

ZONING PRACTICE

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Drone Zoning: Urban Planning's Next Frontier?



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Drone Zoning: Urban Planning's Next Frontier?

By Troy Rule

Businesses are increasingly seeking to use drones to deliver goods, inspect infrastructure, take aerial photos, and serve other valuable functions. Local land-use planners, who have governed uses of low airspace for nearly a century through setback requirements, height restrictions, and other means, could serve important new regulatory roles in that space in the drone era—if federal regulators would let them.

This issue of *Zoning Practice* explores how planners can apply zoning concepts to local regulations governing drone use. It begins with background on the emerging need for more expansive local drone-use controls and briefly summarizes existing barriers to regulating drone use locally before summarizing three potential approaches to drone zoning.

The Merging of Air Traffic Control and Land-Use Laws

Some of the nation's largest retailers hope to soon start delivering many online orders not with trucks but with small, unmanned aircraft systems or "drones." Automated drone delivery systems would free retailers from the constraints of surface roads and enable them to rapidly transport goods directly from distribution hubs to the doorsteps of American homes and businesses. Unfortunately, such widespread commercial drone use would also send millions of daily drone flights into the nation's low airspace—some of which would disrupt land uses below. Drones produce buzzing noises that can interfere with activities on the ground, and drone overflights can also threaten landowners' safety and privacy. Because these potential impacts on underlying land uses vary greatly from place to place, drone activities are particularly well suited for localized, location-based regulation.

With adequate federal and state government support, drone-use zoning—the use of municipal ordinances and overlay zoning maps to regulate drone activities—could emerge as the next great frontier for zoning law. Drones are increasingly capable tools for delivering goods, photographing real estate listings, surveying pipelines, and serving other valuable commercial functions. However, drones can also be like pigs in the parlor instead of the barnyard: In certain settings, their noise and threats to privacy can unjustifiably interfere with activities on the ground. A drone flight over a spa resort or a retirement home can be far more disruptive than an identical flight over a rail yard or a warehouse district. Drones can likewise create security or safety threats—especially over critical infrastructure facilities,



An unmanned aircraft system delivering an automated external defibrillator in Reno, Nevada (Credit: [Mollyrose89, Wikimedia](#))

schools, prisons, and other sensitive places. Accordingly, localized spatial planning may be the only way to optimally balance drone-related uses of low airspace with land-based uses of that space.

Involving municipal governments in the spatial planning and regulation of low airspace uses in the drone era would yield tremendous benefits in communities across the United States. Municipal drone-use zoning ordinances could create specific classes of drone-use zones and attach varying degrees of drone-use restrictions to each type of zone. Corresponding overlay zoning maps could then assign drone-use zoning classifications to every parcel throughout a city with the express goal of optimally balancing drone-based and land-based uses of the city's low airspace. Using geographic information systems (GIS) and geofence technologies, commercial drone operators could even program their drones to automatically comply with local drone-use zoning ordinances. Drone users could likewise consult a city's ordinance provisions and map when selecting sites for drone delivery hubs and other drone-related land development projects. By leveraging municipal planning officials' localized knowledge, such urban drone-use planning could promote much more efficient use of precious low-airspace resources—just as conventional zoning laws do on land.

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Federal and State Obstacles to Municipal Drone-Use Planning

Sadly, until federal regulators signal more support for them, drone-use zoning ordinances face some obstacles in the U.S. Unlike the land-use laws of the 1920s, today's drone-use laws are evolving in the

shadow of a federal agency, the Federal Aviation Administration (FAA). The FAA has claimed on multiple occasions that it alone should regulate where and when drones may fly (FAA 2015). Some of the nation's most powerful companies, such as Amazon and Walmart, also have reasons to favor such a top-down federal structure because it would ease their operations by largely precluding cities and landowners from participating in drone regulation. Incredibly, some federal officials have taken the questionable position that even the airspace resting a few inches above the ground is navigable by a small drone and thus constitutes “navigable airspace” subject to exclusive federal control (U.S. GAO 2020). Advocates of this controversial view often argue that allowing cities, towns, and counties to adopt local drone-use restrictions would create an unworkable patchwork of laws across the country that would stifle drone industry growth.

