Plan invalid
9	Commercial enterprise	The company argued that inadequate provisions in the plan could restrict its commercial activities and future development opportunities.		Not provided	OVG Lower Saxony	Plan valid
10	Two companies as property owners	The plaintiffs complained that the downgrading from GI to a restricted GE is not in line with overriding planning objectives (regional plan) and significantly impaired their ability to utilise the properties commercially.		GE (from GI)	OVG North Rhine-Westphalia	Plan invalid
11	Sweeper manufacturer	The company claimed the plan's provisions exert a disruptive effect on its commercial activities.	Real estate developer for neighbouring residential buildings	WA (adjacent to the company)	OVG Berlin-Brandenburg	Plan invalid
12	Forging and locksmith business	The plaintiff argued that the noise barrier and the plan would have a significant negative impact on the business.		WA	VGH Baden-Württemberg	Plan invalid
13	Agricultural machinery trading and repair business	The company objected to the designation of a WA, citing risks to its commercial activities.		WA (planned adjacent to the company)	OVG Lower Saxony	Plan invalid
14	Heating and sanitation company	The company claimed noise emissions as the main source of conflict and saw its commercial use considerably restricted by the new regulations.	Operator of a planned care home	WA (planned adjacent to SO)	OVG Berlin-Brandenburg	Plan valid

Table 2. (Cont.) Fifteen cases of court decisions on land-use plans in which companies were plaintiffs—the respondent was the municipality in all cases, and “plan” means “new binding land-use plan.”

Case	Plaintiffs	Cause of Action	Party to the Court Proceedings	Specific Land-Use Area	Court	Court Decision
15	Forging and locksmith business	The plaintiff argued that immission control requirements would impair their rights.		Expansion of MI encroaching on GE	VGH Hesse	Plan invalid

The analysis shows that conflicts between manufacturing companies and municipalities’ binding land-use plans in urban areas often arise due to conflicts of use and clashes of interests at the interface between operational requirements and urban development planning objectives. Companies take legal action against the municipalities to protect their economic interests, protect existing operating rights, and safeguard future development opportunities. The reasons that prompt companies to take legal action are diverse and can be categorised as protection of existing rights, restrictions on company expansion, inadequate balancing of interests, violation of the principle of separation, and procedural errors.

4.2.1. Protection of Existing Rights

Companies perceive new binding land-use plans as a threat to their existing rights, particularly when planned uses, such as residential developments, could assert stronger protection claims (e.g., for noise protection). For instance, the decision by VGH Hesse (Case 15) concerned an application for a review of standards by a commercial operator in the metal processing industry, which was directed against the amendment of a binding land-use plan. The plan aimed to extend an MI into a neighbouring GE to create additional residential and commercial space. The plaintiff, whose company was located adjacent to the proposed area, argued that the planned residential development would significantly restrict their commercial operations. The operator feared that new residential uses would assert protection claims, potentially limiting operating hours and emissions, thereby endangering the viability of their business. The plaintiff also criticised methodological errors in the noise report, including inaccurate noise levels, and alleged a failure to appropriately weigh their interests. The court declared the binding land-use plan invalid, citing the following key points:

- The noise calculations contradicted realistic immission values.
- Conflicts between residential and commercial uses were inadequately considered.
- The planning violated the principle of separation, which mandates appropriate spatial division between GE and WA.

The court ruled that the methodological flaws and insufficient consideration of the plaintiff’s interests justified the revocation of the binding land-use plan.

4.2.2. Restrictions on Company Expansion

Companies criticise binding land-use plans for hindering their expansion opportunities, such as by imposing restrictive usage regulations or failing to adequately account for their growth needs (indirect gentrification). For example, OVG Rheinland-Palatinate (Case 3) dismissed the complaint of a chemical company taking

action against a binding land-use plan that designated MI and GE near its site. The plan included noise quotas and usage restrictions that could potentially impact the company's planned expansion of its premises. The plaintiff criticised inadequate consideration of possible industrial uses, errors in the noise report, inadequate balancing of its interests, particularly regarding safety distances to hazardous incident sites, and the inappropriate deferral of conflicts to subsequent approval procedures.

