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# Identifying potential NIMBY and YIMBY effects in general land use planning and zoning

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ABSTRACT

The terms NIMBY (Not-In-My-Back-Yard) and YIMBY (Yes-In-My-Back-Yard) describe negative and positive attitudes toward proposed development projects respectively. These attitudes are posited to be influenced by geographic (spatial) discounting wherein the distance from domicile may contribute to local opposition or support. In contrast to specific development projects, the potential influence of NIMBY/YIMBY in a general land use planning process has not been systematically evaluated. In this study, we analyzed empirical data from a public participation GIS (PPGIS) process implemented for a general plan revision to examine the evidence for geographic discounting for a range of land uses using mapped preferences by community residents. Using distance analysis, we found significant evidence for geographic discounting by land use type with variable discount rates influenced by location of residence and the spatial configuration of land use in the planning area represented by zoning. The findings were consistent with NIMBY/YIMBY expectations with the exception of residential development where the results were more ambiguous. Residents want future land uses with amenities (open space, recreation, and trails) closer to domicile and more intensive, developed land uses (commercial, tourism, events, parking) further away. The findings have potentially broad implications because general/comprehensive planning—a requirement of most local governments in the U.S.—is operationalized through land use zones that appear subject to spatial discounting and the manifestation of potential NIMBY/YIMBY effects in the planning process. Future research should examine other planning contexts such as large urban areas with a greater diversity of land uses.

## 1. Introduction

The terms NIMBY (Not-In-My-Back-Yard) and YIMBY (Yes-In-My-Back-Yard) describe negative and positive attitudes toward proposed development projects respectively. Although the original use of the term NIMBY is vague, it came into widespread use in the 1980s to describe the "social response to unwanted facilities, sometimes called locally unwanted land uses (LULUs)" (Schively, 2007). Frequently used as a pejorative term, NIMBY implies local parochialism guided by selfishness, ignorance, or irrationality for development projects that appear to serve community needs, but which are perceived as unattractive, dangerous, a nuisance, or likely to result in decreased property values. As described by Schively (2007), "NIMBY is complex given the wide range of land uses and facilities, the diverse motivations and concerns of participants, and the manner in which NIMBY responses have been characterized". The term YIMBY emerged in the late eighties as an antipode to describe people that support local development near where they live. For example, YIMBYs may support new housing development that improves local housing conditions or "green" projects such as wind energy (YIMBY, 2009).

These attitudes can result in mobilized opposition or support for local development projects. Opposition groups are often motivated by perceived risks from proposed facilities (Kasperson, Golding, & Tuler, 1992). Some examples of the NIMBY phenomena may involve the siting of human or public service facilities such as affordable housing, homeless shelters, drug treatment facilities, detention centers, or facilities with potential environmental or health impacts such as waste processing plants, landfills, energy production, large-scale agricultural operations, or transportation infrastructure.

An important dimension of NIMBY is the posited influence of distance from domicile to the proposed development or land use. The term "geographic" or "spatial" discounting refers to the theory that people

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prefer to be close to what they like and distant from what they dislike (Hannon, 1994; Norton & Hannon, 1997; Perrings & Hannon, 2001). Geographic discounting can be operationalized and measured by examining the distance between opponents (or supporters) of a proposed development. Studies investigating the influence of distance from domicile on potential development projects have produced mixed results. In summarizing the evidence, Van der Horst (2007), concluded that "on aggregate, proximity does have strong influence on public attitudes to proposed projects, but the nature, strength and spatial scale of this effect may vary according to local context and 'value' of the land."

An alternative method for assessing geographic discounting is to use public participation GIS (PPGIS) methods where individuals identify and map locations of landscape values (e.g., aesthetic, recreation, biological) and land use preferences (opposing or supporting) that are posited to vary based on distance from an individual's reference location (Brown, Reed, & Harris, 2002). There is affirmative, but limited empirical evidence for the existence of geographic or spatial discounting measured using PPGIS methods. For example, Pocewicz and Nielsen-Pincus (2013) observed NIMBYism for residential and wind energy development in regional Wyoming; Brown, Kelly, and Whitall (2014) found evidence for NIMBYism in national forests in California where individuals living closer to the forests mapped fewer preferences for resource utilization than those living more distant. Within urban areas, there is also some empirical evidence for YIMBYism with the location of green space relative to domicile (Kyttä, Broberg, Tzoulas, & Snabb, 2013).

The majority of studies investigating geographic discounting and the NIMBY phenomenon have focused on specific development projects (e.g., low income housing) rather than support or opposition to general classes of land use (e.g., residential, commercial) identified in *general* or *comprehensive* land use plans. Most local governments (e.g., city, county, regional) in the U.S. are legally required to prepare and implement a land use plan, typically covering 10–20 years that identify long-range goals and inform decisions on future public and private development proposals. Zoning is the operational mechanism by which current and projected land uses are made spatially explicit in the form of a zoning map that identifies geographic areas where various types of land use are permitted. The zoning map is an outcome of the initial development or revision of the land use plan undertaken by local government. Land use ordinances define the regulations that apply to zones and may or may not be tightly coupled with the general planning process. Approximately ninety-seven percent of incorporated cities in the U.S. use zoning to regulate land use (Dietderich, 1996).

In this study, we examine the evidence for the presence of geographic discounting and NIMBY/YIMBY effects in a general land use planning process for a coastal community situated in central California (U.S.). Using participatory mapping methods, residents were asked to identify and map preferences for land uses that were identified as having the potential for the expression of NIMBY/YIMBY attitudes. As the first empirical study to examine the evidence for geographic discounting using participatory mapping for multiple land uses in a general land use planning process, there was relatively little guidance for analytical methods.

We structured our approach by first analyzing the distribution of land use preferences within the planning area to identify significant "hot spots" relative to the distribution of resident home locations. An understanding of the geography of the planning area and the distribution of resident domiciles were necessary to inform the analyses to account for spatial irregularities. We then sought evidence for geographic discounting by land use type by performing two types of distance analysis based on: (1) mean distance from resident domicile to mapped land use preferences, and (2) the distribution of preferences in uniform distance bands originating from the residence. The latter analysis generates distance plots showing preferred land uses proximate to resident domicile and less preferred land uses as more distant. We then examined whether the mapping of preferences is related to participant characteristics such as pre-existing attitudes toward the land use as there is evidence that participants translate non-spatial preferences into behavioral choices when mapping (Brown, 2013). Our final analysis used zoning as proxy for distance by examining the distribution of land use preferences mapped by participants within and outside their home zone. Our research methods were guided by the following research questions:

1) How are resident domiciles and mapped land use preferences spatially distributed within the general plan area?
2) What is the empirical evidence for geographic discounting for general land uses that can be characterized as having potential to manifest in NIMBY/YIMBY responses? Operationally, how is resident domicile spatially related to mapped preferences for different types of land use?
3) If geographic discounting is present for some land uses, is this finding related to resident attitudes toward current land use allocation in the planning area?
4) Is geographic discounting influenced by current zoning and land use allocation within the planning area?
5) What are the implications of the findings for general land use planning and zoning processes that are required by most local governments?

## 2. Methods

### 2.1. Study area, data collection, and sampling

Avila Beach is an unincorporated coastal community (census-designated place) located in San Luis Obispo County, California, U.S. with an estimated population of 1474 in 2015 (SLOCOG, 2017, p. 93401). The geographic area for this study is the land area encompassed within Avila Urban Reserve Line (see Fig. 1) containing just over 2220 acres. Much of area contains low intensity development except for areas adjacent to the beach that contain homes, hotels, and small business where tourism serves as the community's primary economic activity. Inland from the beach area are multiple housing developments where a significant portion of residents live.