While the debate over implied federal preemption of municipal drone-use laws rages on, drone industry advocates have also taken their fight to state legislatures in recent years, lobbying for statutory language that expressly preempts local drone-use restrictions. These efforts have yielded some unfortunate results: At least 11 states have enacted statutes over the past decade that provide for some degree of preemption of local drone-use rules ([Table 1](#)). It will be difficult for local governments in these states to engage in significant drone-use planning and zoning until these preemption statutes are repealed. In most other states, however, significant opportunities for municipal drone-use regulation remain intact.

The Case for Local Drone-Use Laws

Ironically, while the FAA continues to argue that it alone should regulate most civilian drone activities, it is increasingly evident that the agency lacks the resources and on-the-ground information needed to effectively handle the job. If major retailers achieve their vision of making billions of drone-assisted deliveries per year, tailoring drone-use laws to fit the unique features of tens of thousands of communities

Table 1. States That Preempt Local Drone-Use Rules

State	Limit on Local Drone-Use Rules
Arizona	Prohibits all local ordinances, policies, or rules that relate to the private ownership or operation of drones, other than restrictions on takeoffs and landings from public parks or preserves (§13-3729)
Connecticut	Expressly preempts all municipal restrictions on commercial drone “ownership, possession, purchase, sale, use, transportation, or operation” (§7-149b)
Delaware	Preempts local regulation of drone testing and operations (§11-1334(e))
Florida	Prohibits municipalities and counties from regulating “the design, manufacture, testing, maintenance, licensing, registration, certification, or operation of an unmanned aircraft system, including airspace, altitude, flight paths, equipment or technology requirements; the purpose of operations; and pilot, operator, or observer qualifications, training, and certification” (though drone operations are still subject to other local regulations specifying illegal acts) (§330.41(3)(b)&(c))
Georgia	Expressly preempts any local regulation of drone testing and operations adopted after April 1, 2017, other than restrictions on noncommercial takeoffs and landings from public property (§6-1-4)
Louisiana	Preempts all local drone regulations (§2:2)
Maryland	Preempts local regulation of drone testing and operations (Economic Development §14-301(b))
Michigan	Prohibits local regulation of drone ownership or operation, with a very limited exception for jurisdictions that prohibit nonemergency motor vehicles (§259.305)
Pennsylvania	Preempts local regulation of drone ownership or operations (§53-305(a))
Rhode Island	Preempts all local drone regulations (§1-8-1)
Utah	Preempts local drone regulations, except for restrictions on operations at locally controlled airports (§72-14-103)

across America will be a gargantuan task. Empowering cities, towns, and counties to engage in drone-use planning within their jurisdictions would distribute this growing regulatory load by enlisting countless local planning officials to help.

American land-use laws provide a valuable blueprint for considering the possibilities of localized drone-use planning. Consider how different cities and towns throughout the nation would look today if a century ago Congress had opted to give one federal agency exclusive authority over all land-use planning in the United States. Specifically, suppose, hypothetically, that real estate industry lobbyists had persuaded Congress in the 1920s to create a Washington-based “Federal Land Use Administration” with exclusive power to make land-use zoning designations everywhere in the country, preempting all state and local land-use laws. The powerful industry stakeholders championing such an action might well

have benefited from such legislation by using it to secure sweeping federal land development authorizations applicable throughout much of the country. However, because the centralized federal agency operating under that system would have lacked the community-level information and resources needed to tailor land-use plans to fit each U.S. city and town, land-use laws in most communities under that structure would have been poorly suited for most locales. Such imprecise land-use laws would have led to more neighbor conflicts and ultimately lower land productivity than the country has achieved by involving municipal and county governments in the land-use planning process.

In similar ways, empowering the FAA to be the nation’s sole drone-use regulator might benefit large drone delivery companies, but it would do so by excluding highly valuable local input from the drone-use planning process. By contrast,

the patchwork quilt of drone-use laws that drone industry stakeholders portray as devastating would actually be a good thing (Bateman 2020). Such a patchwork would reflect local officials' purposeful tailoring of rules to match the distinctive characteristics and preferences of the country's diverse array of neighborhoods and communities—just as local land-use laws and traffic laws presently do on the ground. Amazon truck drivers today have no difficulties using public road systems that require them to observe speed limit signs and other traffic rules that vary as they travel from place to place. Why couldn't Amazon delivery drones handle similar location-based variability in the laws governing low airspace?

