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Article

Density and Decision-Making: Findings from an Online Survey

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Abstract: In many countries, policymakers have used urban densification strategies in an effort to create more sustainable cities. However, spatial density as a concept remains unclear and complex. Little information exists about how density is considered by decision makers, including the different kinds of density and the wider political and economic context in which decisions are made: who makes density decisions, when they make those decisions and what they use to make decisions. To that end, the authors created an online survey to investigate the above issues. One hundred and twenty-nine respondents from the fields of architecture, planning, urban design and engineering answered a 26-item survey over a 3-month period. Findings suggest that decision makers consider more than just population and dwelling density and that city design, planning and policy need to address these other kinds of density. Moreover, the professions making many of the density decisions are not, necessarily, the ones that should be making the decisions; nor are they making decisions early enough. Policymakers also need to be more cognisant of the multi-scalar dimensions of density when creating policy. Finally, more needs to be done in universities to ensure that built environment students receive a broader skillset, particularly in terms of engaging with communities.

Keywords: density; decision-making; sustainability; cities; survey

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1. Introduction

In the UK and elsewhere, urban densification has been a much-debated topic, with naysayers suggesting that our cities will become cramped, noisy, disease-ridden places if they become more dense, and advocates promoting the sustainability benefits of living, working and recreating in relatively close proximity to one another (e.g., greater access to green space, better public transportation choices, greater innovation) [1–10]. Both sides have valid points (see [11,12], for details about the advantages and disadvantages of urban density), but the question of whether or not cities should increase density—and, indeed, if increasing density is even the *answer* to the question or related to the answer—still remains unclear and is made even less clear after acknowledging the larger political economy in which decisions about density are made. This lack of clarity in deciding about density also holds true for how decisions about density are made; that is, little is known about who makes decisions regarding density in urban areas, when they make those decisions, what they use to make density decisions and what forms of density they consider in their decision making. Understanding more about the multi-layered complexity comprising density and carefully considering its impacts on neighborhoods and cities means that key, urban decision makers and stakeholders will have a much more textured and nuanced view of how urban areas can be treated in terms of the design, development and management of sustainable communities (cf. the Location Efficiency Calculator [13]).

In an effort to shed light on what urban density is, how the concept is perceived and how it is used in practice (*i.e.*, how, when and with what decisions around density are made), the authors created an online survey with the aim of obtaining the views of informed, urban decision makers who influence densities in cities. The following paper summarizes the findings from the online survey, based on the responses from 129 individuals working in architecture, the built environment, development, engineering, sustainability, town centre management, town planning, urban design and academia [14]. The paper is divided into six sections: *Describing density* highlights how density is defined, some of the challenges in describing the term and what different kinds of density may be found in cities that are relevant to urban decision makers. *Research Methods* outlines how, and to whom, the survey was distributed as well as gives an overview of the survey questions. *Findings: Respondent demographics* discusses who the respondents are, where they come from and so forth, in a generic manner. *Findings: Perceptions of density* covers how respondents think about density, in particular how often they think about different kinds of density, the key drivers of density and what they believe are low, medium and high dwelling density. *Findings: Density in practice* discloses respondents' answers to questions about how they apply density in their day-to-day work. Finally, the *Conclusions* summarizes and interprets the findings, exploring their relevance to policy, practice and education.

2. Describing Density

When attempting to describe, let alone define, density, people seem to have a difficult time with the concept. At a base level and from a spatial perspective, density may be defined as: *a number of units in a given area*. However, this definition might not be useful or meaningful to many people because it is not relatable in human terms [15]. As a result, people may use alternative and related concepts to describe things in the urban environment, such as *frequency* or *size* as it relates to a non-standardized

unit or area (e.g., the number of homes in a neighborhood, the height of tall buildings in the city centre), or terms such as crowding (see [16]), compactness (see [5,17,18]), sprawl (see [3,19–21]) or intensity (see [22]), rather than the notion of *concentration* with a standardized metric (e.g., the number of homes per hectare). Moreover, the many different ways to collect, analyze, present [23], define and calculate what seem to be similar kinds of densities (e.g., dwelling density, habitable rooms per hectare, site density) may foster further ambiguity and misinterpretation [24]. Finally, what people include and exclude in their definitions of density may differ, causing confusion about how to interpret data (e.g., in some cultures, kitchens would be included in the calculation of habitable rooms per hectare whereas in other cultures, kitchens would not be viewed as suitable spaces for dwelling purposes) [2,12]. However, there *are* people, groups and organizations that use the concept and related terms in an urban context and constitute some of the key decision-makers in cities. They include architects, urban designers, developers, local authority planners, policymakers and transportation engineers, all of whom use the concept of density when describing, predicting and controlling the use of land [2,25].