Land use within the study area is currently governed by four primary plans: San Luis Obispo Inland Area Plan, Avila Community Plan (Inland), San Luis Bay Area Plan (Coastal), and the Avila Beach Specific Plan. These area-specific plans exist within the broader context of the San Luis Obispo County General Plan that identifies development goals and the distribution of future land uses for the county (see Envision Avila, 2016 http://www.envisionavila.org/). The participatory mapping survey reported herein was one component of a broader public participation process designed to inform the new Avila Community Plan which will consolidate the four separate plans into a comprehensive document to guide future land use for the next 20 years. Of particular relevance to this study and its potential implications are the land use categories (i.e., zones) described in the current plans which may be subject to revision. The largest area is zoned *Open Space* at 38%, followed by *Residential Suburban* at 19%, and *Recreation* at 18%.

In 2017, an internet-based participatory mapping survey was developed and implemented in a collaborative effort between the San Luis Obispo County Planning Department and California Polytechnic State University (Brown, Sanders, & Reed, 2018). Participatory mapping is a general term that describes the generation and/or use of spatial information, typically by non-experts, for a range of applications including land use planning. Participatory mapping includes the terms public participation GIS (PPGIS), participatory GIS (PGIS), and volunteered geographic information (VGI). For a review of empirical PPGIS applications to inform land use planning, see Brown and Kyttä (2014; 2018). The survey used a Google® maps application programming interface (API) where participants were instructed to drag and

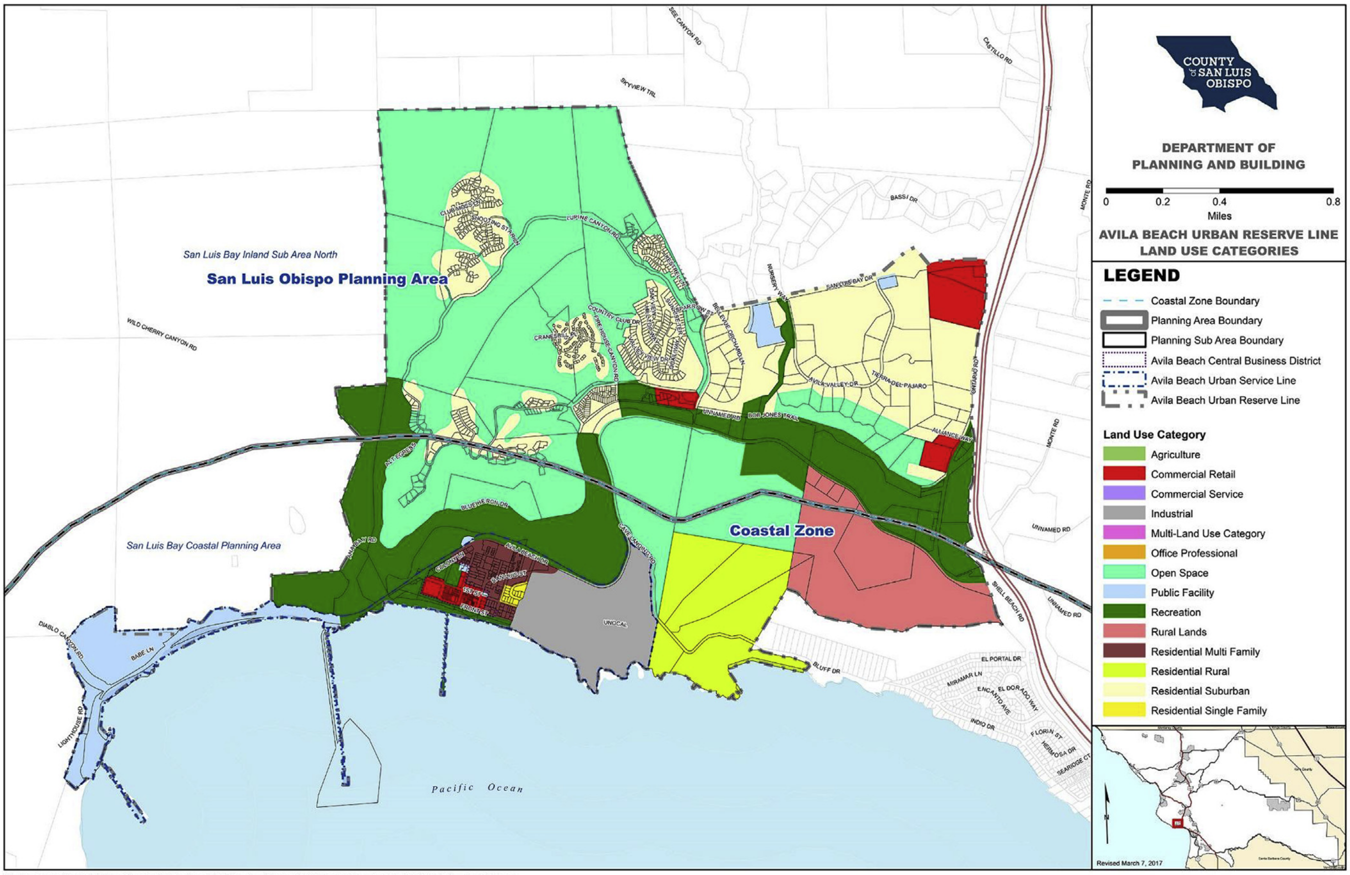


**Fig. 1.** Avila Beach planning area with current land use categories.

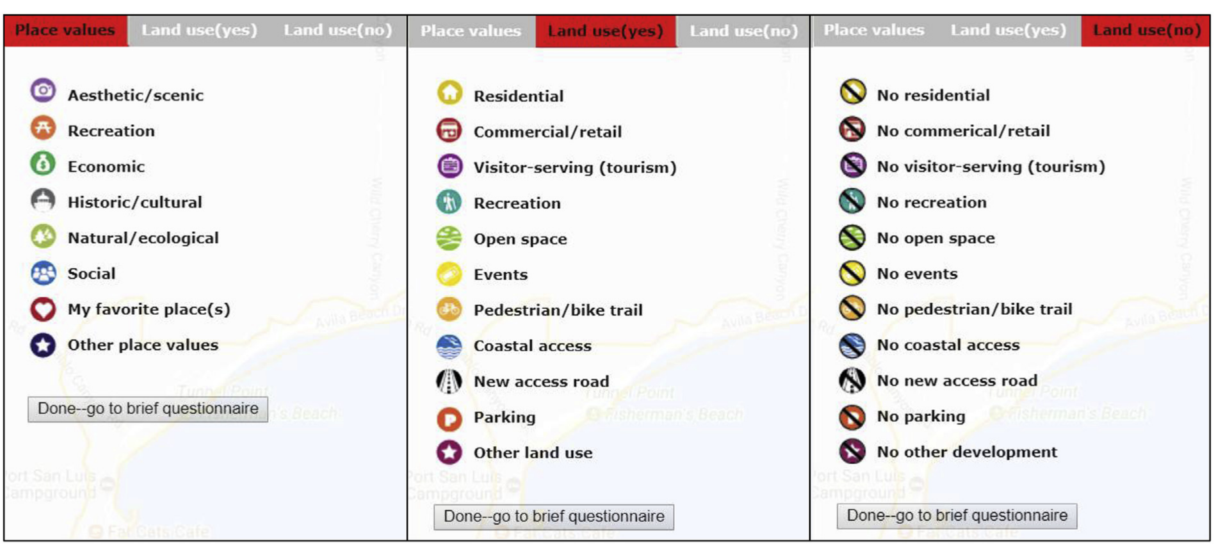


**Fig. 2.** Categories of place values (panel 1) and land uses (panels 2 and 3) used in participatory mapping survey for Avila Beach.

drop digital markers representing place values and land use preferences within the planning area (Avila Urban Reserve Line). The mapping interface consisted of three "tab" panels with eight place value markers (panel one) and 10 land use preference markers (panels two and three). See Fig. 2. The land uses in panels two and three were land uses that could be mapped as appropriate (panel two) or not appropriate (panel three) in the future community plan. The survey also included text questions that identified participant characteristics (demographics) such as home location, age, gender, and formal education, as well as planning questions that asked participants about appropriate levels of community development such as residential and tourism development, parking, community events, and environmental protection.