However, the court upheld the binding land-use plan, stating that formal requirements had been fulfilled and relevant concerns had been adequately addressed. Safety distances and noise limits were properly observed, and no failure to investigate relevant issues could be established. The plaintiff's proposed commercial expansions were not considered a planning factor, as they had not been formally specified. Industrial use was excluded due to the presence of existing residential development, and transferring unresolved issues to subsequent approval procedures was deemed appropriate. The court concluded that the municipality's planning decision complied with applicable laws and did not unlawfully restrict the plaintiff's operations.

4.2.3. Inadequate Balancing of Interests

Companies criticise methodological errors in noise reports or inadequate impact assessments of alternatives, which lead to incorrect considerations in the planning process. For instance, in Case 4, an electrical installation company contested the construction of apartment buildings on a neighbouring property. The company argued that the densification of the area would negatively impact customer traffic and operational processes, particularly night deliveries. The plaintiff claimed that the binding land-use plan jeopardised its operational processes due to conflicts arising from the planned residential use. Furthermore, the company criticised the insufficient consideration of its interests during the planning assessment. The court annulled the binding land-use plan, citing inadequate consideration of the company's interests, immission conflicts that were not sufficiently addressed, and a failure to appropriately balance operational and residential needs.

4.2.4. Violation of the Principle of Separation

Residential development in close proximity to noisy commercial operations is often deemed a violation of the principle of separation (§ 50 BImSchG). In Case 2, a binding land-use plan was declared invalid because it permitted residential development near a waste management company's depot. The plan converted a GE into an MI and extended a SO (§ 10 BauNVO) for a horse riding centre. The plaintiff, the operator of the waste management depot, argued that the plan failed to adequately consider the noise generated by the depot, particularly during nighttime operations. Deficiencies in the noise reports and a lack of effective noise mitigation measures were identified. The court found that the principle of separation had been violated, as the plan failed to ensure sufficient spatial separation between noise-intensive operations and residential use. Additionally, a balancing error was identified, as the interests of the depot—particularly its authorised operating hours—had not been adequately taken into account.

4.2.5. Procedural Errors

Companies identify shortcomings in planning procedures, including the unlawful use of accelerated procedures, inadequate environmental assessments, or the absence of an environmental report. In Case 11,

the operator of a sweeper production facility filed a judicial review. The company's premises partially fell within the scope of a municipality's binding land-use plan, which designated a WA and proposed the construction of a traffic turning area on part of the company's land. The plaintiff argued that the plan significantly affected its operations, particularly due to the loss of operating space and insufficient consideration of its economic interests. It also criticised procedural errors, specifically the unlawful use of an accelerated procedure under § 13a BauGB and the absence of an environmental assessment, despite parts of the plan area being classified as an outer area. The court declared the binding land-use plan invalid, citing the following reasons:

- The accelerated procedure was deemed unlawful.
- The absence of an environmental report constituted a significant procedural error.
- The proposed traffic turning area was unnecessary, as the original plan could not be implemented.
- The plaintiff's economic interests were inadequately considered.
- A lack of clarity regarding noise protection measures resulted in further deficiencies.

As a result of these procedural and balancing errors, the court annulled the binding land-use plan in its entirety.

4.2.6. Summary

Overall, the cases demonstrate that companies' rights of defence can be effectively used to enforce their interests. However, the analysis also indicates that the companies initiating legal action tend to be larger entities, such as waste disposal or chemical companies, which are, in general, likely less embedded in an integrated urban context (see Meyer & Schonlau, 2024). Smaller companies appear significantly less likely to utilise their legal options to challenge municipal urban land-use planning decisions. The courts find themselves navigating between municipal interests and the rights of companies. Decisions are dependent on whether the municipalities' considerations are deemed plausible and comprehensible. This analysis highlights the complex challenges that arise at the intersection of economic and municipal interests in urban land-use planning. Furthermore, it is important to recognise that court decisions can have far-reaching implications beyond the specific case. By interpreting undefined legal terms, they influence the application of the law in subsequent years. In some instances, court decisions bring critical issues to the forefront of municipal planning. For example, the implementation of the EU directive on the control of major-accident hazards involving dangerous substances (Seveso Directive) was highlighted in a key court decision (Schoppengerd, 2015, pp. 201–203).