In the context of cities and in the planning of urban areas, two kinds of density are often prioritized in their various guises: dwelling and population density [11]. The former may be found in national, regional or local planning policy or guidance (e.g., Planning Policy Guidance 3: Housing in the United Kingdom, [26]), and allows decision makers to estimate the requirements for development as well as to determine the form and type that the development will take [2,27]. The latter kind of density may be used to inform the debate around housing and built form in cities, but is not enshrined in planning policy per se (see [24,28]. Other kinds of densities may be loosely discussed in policy, using more general statements, such as "new development should relate well to its surroundings in terms of scale" ([2], p. 29). Although, like population density, these other kinds of density may, at best, inform debate, they are important and may very directly influence the look and feel of cities [29].

As part of a study on spatial density, the authors worked with nine expert practitioners and academics in various built environment fields to develop a taxonomy of density. The taxonomy highlighted five kinds of density that are used in everyday practice. The authors then examined 75 academic studies that related to density in urban environments to validate the taxonomy [11]. The five kinds of density are:

Built form (e.g., dwelling density)
Natural form (e.g., density of green space)
Static form (e.g., road density)
Mobile material form (e.g., traffic density)
People- individual and social/organizational (e.g., population density, employment density)

While density of built form, natural form and people are relatable, static form and mobile material form need explaining. Thus, *static form density* refers to the concentration of objects within the built environment that are not buildings, infrastructure or spaces, but that contribute to the urban scene. These may include the density of transit stops and rubbish. *Mobile material form density* refers to the concentration of objects within the built environment that move. These may include the density of trains, buses and private vehicles [29]. Part of the online survey that participants completed asked whether they made decisions about some or all of the five kinds of density.

3. Research Methods

An online survey was used to solicit views about density in the urban environment from informed practitioners, policymakers and academics (see Section 4 for more information about the respondents). The authors believed this method would reach a wider and more diverse audience via distribution across a variety of digital devices [30], *versus* a more traditional postal or telephone survey [31]. Because specific professions were targeted, it also was less time-consuming and more affordable to access potential respondents using email invitations, either individually or to groups, rather than posting surveys to people or calling them. As a result, the authors used non-probability sampling methods to obtain respondents, which means that the results cannot be adequately generalized to the larger population. Even within the target population, there is a sample selection bias towards respondents from the UK [30]; thus, findings also cannot be adequately generalized to practitioners, policymakers and academics engaging in issues of density.

Survey respondents, who were perceived to be key, urban decision makers around density, were contacted via a number of organizations in the UK, some of whom have international members. These organizations include:

The Association of Town Centre Management
The Chartered Institution of Highways and Transportation
Environmental Sustainability Knowledge Transfer Network
Institution of Civil Engineers (North West region)
Landscape Institute
Local Government Association
Royal Institute of British Architects
Royal Town Planning Institute
Urban Design Group

In addition, members of a developer workshop held at Lancaster University as well as project partners and expert panelists on the Urban Futures project were contacted to participate in the survey.

Each organization or individual was sent an email about the survey (organizations were asked either to email members directly or add a prepared message about the survey to an organization e-newsletter or e-bulletin). The email stated the aim of the survey and asked people to link to the Survey Monkey web site to complete the 10-min survey. An attempt was made to follow up with three of the organizations approximately 2 weeks after the first emails were sent, as a fault was found with one of the organization's mailing lists.

The survey was active on www.surveymonkey.com for 3 months, from May–July 2011. It consisted of 26 questions, divided into three sections (see Table 1):

Table 1. The three online survey question sections.

Set	Question
Respondent demographics	Age; gender; ethnicity; education; profession; employer; place of profession; decision-making role within the organization
Perceptions	Dimensions of density; top three drivers of density; estimating low, medium and high density
Practice	Who makes density decisions; when are density decisions made; decision-making resources; importance of density in urban design and planning

4. Findings: Respondent Demographics

One hundred and twenty-nine people responded to the density survey. Table 2 shows the demographics of respondents by age, gender, ethnicity, education, profession, employer, place of profession and decision-making role within the organization.

From the demographic information in Table 2, it appears that most respondents were male, white/Caucasian, between 25 and 54 years of age and had a postgraduate education (*i.e.*, master's degrees or higher). Although these findings cannot be generalized to everyone in the built environment profession, they certainly echo—rightly or wrongly—the profile of key decision makers currently.

In addition to these more basic demographics, information about respondents' professional roles—what they did, who they were employed by and how long they had been in practice—suggest that they are well-versed in built environment and sustainability issues, and have experience with, and knowledge about, making decisions about density in urban areas. Most respondents work in local authority town planning or in private practice as urban designers, engineers or architects. Others work in university settings as academics or as private consultants. The majority of respondents have been working in their professions for over 10 years and make strategic decisions in their jobs. Taken all together, these demographic findings demonstrate that respondents possessed expertise and responsibility with making decisions about density and other urban issues.

5. Findings: Perceptions of Density

People's perceptions of density in a situation may influence their behavior and emotional responses to others as well as events occurring in that situation and their surrounding environment [32,33]. These perceptions will be influenced by a number of factors, including the symbolic and physical dimensions of an environment; the temporal aspects of activities and events, and; the socio-cultural nature and experiences of individuals, groups and settings [15,34–36]. How and what people perceive in terms of density also will impact their decision making. This section highlights survey respondents' answers to questions about their perceptions of density, and explores how often they consider different kinds of density in their daily decision making, the key drivers of density and what they believe are the numerical values or ranges associated with low, medium and high dwelling density.