The sampling frame for data collection was the county's property database. A total of 820 unique parcels were identified in the planning area and owners of the parcels were mailed a letter of invitation describing the purpose of the survey to inform the Avila Community Plan update. The letter provided instructions, the survey website URL, and a unique access code to track participant responses. Two weeks after mailing the recruitment letter, a reminder postcard was sent to non-respondents to encourage participation. The survey website allowed individuals that did not receive an access code to also participate and this group is referred to as the "volunteer" sample. Data collection occurred from February through March 2017.

To accommodate individuals less comfortable with internet technology, a mapping "office hours" was held at the Avila Community Center. Two individuals participated in the survey at the community center. For additional support, the survey website included a "how-to" video to guide participants through the mapping process. A total of 93 individuals viewed the on-line "how-to" tutorial video.

### 2.2. Descriptive analyses

The spatial data from the survey were prepared for analysis using ArcGIS® v10.4. Home locations of participants were mapped using geocoded addresses from the property database, and for "volunteer" participants, home locations were geocoded from addresses voluntarily provided by participants. The land use preference marker locations were plotted from coordinates captured with the Google Maps API during the mapping process.

The number of participants, the number of land use markers mapped, and the spatial distribution of both were examined to determine the adequacy of spatial data for analysis and constraints for distance analysis given the shape of the study area. We chose nine land uses for analysis that we posited to have the potential for NIMBY effects (*residential*, *commercial/retail*, *tourism*, *parking*, *events*, *no development/change*) or YIMBY effects (*open space*, *recreation*, and *trails*). We examined the spatial distribution of mapped land use markers (points) using the Getis-Ord Gi* spatial statistic or simply Gi* (Getis & Ord, 1992). The Gi* statistic identifies significant high (or low) values commonly referred to as "hot spots" and "cold spots". To calculate the Gi* statistic, we used the ArcGIS® "Optimized Hot Spot Analysis" tool because it aggregates incident data (mapped points representing preferred land uses), identifies an appropriate scale of analysis, and corrects for spatial dependence. The point data were aggregated into 25 m cells with statistically significant cells based on z-scores and 95% and 99% confidence levels displayed on the base map. Each potential land use could be mapped as appropriate or not appropriate for the spatial location. For simplicity, we refer to appropriate land uses as "yes" and inappropriate land uses as "no". The posited YIMBY land uses of open space, recreation, and trails did not have sufficient "no" location markers to do the analysis, but hot spot analysis was done on the "yes" responses.

We assessed the representativeness of study participants by comparing demographic variable responses (age, gender, education, and life-cycle stage) to census data for Avila Beach CDP. Given the study focus on residents, non-residents were excluded from further analysis.

### 2.3. Distance analysis

We performed two types of distance analysis to find evidence of geographic discounting: (1) mean distances from residence to mapped land use, and (2) distance bands showing the distribution of land use markers at increasing distance from residence. The first type of analysis indicates whether mean distances significantly differ by land use type while the second analysis indicates the rate of spatial discounting as function of distance from residence. We calculated the distance between participant residence and each mapped land use marker using Euclidean distance. Given that residential locations in Avila Beach are geographically divided between inland subdivisions and the downtown/beach area, our distance analysis was performed on two sampling groups: (1) inland residents (n = 95), and (2) downtown residents (n = 24). We performed t-tests to assess significant differences in mean distances between sampling groups and analysis of variance (ANOVA) to assess significant differences in mean distances within each sampling groups.

For the distance band analysis, we plotted the frequency of land use markers located in 250 m bands at increasing distance from residence up to 1500 m. For visual display, we grouped the land uses into the posited categories of NIMBY and YIMBY.

### 2.4. Distance analysis by attitude toward current land use allocation

To assess the potential influence of attitudes toward current levels of land use allocation in the planning area on spatial discounting, we examined the mean distance for four different land uses (residential, tourism, parking, and events) in the two sampling groups (downtown, inland) that had an associated attitudinal survey question. The potential effect of participant attitude response was analyzed based on three response categories which consisted of: (1) current level of land use allocation is not enough, (2) current level of land use allocation is about right, and (2) current land use allocated is too much. General linear models (including interactions) were run for each of the four land uses with distance as the dependent variable and attitude response (not enough, about right, too much) and sampling group (inland, downtown) as fixed factors. Separate models were run for both appropriate (yes) and not appropriate (no) land use categories.

### 2.5. Zoning analysis

In the final analysis, we examined the distribution of land use preferences mapped inside and outside the zone of residence to explore whether NIMBY/YIMBY responses could be related to resident concerns with future land use changes in the participant's residential zone. Ultimately, changes in the general plan would manifest in changes in the current zoning map. In this analysis, one would expect mean distances to mapped preferences to be shorter within the zone and more distant outside the zone. However, the focus in this analysis was the number and type of preferences mapped by residents inside and outside the zone of domicile. Consistent with the previous distance analysis, we examined the distribution of preferences by the two sampling groups—downtown and inland residents.

## 3. Results

### 3.1. Participation rates and respondent characteristics

A total of 174 individuals mapped one or more locations consisting of 141 households and 33 volunteers. The household survey response rate was estimated to be 21% after accounting for 149 non-deliverable recruitment letters. There were 7682 mapped locations, with the mean number of markers mapped per participant was 51 with a median value of 37. To conduct the analysis for spatial discounting, we limited our analysis to those participants whose location of residence could be definitively identified (n = 105) from the survey. See Table 1. Of this response subset, most participants were from the household sample (n = 97) versus the volunteer sample (n = 8), and most were full-time residents of Avila Beach (n = 98). In terms of demographics, participants were older (mean age 66 years), more male (59%), and had a higher level of formal education (88% with bachelor's degree) than indicated by census statistics for the area. The most common life-cycle stage of participants was an older couple with no children living at home (48%).