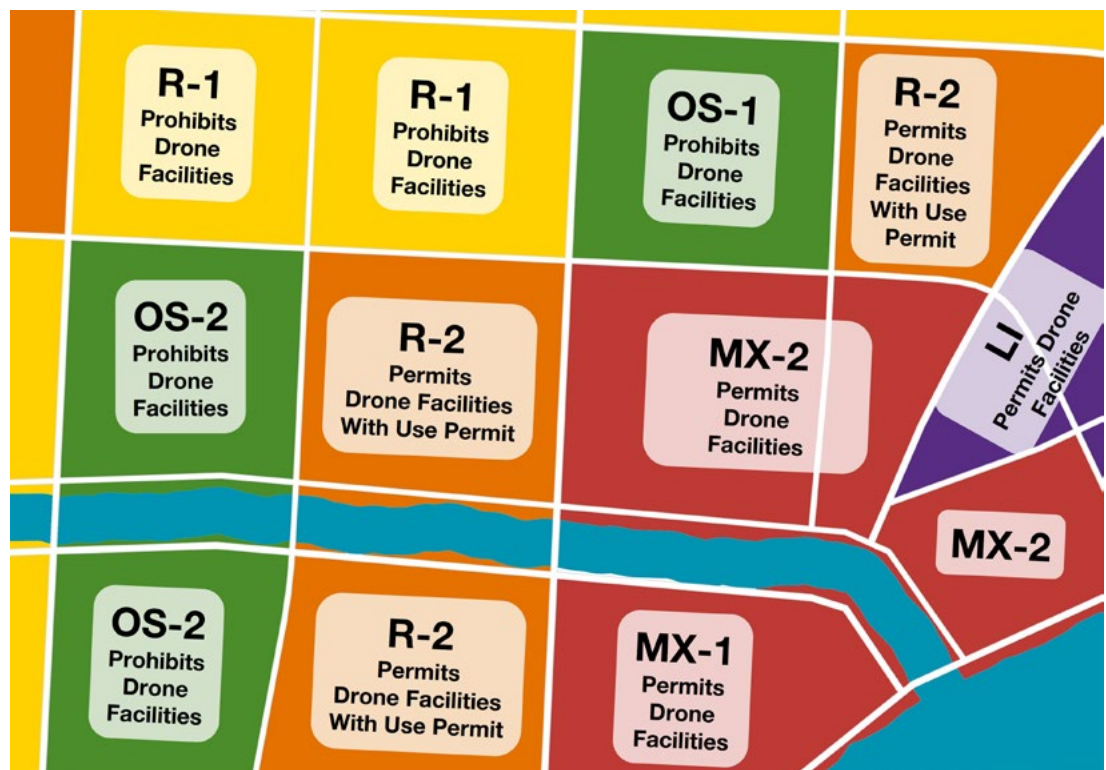
As a legal matter, local drone-use planning is also probably more permissible than the FAA or some drone industry groups would want local planners to believe. The scope of the FAA's preemptive authority over drone-use activities remains unclear in most states but is likely too narrow to preclude all state and local drone-use regulation. A 2017 case, [*Singer v. City of Newton*, 284 F.Supp.3d 125 \(D. Mass. 2017\)](#), seemed to at least partially embrace the FAA's preemption arguments against local drone laws. However, just three years

later a different federal court, in [*National Press Photographers Association v. McCraw*, 504 F.Supp.3d 568 \(W.D. Tex. 2020\)](#), showed far less willingness to recognize the FAA as the country's exclusive drone-use regulator, holding that "federal law has not completely preempted the field" of drone-use regulation and that a particular state drone law was not preempted. In short, there does appear to be room under current laws for municipalities to engage in some drone-use regulation—especially when that regulation is focused on preventing conflicts between drone uses and specific subjacent land uses.