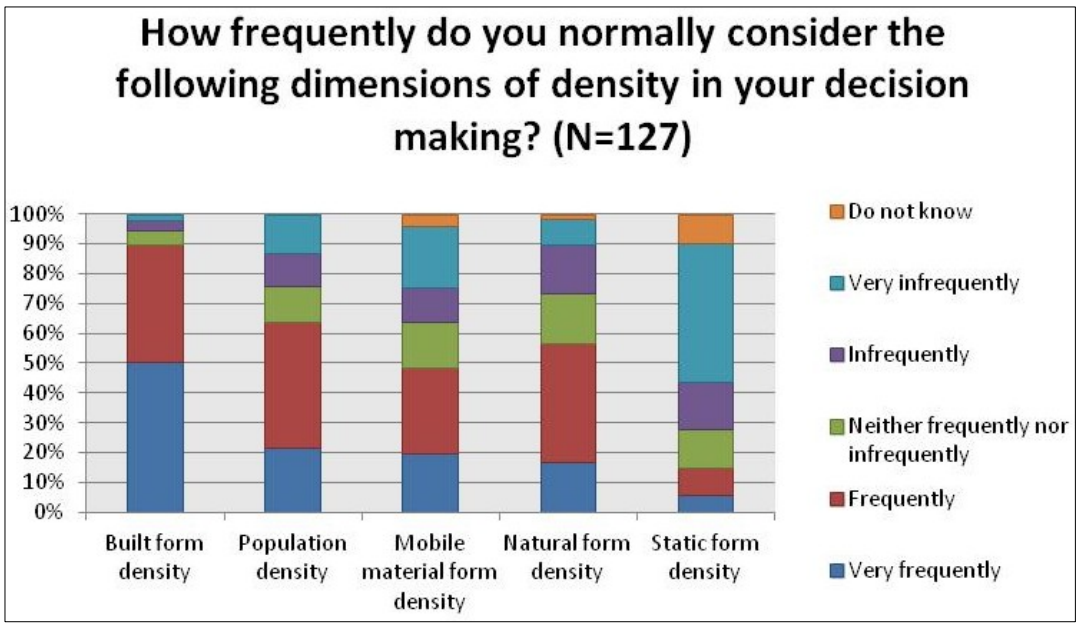
Table 2. Respondent demographics.

Demographic	Responses (percentages in brackets)
Age (N = 109)	Under 25 (1.8%) 25–34 (27.5%) 35–44 (27.5%) 45–54 (24.8%) 55–64 (15.6%) 65+ (2.8%)
Gender (N = 104)	Male (72.1%) Female (27.9%)
Ethnicity (N = 109)	White British (79.8%) White Irish (2.8%) White Other (13.8%) Mixed (0.9%) Indian (0.9%) Black Caribbean (0.9%) Other ethnic group (0.9%)
Education (N = 109)	Undergraduate degree or equivalent (5.5%) Professional qualification (22%) Postgraduate degree or equivalent (72.5%)
Profession (N = 113)	Town planning (53.1%) Urban designers (20.4%) Academia (5.3%) Transport planners (5.3%) Architects (2.7%) Highways engineers (1.8%) Civil engineering (0.9%) Landscape architecture (0.9%) Surveying (0.9%) Other (8.8%)
Employer (N = 111)	Local authorities (64.9%) Private practice (12.6%) Higher education institutions (6.3%) Sole practitioner/consultant (5.4%) Construction/engineering company (5.4%) Central government (3.6%) Other (1.8%)
Place of profession (N = 112)	Southeast (17.0%) London (14.3%) International (11.6%) Northwest (10.7%) Southwest (8.9%) West Midlands (8.0%) East Midlands (6.3%) East of England (5.4%) Scotland (5.4%) Yorkshire & the Humber (4.5%) Wales (4.5%) Northeast (1.8%) Northern Ireland (1.8%)
Length of employment (N = 111)	More than 10 years (66.7%) Between 5–10 years (22.5%) Less than 5 years (10.8%)
Decision-making role within their organization (N = 111)	Make strategic decisions (57.7%) Make operational/day-to-day decisions (42.3%)

5.1. Different Kinds of Density

Using the five kinds of density identified in the authors' previous research [11], respondents were asked whether or not they thought about density in their daily decision making. A majority of the 127 respondents answering this question considered the density of built form (89.8%) and of populations (63.6%) very frequently or frequently. This makes sense, given that certain decision makers want to know this information when undertaking a design and development project, writing policy about density or considering how an area might change in the future. Statistics also are often available to make calculations about the number of homes and people in an area (e.g., UK National Statistics). However, respondents said they also considered the density of the natural environment (56.6%) and of mobile forms (48.4%) very frequently or frequently when making decisions. This suggests that the things we do not build and that are not stationary inadvertently affect how designers create city spaces and undoubtedly have an impact on our lifestyle and wellbeing. Finally, in terms of static form density, more respondents considered this dimension on a very infrequent basis in their decision-making (46.3%) than very frequently or frequently, with 12 respondents (9.9%) not knowing if they considered static form density at all [37]. Although the kinds of density were based on evidence from an extensive scientific review of previous research, static form density as a relevant dimension of density for decision makers may need to be re-considered (see Figure 1).