### 3.2. Frequency and spatial distribution of land use preferences and home locations

The spatial analysis was limited to nine land use preferences mapped by residents falling within the study area (3376 locations). Each land use preference could be mapped as appropriate to the location ("yes") or not appropriate ("no"). The most frequently mapped

**Table 1**
Profile of participants with residence located in study area in study area with selected census demographics provided for comparison from the 2011–2015 American Community Survey 5-Year estimates for Avila Community. Not all percentages total 100% due to rounding.

| Number of participants (home in study area) | All | Household | Volunteer |
|---|---|---|---|
| | 105 | 97 | 8 |
| **Knowledge of study area** | | | |
| Knowledge of places (%) | | | |
| Excellent | 47% | 43% | 75% |
| Good | 40% | 44% | 0% |
| Average | 13% | 12% | 25% |
| **Residence** | | | |
| Full-time resident | 93% | 95% | 75% |
| Part-time resident | 7% | 5% | 25% |
| Years lived in Avila | 12 | 12 | 12 |
| **Demographics** | | | |
| Gender (ACS 2015: Male 54.3%)[1] | | | |
| Female (%) | 41% | 41% | 38% |
| Male (%) | 59% | 59% | 62% |
| Age in years (mean/median) (ACS 2015: median 58.5)[1] | 66/66 | 66/66 | 69/69 |
| Education (%) (ACS 2015: 45.5% Bachelors/postgraduate)[1] | | | |
| Less than Bachelors | 12% | 14% | 0% |
| Bachelor's degree/postgraduate | 88% | 86% | 100% |
| Lifecycle Stage | | | |
| Mature Couple/No children | 21% | 20% | 37% |
| Mature Single | 10% | 10% | 13% |
| Mature Family (youngest child over 16) | 16% | 16% | 13% |
| Middle Family (youngest child 6–15 years old) | 4% | 4% | 0% |
| Older Couple (no children living at home) | 48% | 49% | 38% |
| Young Family (youngest child less than 6 years old) | 2% | 2% | 0% |

land uses by marker counts and category were *open space* (yes = 709); *residential* (no = 630); *trails* (yes = 287); *no development/change* (283); *commercial* (no = 268); *recreation* (yes = 252); *residential* (yes = 189); *tourism* (yes = 182); *parking* (yes = 156); *commercial* (yes = 128); *parking* (no = 96); *tourism* (no = 77); *events* (no = 71); *events* (yes = 33); *recreation* (no = 9); *trails* (no = 4); and *open space* (no = 2).

The hot spot analysis revealed statistically significant clusters of preferences within the planning area. The highest preferences for residential development were located in the downtown area and the area east of downtown, the site of a former industrial tank farm currently zoned "industrial" but with potential for redevelopment (Fig. 3a). Smaller hotspot preferences were located in two coastal areas and near existing residential subdivisions located inland (Fig. 3b). The "intersect" maps (Fig. 3c, f, i) shows the hotspot spatial areas common to both "yes" and "no" mapped preferences for the same land use and indicate differing community views on appropriate land use. Areas of differing residential preferences were located to the west and east of the downtown area and in two coastal locations (Fig. 3c). Commercial/retail development was preferred in three primary locations: downtown and the adjacent former industrial site, the Port San Luis area west of downtown, and an inland area adjacent to an existing hotel and athletic club (Fig. 3d). Opposition to commercial retail development was located in multiple hotspots, principally in the former industrial site, the Port San Luis area, and undeveloped green areas north of downtown (Fig. 3e). Locations of differing commercial land use preferences were located in the former industrial site, the downtown area, and in the Port Luis area (Fig. 3f). Preferences for new tourism development were primarily coastal with the exception of two areas located adjacent to an existing golf resort and a farming operation serving tourists (Fig. 3g). Opposing preferences for tourism development included the former industrial site and green areas north of downtown (Fig. 3h). Differences in tourism preferences were located in the former industrial site and the area adjacent to a golf resort (Fig. 3i).

Two land uses—community event space and parking—are related to community impacts from beach-related recreation and tourism with potential "nuisance" effects on residents from increased traffic, noise, and congestion. Preferences for increased parking occur in multiple locations (Fig. 4a) while opposition to new parking were located in areas surrounding downtown and in Port San Luis (Fig. 4b). Areas of parking disagreement were located near the main access road north of downtown and in Port San Luis (Fig. 4c). Mapped locations for community events was dispersed throughout the study area (Fig. 4d) while opposition was in open areas proximate to the downtown core area (Fig. 4e). The areas of preference disagreement (spatial intersection of "yes" and "no") were located in open areas proximate to downtown (Fig. 4f).

Land use typically associated with amenity values—open space, recreation, and bike/pedestrian trails—were posited to be associated with YIMBY attitudes. As such, there were insufficient mapped locations in opposition to do hot spot analysis. In support of these land uses, residents mapped open space preferences in the former industrial area, the existing "Pirates Cove" park reserve, designated open space inland, and in the corridor connecting downtown with Port San Luis (Fig. 4g). Recreation hot spots were spatially coincident with open space hot spots, but also included areas with more developed forms of recreation such as the golf resort and beach areas (Fig. 4h). Trail hot spots were located primarily along the coast (Fig. 4i).

Resident home locations were split into two relatively distinct areas. The largest number of participant residences (n = 83) were located in residential subdivisions inland from the downtown area with the remainder of residences (n = 22) located in the downtown/coastal area. With this bifurcated spatial distribution, distance analysis for NIMBY/YIMBY land use was performed for the two residential sampling groups separately (downtown, inland) given that distance effects can be masked by averages for land uses that span both residential areas.

### 3.3. Distance analysis

We examined the mean distance between residence and land use for all participants (n = 105), downtown residents (n = 22), and inland residents (n = 83). For all participants combined, residential (yes) preferences were mapped closest to home followed by commercial (no), recreation (no), tourism (no) and open space (yes). Land use preferences most distant from home were parking (yes), commercial (yes), and tourism (yes). However, these aggregated community responses (inland + downtown residents) are biased toward inland residents because of the large difference in sampling group size. More meaningful distance results appear by sampling group as shown in Fig. 5 where the mean distances were plotted using error bars with confidence intervals. Downtown residents mapped all land use preferences, on average, closer to residence compared to inland residents. These mean differences between sampling groups for all land uses were statistically significant (t-tests, $p < 0.05$) and are visually evident in separation and non-overlap of the error bars. Within each sampling group, many of the mean differences between land uses were statistically significant (ANOVA, Bonferroni, $p < 0.05$), especially in the inland sampling group which was larger with less variability in distances.

For inland residents, commercial (no), recreation (no), residential (yes), and open space (yes) were mapped closest to home while tourism (yes), parking (yes), commercial (yes), and events (yes) were mapped furthest from home. For downtown residents, parking (no), residential (yes), no development, and recreation (no) were mapped closest to home while parking (yes), commercial (yes), tourism (yes), and recreation (yes) were mapped furthest from home. There were insufficient markers to meaningfully plot land uses for recreation (no), trails (no), and open space (no).

In the second type of distance analysis, the distribution of mapped land use preferences were plotted by distance bands (250 m) around the residence for the downtown and inland sampling groups. The results