Three Potential Categories of Local Drone-Use Planning

As local officials and planners increasingly embrace the idea of local drone-use planning, they are likely to wonder where to begin in this pioneering effort. As a starting point, it's useful to recognize the three general types of drone-use regulatory approaches potentially available to local governments: (1) land-based restrictions, (2) radius-based restrictions, and (3) zoning restrictions.

A hypothetical zoning map with land-based restrictions on commercial drone facilities (Credit: American Planning Association)



Land-Based Drone-Use Restrictions

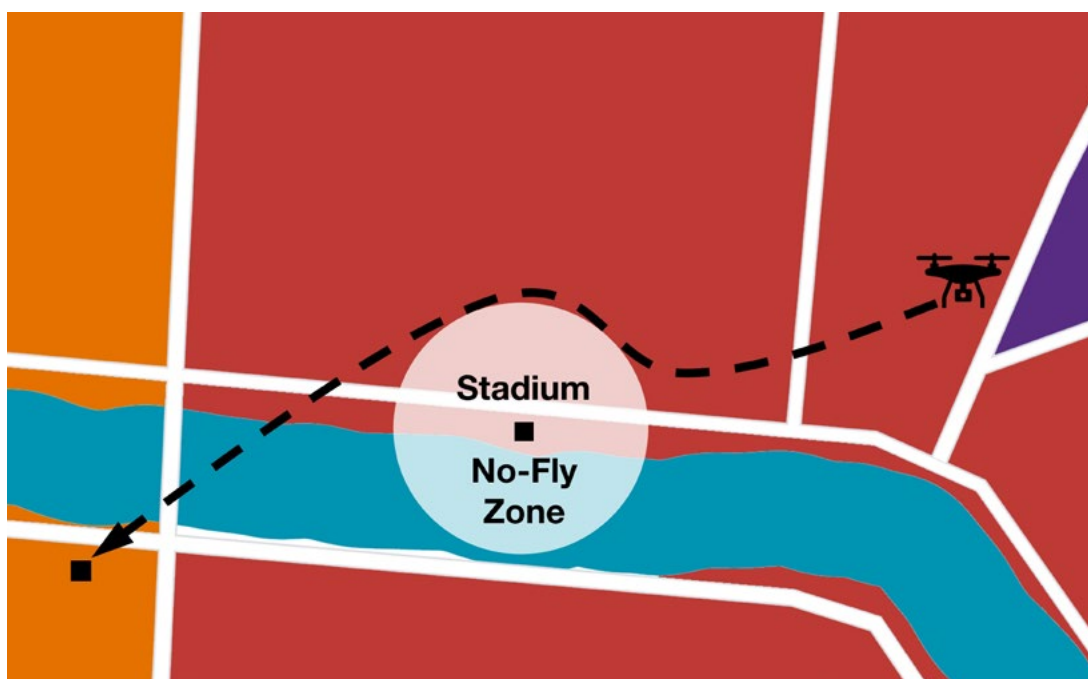
Land-based drone-use restrictions, which fall squarely within most municipalities' well-established regulatory authority, merely restrict where drone operators may launch or land drones within a community. For instance, an ordinance prohibiting the siting of certain types of commercial drone docking stations within 500 feet of the boundary of any existing residential zone would be a land-based drone-use restriction. High volumes of drone activity can occur at some kinds of commercial docking stations, so siting such stations sufficiently far away from residential areas could help to prevent conflicts with residential land uses. Such laws would be similar to existing land-use zoning restrictions designed to prevent low airport flight paths from flying over residential areas. Because land-based drone-use restrictions focus on places where drones take off and land, they obviously do relatively little to prevent conflicts between land uses and drones in mid-flight. Still, they can provide some additional protection against drone-related land-use conflicts and are less likely raise preemption questions than most other types of local drone laws.

A handful of local governments have recently added drone or “unmanned

aerial” centers or docking stations to their lists of permitted or special uses within certain zoning districts (e.g., Albion, Michigan, [§100-4.12](#)). Others, such as College Park, Georgia, have also codified a definitions of such centers to help guide developers and aid future enforcement of such rules ([Appendix A §1.4](#), defining “unmanned aircraft system dispatch and delivery center”). College Station, Texas, even amended a planned development district ordinance to make “consumer, small-scale aerial distribution” a permissible use to accommodate proposed Amazon drone delivery facilities (2022).