Figure 1. Dimensions of density.



Each density type then was explored in more detail to find out what sub-types of density were most often considered by respondents in their daily decision making.

5.1.1. Built Form Density

Of the 126 respondents who replied to this question, 90.5% stated that they consider residential dwellings very frequently or frequently in their decision making. In addition, more than two-thirds of respondents considered non-residential buildings and a mix of building uses (both 80.6%) and

infrastructure (79.0%) very frequently or frequently in decision making. The only built form types that were not considered very frequently or frequently were other structures, which include street intersections, pedestrian crosswalks and open space. Given that policy formation around density focuses principally on residential development, and non-residential densities—including commercial density, and densities of mixed-use buildings and roads—are foremost in the minds of local authorities and developers as they grapple with the larger political economy, it makes sense that these kinds of densities are considered in daily decision making.

5.1.2. Population Density

Of the 125 respondents who replied to this question, only one kind of population density was considered very frequently or frequently by more than half of respondents: demography (55.7%). This includes densities of people's age, gender, education, occupation and so forth. Due to the availability of demographic data from existing surveys and censuses, respondents could relatively easily calculate appropriate densities and use the information in making decisions about, for example, the number of homes in a neighborhood. The only other kind of population density approaching this level of frequency was private sector density (*i.e.*, the number of private sector businesses per hectare), with 40.3% of respondents considering it very frequently or frequently. Other than decision makers wanting to know the concentration of businesses in an area, one reason for the popularity of this kind of density could be that respondents were mistaking it for commercial density. The remaining kinds of population density were considered much less frequently, ranging from 32.5% for density of government (*i.e.*, the number of government offices per hectare) to 6.8% for density of religion 6.8% (*i.e.*, the number of people of different types of religions per hectare).

5.1.3. Mobile Material Form Density

Of the 119 responses, well over half said that they considered the density of private vehicles (70.3%), bicycles (64.1%) and buses (63.6%) very frequently or frequently. The density of trains also was considered very frequently or frequently by 44.9% of respondents. The density of airplanes was the only mobile material form that a majority of respondents considered infrequently or very infrequently (65.8%). However, respondents mentioned that the density of pedestrians was a mobile material form worth considering, although only 27.3% considered pedestrians very frequently or frequently. In general, these findings chime with current sustainable transport research and policies, suggesting that transportation, and in particular, infrastructure, needs to be strongly considered within urban environments as cities age and increase in population [38,39].

5.1.4. Natural Form Density

The majority of the 124 respondents who answered this question stated that they consider the density of green spaces and water very frequently or frequently (79.7% and 61.5%, respectively). Given the attention in research about the potential health benefits of green spaces and natural environments in cities (see [40–42]), and the UK Government's opposition to "garden grabbing" in 2010 (*i.e.*, the practice of building on previously residential land, such as people's back gardens), it

makes sense that the density of green spaces and water would be issues to take into consideration when designing, planning and managing urban environments. Additional kinds of natural form density mentioned by respondents—but not considered very frequently or frequently by over a third of them—included beaches, urban farms, mountains, hillsides, gardens, green routes, trees, hedges, woods, wildlife corridors, play areas, allotments, roof terraces, private outdoor space, areas of biodiversity and topography.

5.1.5. Static Form Density

None of the detailed kinds of static form density was considered very frequently or frequently by a majority of the 118 respondents who answered this question. Density of waste had the highest percentage of respondents (40.7%), followed by food (14.7%), general products (5.2%) and density of equipment and digital technology (both 4.3%). Just under half of the respondents said that they did not know if they considered these sub-dimensions in their decision-making. The density of waste generated—or, more likely, the *amount* of waste generated—is something that decision makers, particularly local authorities, may consider when making decisions about planning applications. The other forms of waste, however, may not be thought about by decision makers in an explicit manner, particularly as food and equipment may fall to other types of decision makers (e.g., supermarkets, manufacturers and suppliers of appliances).

In summary, respondents appeared to make decisions about many kinds of density. These included the more obvious densities of built form (residential and non-residential, infrastructure) and people, but also of natural form (green spaces and water) and mobile material form (private vehicles, bicycles and buses). One potential reason as to why these less obvious kinds of density were selected by respondents is that policies, guidance and/or Government programs and departments exist that relate directly to issues, such as green space and private vehicles. Moreover, recent academic literature has highlighted relationships between these issues and its effects on health and the design of cities (please see above). Thus, the issues are timely, but also are perceived to be important issues to consider at different decision making stages of design, development and policymaking by various decision makers.