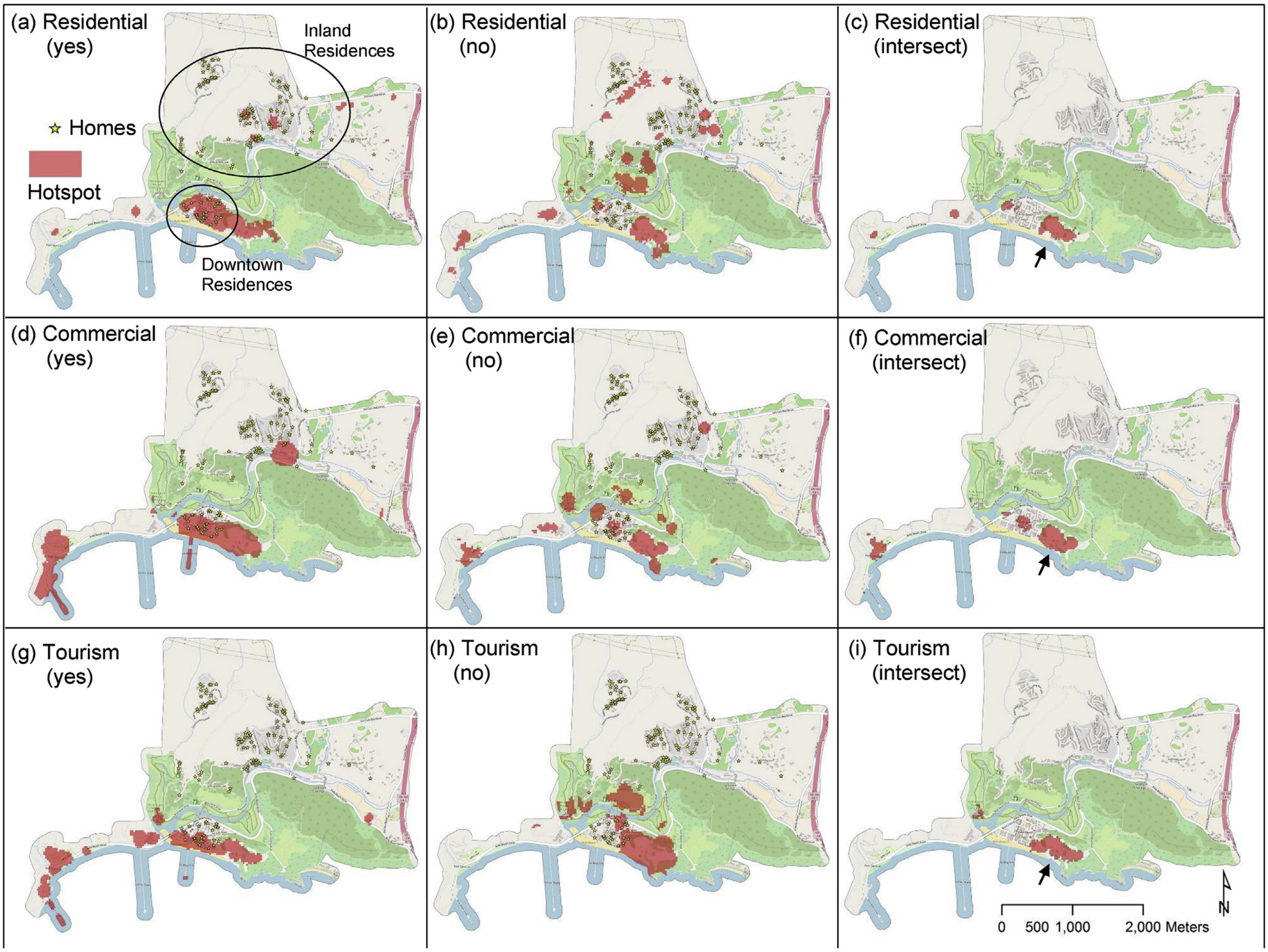


**Fig. 3.** Significant hotspots (Getis-Ord Gi* > 95% confidence) for three different land uses: (a) residential development (yes); (b) residential development (no); (c) spatial intersection of residential (yes) and residential (no); (d) commercial/retail development (yes); (e) commercial/retail (no); (f) spatial intersection of commercial (yes) and commercial (no); (g) tourism development (yes); (h) tourism development (no); (i) spatial intersection of tourism (yes) and tourism (no) hotspot areas. The "intersect" map is the hotspot spatial area common to both the "yes" and "no" mapped preferences and is indicative of differing views on the appropriateness of the land use in this area.

appear in Fig. 6. The findings of the mean distance analysis were confirmed by distance band analysis but provide additional information. The rate of spatial discounting differed by land use and sampling group as evidenced by large visual differences in the lines that display frequency distributions of mapped land uses as a function of distance from residence. For downtown residents, the land uses mapped closest to residence (within 500 m) were parking (no), residential (yes), and no development. For inland residents, the land uses mapped closest to residence were commercial (no), residential (no), and residential (yes). The spatial discount rates for posited YIMBY land uses (open space, recreation, and trails) were also markedly different between inland and downtown residents. Downtown residents mapped the plurality of these land uses within 500 m while inland residents mapped a very small percentage within the same distance.

The spatial distributions of NIMBY and YIMBY land use preferences by distance band (Fig. 6a and c) for downtown residents merit special attention because they are visually different from inland residents (Fig. 6b and b). Normatively, one might expect that preference markers for land uses (both positive and negative) would distribute incrementally as a function of distance band. However, the NIMBY and YIMBY preferences for downtown residents by distance band do not show incremental changes in marker counts similar to inland residents because of differences in the study area geography and existing land uses. Several factors contribute to the more variable distribution of preference markers by distance band: 1) downtown residents are bounded by the coast which precludes marker placement in all cardinal directions, 2) there is greater heterogeneity in land uses and zones proximate to downtown residents compared to inland residents, and 3) there are natural limiting factors for locating some land uses. For example, the increase in events (yes) preferences at approximately 750 m from downtown coincides with the location of community parklands where large community events are often held. For the YIMBY markers, downtown residents prefer trails, recreation, and open space within close proximity (500 m) as expected, but the coastal boundary forces additional preferences to be distributed in more distance inland areas or laterally along the coast. Thus, variability in local area geography and existing land uses result in greater variability in land use preference distributions as a function of distance from domicile.

To summarize, there is strong evidence for the presence of geographic discounting by land use type and by sampling group. Further, the location of residence, combined with the existing spatial configuration of land use, appear to influence the types of land uses that are spatially discounted. Inland residents living in residential suburbs were concerned about the proximity of new commercial and recreation