Radius-Based Drone-Use Restrictions

A second category of local drone laws—radius-based drone-use restrictions—can protect landowners against a broader range of potential drone-related conflicts than is reachable using land-based restrictions alone. Radius-based laws are already on the books in multiple major U.S. cities and prohibit drone activities within a specified radius of certain types of land uses. For instance, an ordinance adopted in Miami, Florida, prohibits drones from flying within a half mile of major public sports venues during events ([§37-12\(c\)](#)). A similar ordinance in Calabasas, California,



A no-fly buffer zone around a large place of public assembly (Credit: American Planning Association)

precludes drone operations within 200 feet of a school without school officials' permission and prohibits drone uses within 100 feet of many other public facilities (§9-10-030). Comparable state laws restricting drone activities near specified land uses have also been enacted in Arizona, Kentucky, New Mexico, Oklahoma, Oregon, Texas, and a few other states.

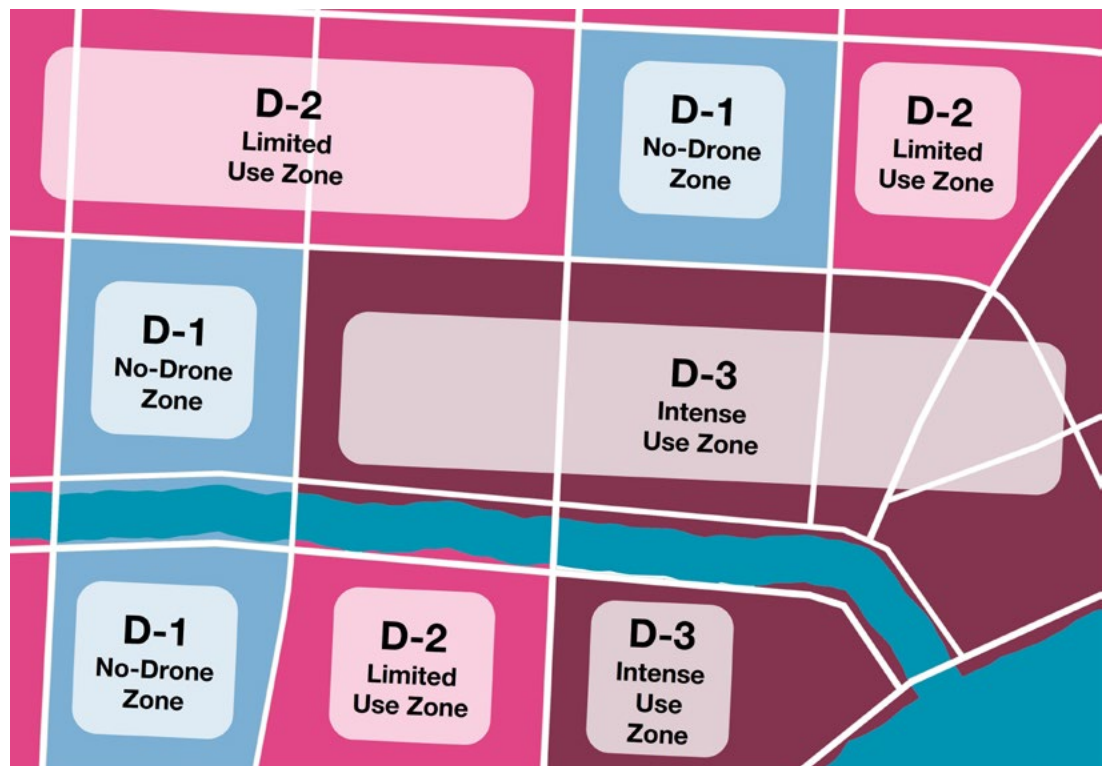
Radius-based drone use restrictions resemble certain early 20th-century laws that ultimately served as precursors to modern land-use zoning. For example, before land-use zoning became widespread, several cities had adopted restrictions on the siting of slaughterhouses or taverns within specified distances of certain incompatible land uses such as residential neighborhoods or schools. Eventually, these radius-based land-use ordinances—aimed at keeping certain disruptive land-use activities away from certain other protected ones—gave way to full-fledged land-use zoning laws in much of the country. It's quite plausible that laws similarly prohibiting drone-use activities near specified types of incompatible land uses could eventually pave the way for drone-use zoning as well.