Another finding is that some of the more detailed kinds of density (e.g., density of religion) were not clearly defined or described, prompting uncertain responses by survey participants. This is an important finding, as it helps the authors and other researchers to better understand how the various kinds of densities might be explained. It also highlights gaps in the current academic literature that might be filled with further research.

5.2. The Drivers of Density

As stated in the Introduction, the current debate about whether decision makers should increase densities in their cities is multi-faceted and complex. While the authors do not, necessarily, advocate increasing urban densities without a more complete understanding of the nuances of such decisions (e.g., increasing densities in cities may reduce the need for travel [43], yet increase traffic congestion, [44]; see [11] for a more comprehensive list of advantages and disadvantages of increasing densities), the reality of increasing numbers of people migrating to cities means that decision makers may need to

profoundly consider how to accommodate future city dwellers in less space. To better understand the reasons why decision makers might wish to increase urban densities, respondents were asked to prioritize their top three choices (see Table 3).

Table 3. The top drivers for increasing density in cities (N = 120).

Number	Driver
1	**Efficient use of land**
2	**Increased profitability/return on investment**
3	**More use of public transport**
4	Efficient use of resources
5	Promoting a critical mass to support services
6	Policy/regulation
7	More people immigrating to cities
8	Creating area employment
9	Improving housing choice and affordability
10	Less use of private transport
11	Reduced energy consumption
12	Other
13	Increasing diversity in an area

The top three drivers—efficient use of land, increased profitability/return on investment and more use of public transport—appear to align with the idea (see Section 6) that developers and local authority planners make most of the density decisions on planning projects.

In terms of the most-cited reason, many density policies at national, regional and local levels use terminology such as "efficient use of land" in the hopes of creating and sustaining cities that are not sprawling, but are more compact (e.g., Planning Policy Statements 1 and 11 in the UK, [45,46]). Developers also may want land to be used more efficiently because they can have a greater return on their investment and increase profitability, which is the second-most cited reason for wanting to boost urban densities. Regarding the third-most cited reason, increasing densities to increase the use of public transport, policies relating to density may highlight the relationship between building more efficiently on land and the need for more well-connected public transport. In addition, local authority planners and highways departments will be trying to manage the very practical issue of congestion in urban centers and its consequent knock-on effects to the economy, the environment and society (see [47]).

5.3. Perceptions of Low, Medium and High Dwelling Density

The idea that a quantitative figure for density is not standardized in practice or policy, such that everyone knows, for example, that 50 dwellings per hectare is considered high density, can lead to decision makers making decisions based on unequally-comparable figures. It also may result in stakeholders perceiving that something is high in density when, in fact, it is lower in density, such as the case with many gentrified areas of cities [48,49] (for a more nuanced discussion of perceptions of density, see [15]). Yet having a single, standardized density target across a city would be unhelpful because of the contextual differences between various areas of cities (e.g., high dwelling density in

one neighborhood might be 50 dwellings per hectare, yet in another neighborhood, the figure might be 100 dwellings per hectare). These contextual differences may be due, in part, to factors such as access to jobs, amenities and services; connections with public transport; land values; and the opportunity for brownfield development and conservation and re-use of existing buildings [24].

In an attempt to illuminate this issue, respondents were asked to provide figures for low, medium and high dwelling density. Dwelling density was chosen because, as stated earlier, policies around density often, if not always, pertain to the concentration of dwellings in an area. As imagined, the ranges of the answers from the 103 respondents varied tremendously: from 1–70 dwellings per hectare (dph) for low dwelling density, 5–200 dph for medium density and 10–400 dph for high dwelling density (see Table 4).

Table 4. Perceptions of low, medium and high dwelling density (N = 103).

Dwelling density	Mean (dph)	Median (dph)	Mode (dph)	Range (dph)	Standard deviation
Low	23	20	30	1–70	11.68
Medium	44	40	30	5–200	23.97
High	79	60	50	10–400	58.47

From this data, the authors were able to calculate figures for each density level: *low* dwelling density was perceived to be about 23 dph (median = 20 dph, mode = 30 dph, standard deviation = 11.68 dph), *medium* dwelling density was approximately 44 dwellings per hectare (median = 40, mode = 30, range = 5–200) and *high* dwelling density was approximately 79 dwellings per hectare (median = 60, mode = 50, range = 10–400). Among other things, what Table 4 demonstrates is that people have very different ideas about what is low, medium or high density even though the terms are used in planning applications and policy as if everyone knows what they mean. Again, the responses point to the importance of context, with international, national, regional and local variations as well as societal, cultural and personal differences impacting how people view density. When policies about density are developed, decision makers need to pay careful attention to these contextual differences and follow through with them in a consistent manner, rather than only recognize that they exist [24]. Specific numbers instead of vague terms, like "low", "medium" and "high" also need to be used so that people do not misinterpret them and are not confused by what is written in policies.