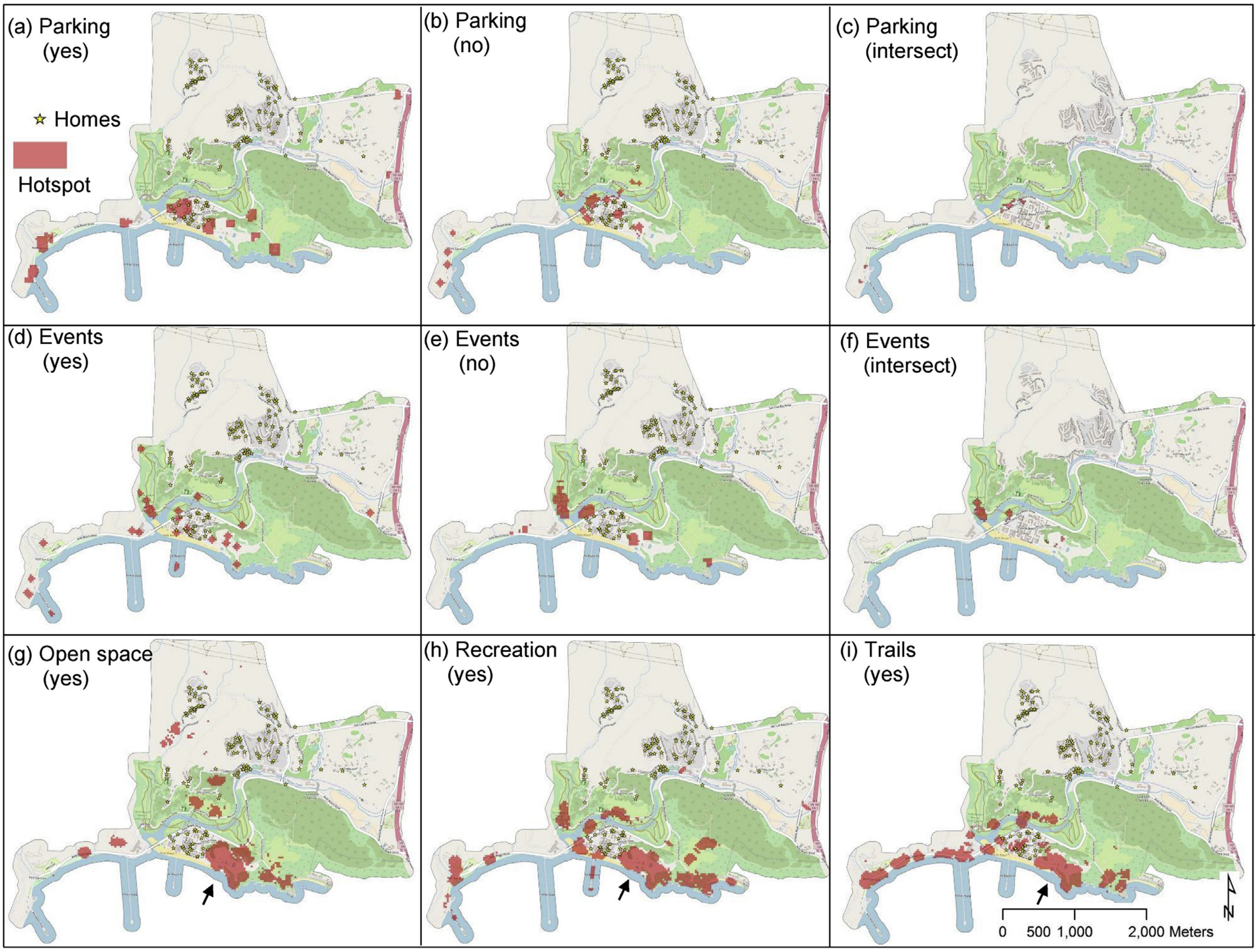


**Fig. 4.** Significant hotspots (Getis-Ord Gi* > 95% confidence) for multiple land uses: (a) parking (yes); (b) parking (no); (c) spatial intersection of parking (yes) and parking (no); (d) events (yes); (e) events (no); (f) spatial intersection of events (yes) and events (no); (g) open space (yes); (h) recreation (yes); (i) trails (yes). The "intersect" map is the hotspot spatial area common to both the "yes" and "no" mapped preferences and is indicative of differing views on the appropriate of the land use in this area.

development and somewhat less concerned about new residential development. Inland residents prefer to be close to open space which is the present situation. Downtown residents were most concerned about the proximity of new parking along with new commercial and tourism development. Downtown residents were less concerned about the proximity of new residential development.

### 3.4. Distance analysis by attitude toward current land use allocation

The potential influence of resident attitude about the current level of land use allocation on spatial discounting were analyzed for four land uses—residential, tourism, events, and parking. General linear models with interactions were run for each of the four land uses with distance from home as the dependent variable and attitude response ("not enough", "about right", "too much") and resident location (downtown, inland) as fixed factors. There were 12 models in total–appropriate, not appropriate, and combined markers—for each of the four land uses. The model results are presented in Table 2. All the models were statistically significant ($p < 0.05$) with residence location also being a significant main effect ($p < 0.05$) in each model. Mean distances for downtown residents were less than inland residents for all four land uses. There were no significant model interactions between the attitude and location factors. The attitude variable, as a main effect, was only significant in the residential land use model. Both Downtown and Inland residents who responded "not enough" mapped residential locations (yes) further from home than those who responded "too much". Participants who were attitudinally receptive to new residential development (i.e., "not enough" residential development) still prefer locations more distant from home. For the other three land uses (tourism, parking, events), resident attitude toward the current land use allocation—whether the respondent believed current allocation was about right or too little/much—did not influence where the related land use preference markers were placed as a function of distance from residence. Overall, there was little evidence for attitudinal effects on distance in mapping appropriate or inappropriate land uses.

### 3.5. Zoning analysis

The distribution of land use preferences that were mapped inside and outside the participant's residential zone were tabulated for comparison and appear in Table 3. Spatial data for the downtown sampling group was limited given the small number of residents in this group. The most salient future land use within the immediate home zone of participants for both sampling groups was residential development based on the number of preferences and individuals who mapped this land use. Downtown residents also mapped preferences in support and

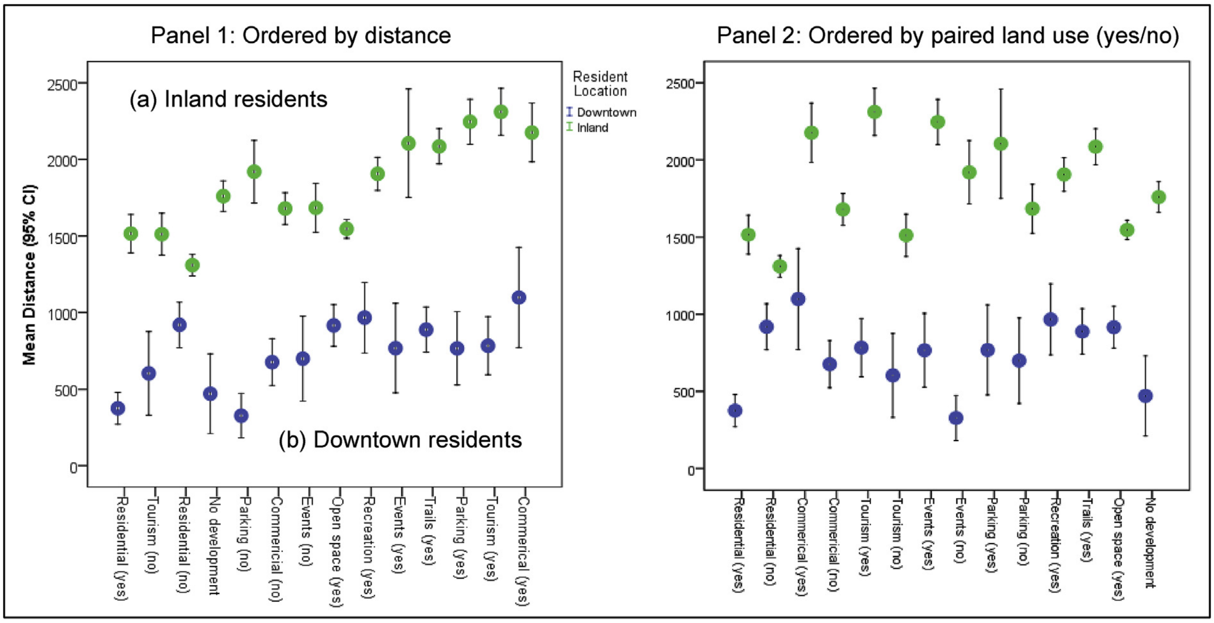


**Fig. 5.** Error bars showing mean distances from residence to mapped land uses with 95% confidence intervals for two sampling groups: (a) inland residents; and (b) downtown residents. Panel 1 is ordered by increasing distance and Panel 2 is ordered by paired land uses (yes/no). There were insufficient markers to plot land uses for recreation (no), trails (no), and open space (no).