Drone-Use Zoning

The third category of potential local drone use laws involves drone-use zoning—an approach that is more restrictive and thus more controversial than existing approaches (much like land use zoning was a century ago). Drone-use zoning ordinances would feature textual provisions describing specific types of drone-use zones and outlining the various drone-use restrictions applicable within each type of zone. Such ordinances would likewise feature a separate overlay zoning map that assigns drone-use zoning designations to every parcel within the local jurisdiction's boundaries.

One great benefit of drone-use zoning would be its ability to more effectively coordinate drone uses with land uses across a community. For instance, local planners might opt to designate certain neighborhoods near a community's beachfront, public school buildings, power plants, prison facilities, or other sensitive land uses as "D-1" or "no drone zones," subject to relatively strict drone-use rules. The planners might then designate other specific neighborhoods of the city—such as those having a mix of commercial and residential land

*A hypothetical
drone-use zoning
map (Credit:
American Planning
Association)*



uses—as “D-2” limited-drone-use zones, where somewhat less stringent drone-use rules apply. Still other neighborhoods with predominantly industrial and less-sensitive commercial land uses might then receive a “D-3” drone-use zoning designation and be subject to comparatively permissive drone restrictions.

To avoid violating citizens’ reasonable investment-backed expectations, drone-use ordinances could have lengthy grace periods before taking effect. Upon some future date specified in the ordinance, companies licensed to use drones within the city would then become legally responsible to ensure that their drones obeyed the ordinance’s restrictions. Some commercial drone users, such as aerial real estate photographers seeking to capture drone-assisted photos of a home for sale, would likely comply with such ordinances by simply locating specific properties on the city’s drone-use zoning map and reviewing applicable restrictions prior to launching their drones. Other companies, such as national retailers making deliveries with automated drones,

would more likely use GIS software and geofence technologies to ensure compliance. These innovations could enable drone operators to embed data reflecting a city’s drone use zoning map into delivery drones such that the drones automatically follow the ordinance’s provisions.

It is easy to imagine how cities could adapt various other common features of traditional land-use zoning into local drone-use zoning structures as well. For example, drone-use ordinance provisions might authorize drone users to apply for conditional use permits to conduct certain types of drone activities that are ordinarily not permitted within a specific zone. Other provisions might outline processes through which drone users could seek variances to drone-use zoning restrictions based on showings of undue hardship and minimal resulting harms to others. Today’s well-established legal understandings of how such provisions operate in the land-use context would help to ease their adaptation into drone-use regulatory settings.



*A drone-free zone
in Helsinki, Finland
(Credit: [Eric
Fischer, Wikimedia](#))*

Unique Potential Features of Drone Zoning Ordinances

Although drone-use restrictions that vary across spatial zones would share many similarities with conventional land-use zoning laws, effective drone-use ordinances would also differ from land-use ordinances in some notable ways. Among other things, the temporary nature of drone activities allows planners to build greater flexibility into drone zoning laws than is possible for land-use zoning. For instance, some cities such as Chicago ([§10-36-400](#)) and Calabasas, California, ([§9-10-030](#)) integrate the dimension of time into their drone-use restrictions by limiting most drone activities to daylight hours. Other municipalities, such as Point Pleasant Beach, New Jersey, take a similar approach and prohibit drone flights over schools only during regular school hours ([§3-50.3](#)). Future drone zoning ordinances could similarly integrate the dimension of time into their restrictions as well. For example, local officials concerned about drone noise disruptions in residential areas might opt to craft ordinance provisions to permit drone operations in a city's D-2 zones only on weekdays between 9:00 a.m. and 6:00 p.m. Likewise, officials hoping to allow real estate photographers and hobbyists sufficient opportunities to use drones even in highly restricted drone-use zones could adopt provisions allowing for a few "open drone use" periods each week or month, such as on Saturday mornings from 10:00 a.m. to noon or on the first Tuesday of each month from 4:00 to 6:00 p.m. Such restrictions and exceptions based on time are obviously not possible in the context of land-use laws, given the generally permanent nature of land development but create interesting new possibilities in the drone-use zoning context.