In examining all the findings about perceptions, it becomes apparent that density is a complex concept with many layers, influences and impacts. Decision makers perceive density in cities to be about more than the number of dwellings, commercial properties and populations in an area; rather, the densities of other built, natural and mobile material forms also are important to the way cities look, feel and function. In addition, the reasons why decision makers might wish to increase densities in cities vary, possibly depending on their profession, what motives they have (e.g., policy-led, market-led) and what consequences an increase in density would have on the surrounding area and services. This last point coincides with the most-cited reason for having density policies, which is to maintain the residential character of an area [1]. To maintain residential character, decision makers need to know more about the context; this includes knowing more about the densities in an area as well as people's perceptions of those densities. It is through knowing this information that

contextually-relevant density targets—ones that should be reviewed periodically to account for the dynamism of neighborhoods [50]—could be created.

6. Findings: Density in Practice

Knowing how people perceive density is important, as it begins to highlight differences in the way information about the concept is taken in, processed and analyzed. Understanding how people consider density in practice compliments this work and illustrates how the concept is managed in a functional capacity. As part of the survey, respondents were asked who the decision makers around density were, when density decisions were made and what was used to help facilitate decision making around density.

6.1. Who Makes and Who Should Make Decisions about Density

Survey respondents were asked first to consider whom they believed made most of the decisions about density in the practice of urban design and development. Of the 767 responses from 113 respondents [51], 87.6% stated that developers made the most density-related decisions. In order of declining percentage, other professions who made density decisions included local authority development control/management officers and local authority policy planners (84.1% each), urban designers (72.6%), architects (65.5%), private sector planners (63.7%), Central government (62.8%), Councilors on planning committees (60.2%), financiers (43.4%), the local authority highways department (25.7%), residents (18.6%), local businesses (5.3%) and other (5.3%). The Other category included public health professionals contributing to planning, housing and education; property agents who act as consultants to developers; development agencies; landowners; and community organizations and specialist groups.

Survey respondents then were asked whom they believed *should* make most of the density decisions in practice. Of the 631 responses from 114 respondents, 86.8% stated that local authority policy planners should make most of the density-related decisions. Subsequent professions included local authority development control/management officers (76.3%), urban designers (70.2%), architects (53.5%), Councilors on planning committees (50.9%), residents (46.5%), developers (43.9%), private sector planners (37.7%), Central government (35.1%), the local authority highways department (22.8%), financiers and local businesses (12.3%) and other (5.3%). The Other category included collaborative teams comprising a number of the above groups, transport planners, leisure and recreation planners, development agencies, community groups and specialist organizations.

Although respondents felt that a wide range of decision makers made the most density-related decisions, they believed that only five of these groups—local authority policy planners, local authority development control/management officers, urban designers, architects and Councilors on planning committees—*should* be making those decisions, based on at least a 50% response rate. Interestingly, developers, who were the most-citied density decision-makers in the former list, were seventh on the latter list, below residents. This finding suggests that developers have too much power when it comes to making decisions about the density of urban design and development projects [52–55], and that more emphasis should be placed on local authorities and professional designers to make those decisions.

6.2. When in the Process Do Respondents and Others Make Density Decisions

To better understand when density decisions are made in urban design and development projects, respondents were asked to identify the process stage(s) in which *they* made decisions about density. The process stages (see [56] for more discussion about the urban design and development process) are:

Pre-design 1: Identify need or opportunity
Pre-design 2: Explore and research
Design 1: Conceptual design and development
Design 2: Detailed design and development
Design 3: Choosing a Design
Post-design 1: On-site implementation and construction
Post-design 2: Evaluation

These stages do not exist in a vacuum and are embedded in both smaller (e.g., landscape architecture) and larger (e.g., town planning) processes that must be acknowledged. For example, landscape architects might be involved at the conceptual or detailed design and development stages, with their own process of bringing in ideas at those stages looking similar to the process outlined above. With town planning and urban design and development projects, the two processes often overlap at the end of the design stage, when the applicant's designs are submitted to local authority planners for approval. However, planning policies often have advocated earlier engagement on design [57], such as during the pre-design stage when initial ideas are discussed between relevant parties.

Based on the 111 people who responded to this question, 59.1% stated that they made density decisions very often or often during the *Conceptual design and development stage*. This was followed by the *Detailed design and development* stage (56.9%), the *Identify need or opportunity* stage (55.6%), the *Explore and research* stage (50.5%) and the *Choosing a design* stage (49.0%). Respondents stated that they did not make density decisions often or not very often during the final two stages of the process.

Asked when they felt *other people* in their organization made density decisions, 72.3% of the 105 respondents selected the *Detailed design and development* stage as their most preferred option. In order of declining percentage, the other stages include the *Conceptual design and development* stage (69.9%), the *Explore and research* stage (63.3%), the *Choosing a design* stage (62.6%) and the *Identify need or opportunity* stage (61.7%). There was nothing conclusive in the findings about whether other people made density decisions in the final two stages—*On-site implementation and construction* and *Evaluation*.