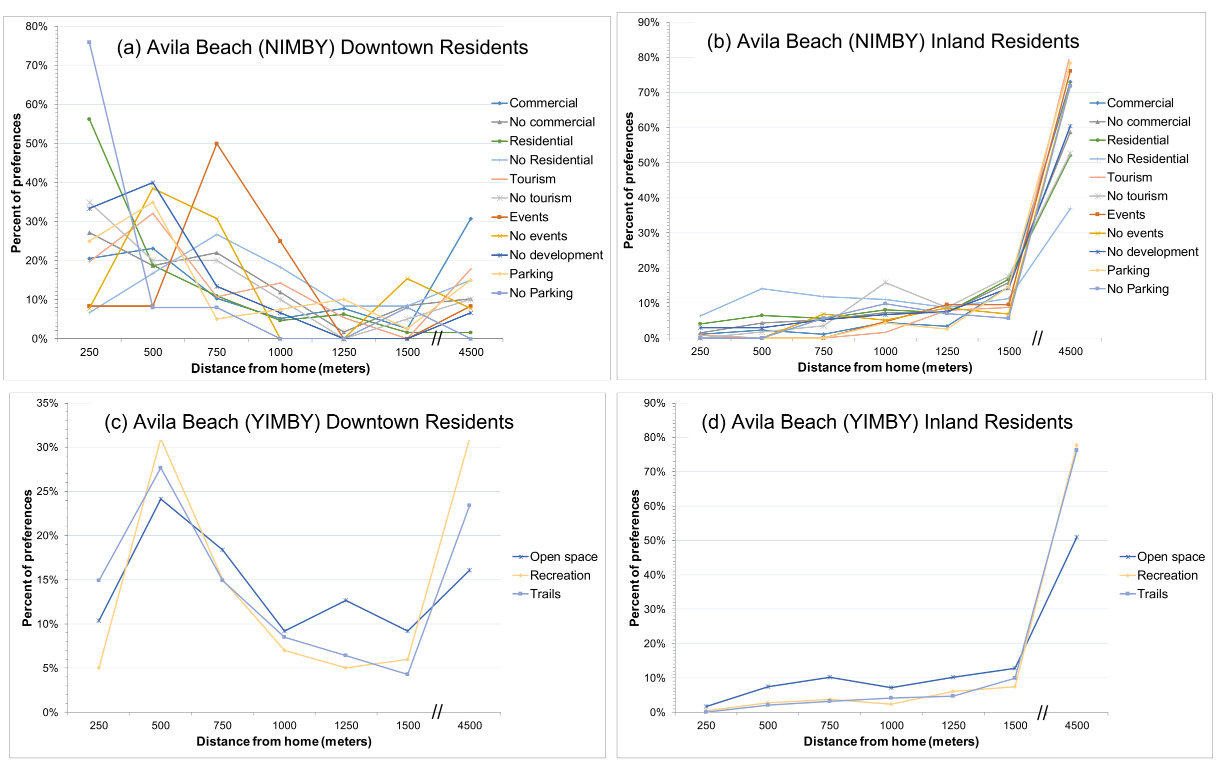


**Fig. 6.** Frequency distribution of mapped land uses in 250 m distance bands from residence for two sampling groups: downtown residents and inland residents. Land uses are grouped by posited NIMBY and YIMBY land use categories.

opposition to commercial and tourism development within their home zone, but only three inland residents (out of 83) mapped preferences for these land uses in their home zone. Inland residents expressed most of their preferences outside their home zone with no preferences at all mapped for events, trails, and parking land uses. In contrast, downtown residents mapped preferences for the full range of land uses in their home zone.

## 4. Discussion

This study was one of the first to examine the evidence for geographic discounting and potential NIMBY/YIMBY effects using participatory mapping across a range of land uses in a general land use planning process. The purpose of the study was to identify whether different spatial discount rates apply to different types of general land use and the potential for the emergence of NIMBY/YIMBY community

**Table 2**

General linear model results on potential effects of respondent attitudes on distance to mapped land use preferences from home location. Land use preferences were mapped separately as appropriate (yes) or inappropriate (no). All GLM models were statistically significant ($p < 0.05$) with the location factor (Downtown vs. Inland) also being significant ($p < 0.05$). No factor interactions were significant ($p > 0.05$) Only residential land use showed a potential attitudinal effect on distance.

| Land use | Attitude toward land use allocation by response category and resident location | | | | Attitudinal effect on distance? | | | Finding/interpretation |
|---|---|---|---|---|---|---|---|---|
| | | Resident Location | | | Marker category | | | |
| | | Downtown | Inland | All | Combined (yes/no) | Yes (appropriate) | No (not appropriate) | |
| Residential | Not enough | 21.0% | 4.5% | 7.0% | Significant | Significant | NS | Both Downtown and Inland residents who responded “not enough” mapped residential locations (yes) further from home than those who responded “too much”. Participants who are receptive to new residential development prefer locations more distant from home. |
| | About right | 42.7% | 72.0% | 67.6% | | | | |
| | Too much | 36.3% | 23.5% | 25.4% | | | | |
| Tourism | Not enough | 22.4% | 13.7% | 16.2% | NS | NS | NS | Attitudes toward tourism reveal no significant effect on distance to mapped tourism locations. |
| | About right | 64.5% | 57.4% | 59.5% | | | | |
| | Too much | 13.2% | 29.0% | 24.3% | | | | |
| Parking | Too little | 58.5% | 65.9% | 64.0% | NS | NS | NS | Attitudes toward parking reveal no significant effect on mapped parking locations. |
| | About right | 41.5% | 29.7% | 32.8% | | | | |
| | Too much | 0.0% | 4.3% | 3.2% | | | | |
| Events | Too few | 4.3% | 12.8% | 10.9% | NS | NS | NS | Attitudes toward parking reveal no significant effect on mapped parking locations. |
| | About right | 69.6% | 28.2% | 37.6% | | | | |
| | Too many | 26.1% | 59.0% | 51.5% | | | | |

NS = non-significant effect in GLM model.

responses. Whereas traditional approaches to the study of geographic discounting and the NIMBY phenomenon focus on specific development projects, this study examined resident proximity to preferred land use types. The findings have potentially broad implications because in the development or revision of a general plan, zoning decisions will be made with the potential to mobilize local resident opposition (or support).

In our distance analysis of preferences for land use, we found that different spatial discount rates were present and appear to be influenced by the allocation of current land use as well as preferences for future land use. In the planning area, resident locations were geographically bifurcated into downtown and inland areas, requiring separate distance analyses. In general, downtown residents had a higher spatial discount rate and were most concerned about proximate land uses with potential nuisance effects from commercial and tourism development, event locations, and parking. Inland residents in subdivisions who were most distant from the commercial downtown area were concerned about preserving their residential land use and surrounding open space. Downtown residents expressed YIMBY spatial preferences for open space, trails, and recreation opportunities.

The interpretation of spatial preferences for residential development merits special attention. One might hypothesize that a strong NIMBY attitude would be consistent such that residents map preferences opposing new residential development proximate to domicile, and preferences in support of new residential development more distant. But residents in both sampling groups mapped a significant number of supporting residential preferences proximate to domicile. We interpret these supporting residential preferences as a desire for residents to maintain the residential status quo in proximate areas rather than preferences to increase the intensity of residential development. The NIMBY effects of new residential development is more likely associated with a particular type of residential development such as multi-family or low-income than residential development per se. For example, in a study of multiple housing projects, Pendall (1999) found that

**Table 3**

Analysis of land use preference mapping inside home zone versus outside home zone by number of preference markers (individuals) and mean distance (meters) for downtown and inland residents. ns = non-sufficient markers for analysis.