Another major difference between land-use zoning and drone zoning is that it's technologically possible to inexpensively enforce drone-use zoning laws using GPS-based geofence technologies. DJI and multiple other major drone manufacturers already embed remotely updatable geofence software into their drones to prevent the drones from flying near thousands of specific airports and other protected areas around the world. For instance, a

2015 update to DJI's geofence database after a drone landed in the White House lawn now prevents DJI drones from flying within a 15.5-mile radius of Washington, D.C. (Bi 2015). When drones with geofence software approach geofenced areas, they automatically begin to lose power or are otherwise programmed to be unable to proceed forward into that protected space. Embedding local drone zoning ordinance restrictions into all registered commercial drones and enforcing those restrictions using geofences could greatly simplify enforcement and make the patchwork of drone-use restrictions across communities even less burdensome for commercial drone users.

Like ordinary land-use zoning ordinances, drone-use zoning ordinances could have some unintended consequences unless carefully crafted to avoid them.

Drone Zoning and Social Justice

Like ordinary land-use zoning ordinances, drone-use zoning ordinances could have some unintended consequences unless carefully crafted to avoid them. On the one hand, many common criticisms of modern land-use zoning—such as the potentially adverse impacts of single-family zoning on suburban sprawl, housing affordability, or racial and socioeconomic integration efforts—are less applicable in the drone zoning context because drone zoning has far less influence on where citizens reside. On the other hand, if cities draw their drone zoning maps such that historically underserved or underinvested neighborhoods end up having far more drone overflights, such laws could exacerbate existing disparities and disproportionately harm marginalized residents in those communities.

Fortunately, there are ways to prevent drone-use zoning from contributing to the social injustice challenges facing American cities. Most notably, I've recently advocated for the use of digital platforms and distributed ledger technologies to



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help landowners temporarily license their low airspace to drone users in exchange for compensation (Rule 2022). Such an approach would empower landowners to determine how often drones fly over their land and would ensure that landowners are compensated for every drone overflight. Federal and state statutes affirming and clarifying the scope of landowners' low airspace rights could help to spur private investment in this promising approach to drone routing, which would greatly reduce the potential social injustices associated with large corporations' growing use of low airspace.

Spurring a Drone Zoning Revolution

For land-use planners intrigued by the possibilities of drone zoning, the time to start acting is now—before major retailers begin traversing our airspace with drone-delivered packages. Although some uncertainty remains regarding the scope of municipalities' power to regulate civilian drone activities, that has not stopped municipal governments throughout the United States from adopting local drone-use ordinances. From Telluride, Colorado ([§10-11](#)), to Orange Beach, Alabama ([§54-41 et seq.](#)), various municipal drone laws are already helping to reduce conflicts between drone operators and subjacent landowners. Citing what they describe as “gaps” in the country's regulatory apparatus, the National Conference of Mayors adopted a resolution in June of 2022 specifically requesting broader formal

authority from the federal government to take local actions to keep drones away from critical infrastructure and certain other land uses. Meanwhile, dozens of municipalities across the country are opting not to wait for official federal permission and are actively developing and adopting local drone-use ordinances of various kinds. Especially in states with no express statutory preemption of such ordinances, local officials should start today to consider possible ways of structuring drone-use regulations for their jurisdictions so that they're better prepared when commercial drone operators inevitably come to town.

Urban planners who personally know the communities where they live and serve have greatly enhanced land-use development across the U.S. over the past century and could do the same for drone uses in the drone era. Applying their training and localized knowledge, these trained and passionate public servants enable cities to grow in more orderly and efficient ways and prevent countless neighbor conflicts by carefully segregating incompatible land uses from each other. As drone technologies are now introducing a new class of potential spatial conflicts, local planners are again well suited to provide the community-level spatial planning needed to govern them. By embracing the important role of local planners in this massive undertaking, commercial drone users and the FAA could help them to hasten the day when hot pizzas and hamburgers hover to American doorsteps without disturbing any other landowners along the way.

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