Looking at both sets of responses by profession, some patterns emerge (see Table 5):

Table 5. When respondents make density decisions and when respondent think others make density decisions, by profession. *Note.* As some professions did not have many respondents, the following were consolidated into the category, "Other professions": Civil engineer, Landscape architect, Surveyor and Other.

Profession	When respondents make density decisions (N = 109)	When others make density decisions (N = 102)
Academics	Pre-design 1, Pre-design 2	Pre-design 1, Pre-design 2
Architects	Pre-design 1, Pre-design 2, Pre-design 3	Pre-design 1, Pre-design 2, Pre-design 3
Highways engineers	Pre-design 3, Design 1, Post-design 1	Pre-design 1, Pre-design 3, Design 1, Post-design 1, Post-design 2
People with multiple professions	Pre-design 1, Pre-design 2, Pre-design 3	Pre-design 1, Pre-design 2, Pre-design 3
Town Planners	Pre-design 1, Pre-design 3, Design 1	Pre-design 1, Design 1, Design 2
Transport planners	Pre-design 3	Pre-design 1, Design 1, Design 2
Urban designers	Pre-design 3	Pre-design 1, Pre-design 3
Other professions	Design 1, Design 2	Pre-design 1, Pre-design 2, Pre-design 3, Design 1

From the above table, it shows that academics, architects and respondents with multiple occupations believed that they made decisions about density at the same stage of decision making as other built environment professionals. However, highways engineers, town planners, transport planners, urban designers and other professions reasoned that they made decisions at other points in the decision making process compared with their colleagues. In the case of town planners and to some extent, transport planners, decisions about density seemed to shift to later stages when considering when others made similar decisions. With urban designers and other professions, the reverse was true for the most part: they felt that others made decisions about density earlier in the process or at about the same. Finally, highways engineers stated that others made decisions earlier, at the same time and later than they did.

Taken without the findings by profession, the above findings illustrate that respondents felt other people made density decisions later in urban design and development projects, *versus* themselves. One possible reason for this finding is that respondents may feel as though other people make decisions about density *too late*, thus resulting in developments that do not adequately consider density and its consequent impacts on the surrounding area and city. Alternatively, respondents may have felt that *they* made decisions about density too early, and it was really at the detailed design stage when decisions should be made. When adding the cross tabulations by profession into the responses, the results are muddled: some professions think that others make density decisions before them whereas other professions think they make decisions after them. Still other professions believe that everyone is making density decisions at the same time. A follow-up question about *why* respondents chose to answer in the way they did would have been helpful to uncover the stage(s) that is more preferred (v. the stage(s) in which such decisions are most often made).

6.3. Resources Used by Respondents to Inform Density Decisions

Survey respondents were asked to list the resources, tools and techniques that they used most often when making decisions about density. Of the 111 respondents who answered the question, 90.1% used planning policy, 81.1% looked at guidelines and standards, 72.1% were informed by past experiences, 44.1% sought advice from colleagues, 42.3% utilized three-dimensional visualizations, 39.6% read academic publications and 27.9% employed other means. This latter category included using resources from the Commission for Architecture and the Built Environment (CABE) (now the Design Council CABE), undertaking public consultation and design review, accessing Supplementary Planning Documents and masterplans, visiting other developments, finding best practice examples, surveying the surrounding context, utilizing statistical evidence and examining the financial viability of a scheme.

Survey respondents also had the opportunity to mention *specific* resources, tools and techniques, or additional sources of information, for making density-related decisions. Fifty-one respondents answered this question. The most-mentioned type of information that respondents felt could be used to make density decisions was *knowledge of the local context*. This may involve a design or physical analysis of the local area, taking stock of the general character or consulting with local people during the urban design and development process. Having *appropriate standards and guidelines* also was viewed as important to steer decision making about density. Such documents include:

Best practice guidance on density.
Clear guidance at the national, regional and local scales about the importance of getting a proper balance between density and design quality.
Guidance about participatory processes to help show what density looks like.
Guidance on legal policies for density and related issues.
A "pattern book" of similar densities with different physical forms to improve innovation, variety and quality of buildings and spaces.
Recreation space standards.
Highways standards for existing urban design developments.
Standards from Central government that illustrate "good" and "bad" examples of residential density and their impacts on the public realm, infrastructure, neighborhoods and cities.

Related to guidance on good and bad examples, respondents believed that having access to *case studies from around the world* to demonstrate what "good density" looks like and how it functions was important for making density decisions. Case studies could focus on, among other things, the tradeoffs between density and *transportation*, and density and *social issues*, like social equity and privacy.