| Land use | Downtown (n = 22) | | | | Inland (n = 83) | | | |
|---|---|---|---|---|---|---|---|---|
| | Inside | Mean Distance | Outside | Mean Distance | Inside | Mean Distance | Outside | Mean Distance |
| Residential (yes) | 21 (5) | 138 | 43 (11) | 492 | 8 (6) | 431 | 117 (37) | 1590 |
| Residential (no) | 2 (2) | 158 | 58 (12) | 946 | 36 (7) | 480 | 534 (61) | 1310 |
| Commercial (yes) | 8 (2) | 126 | 31 (13) | 1350 | 0 (0) | N/A | 89 (34) | 2176 |
| Commercial (no) | 4 (3) | 89 | 55 (12) | 719 | 10 (3) | 879 | 199 (53) | 1720 |
| Tourism (yes) | 6 (4) | 190 | 50 (13) | 855 | 0 (0) | N/A | 126 (40) | 2311 |
| Tourism (no) | 4 (2) | 93 | 16 (8) | 731 | 0 (0) | N/A | 57 (18) | 1512 |
| Recreation (yes) | 0 (0) | N/A | 40 (13) | 967 | 2 (1) | 330 | 210 (51) | 1906 |
| Recreation (no) | ns | ns | ns | ns | ns | ns | ns | ns |
| Open space (yes) | 3 (3) | 106 | 84 (15) | 945 | 13 (4) | 613 | 609 (57) | 1567 |
| Open space (no) | ns | ns | ns | ns | ns | ns | ns | ns |
| Events (yes) | 1 (1) | 239 | 11 (11) | 816 | 0 (0) | N/A | 21 (14) | 2105 |
| Events (no) | 0 (0) | N/A | 13 (7) | 700 | 0 (0) | N/A | 58 (25) | 1684 |
| Trails (yes) | 9 (3) | 122 | 85 (11) | 970 | 0 (0) | N/A | 193 (52) | 2086 |
| Trails (no) | ns | ns | ns | ns | ns | ns | ns | ns |
| Parking (yes) | 3 (2) | 113 | 37 (13) | 820 | 0 (0) | N/A | 116 (43) | 2246 |
| Parking (no) | 17 (2) | 173 | 8 (3) | 657 | 0 (0) | N/A | 71 (21) | 1920 |
| No development | 4 (2) | 98 | 11 (4) | 607 | 9 (5) | 189 | 259 (40) | 1815 |

multifamily projects were most likely to encounter NIMBY resistance. However, Doberstein, Hickey, and Li (2016) found that messaging about the public benefits of increased housing density can potentially reduce the NIMBY response. In this study, we could not assess NIMBY effects based on residential density without providing mapping options for different types of residential development. Including different residential development options would be a useful innovation in future participatory mapping studies.

The findings of mapped preferences by home zone were consistent with general distance analysis results, but reinforce the importance of examining the current land use zoning context. Downtown residents live in close proximity to a greater diversity of land use zones, including commercial/retail zones while inland residential zones appear as enclaves surrounded by open space (Fig. 1). Changes in future land use are likely to be more dynamic in the downtown/coastal area compared to inland residential areas. The potential NIMBY/YIMBY effects expressed by residents in mapping preferences appear to be influenced (and confounded) by the current zoning context, even if participants were unware of specific zoning boundaries. In the web-based mapping application, residents did not have visual access to current zoning boundaries. The research team debated whether to include the current zoning map as an overlay in the mapping application, but decided it was more important for participants to map future land use preferences without being influenced or constrained by the current zoning map. Including the zoning map for some participants in an experimental design would be a useful innovation in future studies to examine the potential effects of zoning information on future land use preferences.

### 4.1. Implications for general/comprehensive land use planning

Land use decisions by local government involve a two-step process—the generation of a zoning map with associated regulations that determine general land use allocation, followed by specific development proposals that either conform to zoning requirements or seek a change. The general land use planning process where zones are delineated strongly influence future development by establishing the presumptive future land use. Once zones are established in the general plan, viable options for the public to oppose future land uses that appear consistent with the zone are limited. In most planning systems, the opportunity for greatest public influence in future land use comes not in response to project-specific proposals (i.e., an expression of NIMBY), but in the development and adoption of the general plan where the community development framework becomes established. The perceived threat (or opportunity) from zoning classification to residents appears more indirect and intangible to residents and thus is unlikely to generate the same type of NIMBY response as a specific project where the perceived impacts on residents appear more direct. Thus, the participatory mapping process described herein serves as a general diagnostic for examining the potential for land use conflict (see Brown & Raymond, 2014; Karimi & Brown, 2017) and provides evidence for spatial discounting as a contributing factor. For example, a proposed commercial development in the inland residential area of Avila Beach would suggest high potential for the mobilization of NIMBY opposition given the mapped preferences of inland residents for continued residential use and open space, but not opposition from downtown residents given the distance.

There are likely to be some community planning issues where preferences are not strongly related to distance and spatial discounting. In this study, the area southeast of downtown and former tank farm industrial site was mapped by many participants, regardless of resident location, with preferences both in support and opposition to residential, commercial, and tourism land use (see intersection hot spots, Fig. 3c,f,i). This finding highlights the importance of understanding the meaning of "local" land use where distance and spatial discounting may initiate a NIMBY response, and a "community" land use issue that is not strongly associated with distance per se. The future land use in this former industrial site is likely to be contentious given conflicting community preferences ranging from various types of built development (residential, tourism) to open space and the associated amenities of recreation and trails (see intersection hot spots, Fig. 4g,h,i). A 232-unit resort has been proposed for the site called "Avila Point" (see http://avilapoint.com) but there are community concerns about access and increased traffic (Sneed, 2015).

Whether or not actual opposition (or support) to changes in land use manifest in a general planning process are likely subject to the same variables found in specific development projects. For example, opponents of proposed facilities with NIMBY potential are more likely to vote and engage in other collective action and are typically older, more highly educated, and wealthier than supporters (Mansfield, Van Houtven, & Huber, 2001). These characteristics are present in Avila residents who are active and engaged in the general planning process. Although the specific changes to the updated general Avila plan were not developed as of the writing of this paper, we speculate that zoning changes that would increase the intensity of land use in the planning area would face significant organized opposition.

### 4.2. Study limitations and future research

The overall survey response (n = 176) generated a sufficient but small sample of 105 participants who mapped land use preferences and whose residence could be confirmed in the study area. Spatial analysis by multiple land use categories requires significant quantities of spatial data to make valid inferences, and although over 3300 observations were available for analysis, the data were still inadequate for some types of statistical and spatial analysis such as paired or repeated measures procedures, especially when two distinct resident sub-populations need to be analyzed.

There are inherent limitations in the selection of land use preferences for inclusion in a participatory mapping process. Design tradeoffs must be made. Participant time and effort is finite and providing a more comprehensive list of land use preference options (e.g., different types of residential development) will not generate significantly more spatial data for analysis (see Brown, 2017). The effect of adding more mapping options is to spread a finite response effort over more land use categories. This constraint poses a significant challenge for the implementation of participatory mapping in more complex planning applications such as those found in large urban areas which have an even greater diversity and spatial distribution of land uses. As a design heuristic, we suggest targeting the 10–12 most important land use categories which can be focused broadly, as in this study, or more specific land use sub-categories (e.g., different types of residential or commercial development).

## 5. Conclusion

The concept of spatial discounting and the potential for NIMBY/YIMBY community responses in a general land use planning process is complex given the range of potential land uses, the diverse motivations of residents, and the spatial distribution of current allocated land use relative to resident locations. Nonetheless, we found evidence of spatial discounting for general land use categories that were logically consistent with NIMBY/YIMBY expectations, with the exception of residential development where the results were more ambiguous. In general, residents want land uses with amenities closer to domicile and more intensive, developed land uses further away. But these findings are necessarily limited to the planning context, in this case, a land planning system characterized by Euclidean or single-use zoning. In other geographic locations the same conclusions may not hold. For example, high intensity urban development (dense infill) that might logically result in a NIMBY response were found to be rather attractive in Helsinki, Finland (Schmidt-Thomé, Haybatollahi, Kyttä, & Korpi, 2013). We speculate that planning contexts where mixed land use is more prevalent such as in European cities will not yield such clear evidence of spatial discounting by general land use classification and spatial preferences. Future research should be applied to other planning contexts such as large urban areas with a greater diversity of land uses.

## Appendix A. Supplementary data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.apgeog.2018.07.026.

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