5. Conclusion

The findings indicate that companies can effectively protect themselves from potential legal displacement (such as encroaching residential development) through judicial review procedures when a new binding land-use plan drawn up by the municipality affects their site or a neighbouring one. Zoning, as highlighted in international literature (see Section 2), is an effective tool for protecting urban manufacturing and has withstood judicial scrutiny. The success of corporate lawsuits suggests that noise conflicts could be mitigated through various planning instruments. However, in most of the court decisions examined, the municipalities either failed to adequately identify and assess these problems or committed procedural errors. This may partly result from the complexity of legal regulations.

It should also be noted that courts assess whether a plan complies with applicable law, but their decisions do not necessarily reflect whether the plan represents good planning practice in terms of content. For example, if a company is planning a future expansion, it must obtain planning permission, enabling the municipality to consider that when balancing private and public interests and developing neighbouring properties. Both coarse- and fine-grained mixes of uses are required to accommodate companies with different noise levels (see Section 4.1.3). A combination of these approaches is evident in many of the binding land-use plans analysed. Zoning can, in some cases, facilitate the integration of WA and (productive) GI, provided individual solutions are appropriately defined.

Consequently, legally watertight planning is not automatically an expression of a good planning concept. Conversely, new plans that are contested in court are not always bad, as even ordinary/trivial procedural errors can lead to the failure of a binding land-use plan. Court decisions can reveal conflicts that affect specific planning concepts and, when such conflicts occur frequently across a large sample of cases, highlight broader challenges and uncertainties in planning practice. For example, complex legal structures make noise an aspect of planning that carries a high degree of legal uncertainty. A scientific and systematic analysis of court decisions can therefore reveal conflicts at various levels and support sound planning practice, both *de jure* and *de facto*.

Nevertheless, these findings require further empirical validation. For instance, it must be examined whether large companies have greater resources to defend their rights in court compared to small or medium-sized enterprises (SMEs). Questions remain about the fate of companies lacking access to urban planning expertise, human capital, or financial resources for legal representation. Larger companies may be able to hire more experienced lawyers, whereas smaller municipalities might struggle to adequately defend their plans due to limited human and financial resources. Further research should investigate whether companies only pursue legal action when they are confident of success.

Simply demanding that municipalities “do their homework,” develop better solutions, and ensure compliance with planning law oversimplifies the issue. Municipalities often lack the personnel and resources to achieve this. Based on our empirical findings, we recommend that urban planners consider companies—especially small and medium-sized urban manufacturing companies—when balancing interests during the planning process to minimise the likelihood of legal disputes.

Additionally, political will is essential, as the analysis of preparatory and binding land-use plans indicates a clear trend toward conversions prioritising residential development, which does not prevent industrial gentrification. The analysis of preparatory and binding land-use plans further reveals that economic industrial gentrification is rarely addressed, with only limited planning approaches available to manage it. While some restrictions exist—for instance, limiting retail or amusement centres to prevent industrial gentrification—these constraints can be implemented within the framework of the BauNVO, as they pertain to usage types explicitly mentioned and do not constitute the central uses of the area type.

We identify a significant shortcoming in German planning law: The BauNVO does not classify “productive industry” as a type of use. This omission limits the ability of urban planning to adequately safeguard and promote urban manufacturing within the legal framework.

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Conflict of Interests

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Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

LLMs Disclosure

To ensure responsible use of AI and LLMs and to preserve the integrity of our publication, we note that we used ChatGPT (version ChatGPT with GPT-4-Turbo) and DeepL (version 25.1.4.15077) as generative AI technologies during the research and writing process. ChatGPT was used to create an overview of the court decisions, which was then manually reviewed by the researchers. Both ChatGPT and DeepL were used to optimise the linguistic correctness of our manuscript; in particular, linguistic improvements were made in terms of grammar and style.

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