Several respondents also felt that some clarification was needed about the quantitative calculation of density. *Having a better measure of density* was seen as one strategy to improve density decision making whereas *obtaining better data* was another strategy. Finally, respondents discussed the following:

- *Using models to visualize* different densities for urban design developments

- *Considering density at the appropriate scale* (e.g., there are times when the density of whole neighborhoods is more important for decision makers to think about than just individual dwellings or developments)
- *Earlier consideration of density in the urban design and development process*

Many of the resources coincide with what the authors found when mapping the urban design decision making process and speaking with key, urban decision makers about their roles in design and development [58,59]. Both their earlier findings and the findings based on this survey suggest that resources could be divided into those that are more *formal*, such as planning policies, guidelines and standards, and more *informal* or *social*, such as past experiences, visits to other developments, advice from colleagues, having knowledge of the local context, being able to look globally at best practice and considering wider transportation and community issues. It is this latter set of informal resources that is often not discussed, yet which helps decision makers to understand local contexts and compare projects and places. Alongside the more formal resources, a comprehensive suite of tools should be developed to help decision makers navigate the complexities of density in urban environments.

In this section about density in practice, respondents said that the decision makers who *should* be making decisions about density are not, necessarily the ones who are *currently* making those decisions. This suggests a power imbalance within the planning process [60–62]. At present, respondents believe that developers have far too much power, which is having an adverse effect on the development and densities of cities. They also perceive that decisions about density are being made by others at a later stage of decision-making than when they make similar decisions, although when split by profession, this finding is less pronounced. By continuing to critically examine the power imbalance and suggesting ways to make planning and decision making more open, transparent and collaborative in practice as well as in policy [63–65], decisions about density should become more equitable, occur earlier in the process and involve more decision makers and stakeholders at the table. Finally, although the amount of resources and tools available to decision makers is great and varied, people, groups and organizations need to ensure that decision makers are conversant in, and have access to, a diverse range (from formal to informal) to ensure they have a broad skillset from which to make more informed decisions about density.

7. Conclusions

While 95% of survey respondents agreed that urban density is important or very important for making decisions about the design and development of cities, the concept of density is perceived as unclear, complex and easily misinterpreted. In particular, not enough is known about how different kinds of density—particularly when not planned or legislated for—have an impact on cities, who makes density decisions and when and how they make those decisions. This article sought to provide some answers and, in so doing, equip policymakers, practitioners, academics and the public with ideas about how to improve density policy, practice and education.

The 129 people who responded to the online survey represented a broad range of key, urban decision makers with a wealth of experience about the design, planning and management of cities. To them, knowing about the concentration of people and buildings in an area is integral to making better use of land, increasing opportunities for public transport, being economically viable and ensuring that

urban areas remain balanced, sustainable and resilient to whatever the future holds. Other kinds of density are important to this cause as well, such as the densities of natural and mobile material forms. Although not enshrined in policy, these kinds of densities deserve more attention due to empirical evidence suggesting the link between natural forms and mental health [40–42,66], and the social, economic and environmental consequences of people's mobilities [67,68], respectively. Furthermore, policies about or involving density need to be made at different scales to allow for more contextual compatibility within different areas of cities. Local authority policy makers need to be able to interpret national density policies, should they exist, at the city and neighborhood scales with an understanding of the changing context of these places. Finally, as this survey only scratched the surface about density policy, more research should be done to understand how and why policy plans are made and by whom so that the above issues can better integrated into the process of policymaking and within the larger political economy.

In terms of practice, survey respondents suggested that there is inequity in the urban design process and within the planning system, particularly as it relates to who makes decisions about density. At the moment, developers appear to have a large role to play in making decisions about how dense an area could be, but a shift needs to occur: the system needs to be more collaborative, participative and allow for consensus to be sought, rather than be a top-down exercise. Decisions about density also need to be made earlier in the process, as leaving them for the detailed design stage might result in architects and urban designers having to modify their schemes if local authority planning officers do not think the proposed densities relate well enough to the local context. As important, residents may react quite strongly and negatively if densities are not known until the final stages of design development and they are not part of negotiation discussions with decision makers. Bringing key, urban decision makers and stakeholders earlier and often into the process of decision making (*i.e.*, those who *approve* decisions about density, such as local authority development control/management officers and Councilors on planning committees; *take* decisions, such as developers; *shape* decisions, such as urban designers and architects; and *inform* decisions, such as residents) [69], can create better opportunities for consensus-building around density. One way to achieve this would be to create a team that likely will be involved throughout the lifetime of any development project (e.g., construction agencies, financiers/investors, local authority planners, residents) (see [55] for information about the creation of such teams in relation to the sustainability of urban design and development projects), and whose responsibility it would be to ensure that appropriate and sustainable decisions about density are taken.

In terms of education, schools of planning, design and engineering are mainly focused on readying their students for employment, which often involves learning formal, technical skills, such as Computer Aided Design or Geographical Information Systems [70]. However, when it comes to considering density in cities, students also need to have a broader skillset that embraces the more informal side of working with individuals and communities. Such resources should reflect the dynamic, cultural- and value-sensitivities of communities [71,72], and need to be embedded in a curriculum that regards these skills as important, rather than something that professionals will "pick up" on the job.

By carrying out some or all of these ideas in policy, practice and education—and continuing to undertake research about density and related issues—decision makers hopefully will make more

informed decisions about the density of urban environments, thus creating more sustainable cities, now and in the future.

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Conflicts of Interest

The authors declare no conflict of interest.

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