Towards Green and Healthy Commercial Centers in Asian Cities: Evaluating Sustainability of Green Open Spaces in Shopping Malls

ショッピング・モールの中に大きな露天のグリーンスペースを作るとしたら、それは経営的に成り立つのか。マニラで行った検証結果を発表する。

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Abstract

This paper aims to approximate the amenity values of parks inside malls and evaluate their sustainability, approaching it from the contingent property valuation angle, using hedonic price modeling. Through a case study of restaurants inside malls (interviews and mapping inventory), it will establish the correlation between restaurant distances to park amenities. It is hypothesized that retail shops or restaurants located near the parks have a higher probability of ROI (return on investment) despite higher rental fees, due to volume of foot traffic generated by this amenity. Geographic Information Systems (ArcGIS) is used as a tool in measuring these observations. Factor analysis is performed to determine the significant variables, after which these are entered into a regression analysis to corroborate initial assumptions and hypotheses regarding the inverse proportionality between ROI and zoning/ distance and view to park, i.e. the nearer the shops are to the park, the higher the ROI. It is the researcher's hope that having the parks' economic viability and sustainability established will encourage urban planners and mall developers to allocate more generous portions of green open space, thereby contributing to the general welfare of its users and ultimately enhancing sense of place and communion with nature.

Keywords sustainable design, green open spaces

Introduction

In a consumerist society where practicality and profitability are regarded as foremost in the scale of priorities, where space allocation for rentable units is usually at a minimum in order to maximize revenue for the developers (whether housing or commercial ventures), there is a need to pause and consider the monetary value of what generally are regarded as non-revenue-generating amenities offered to the public for free, such as parks and open spaces.

Numerous real estate empirical observations on determining property values have been applied to housing, where proximity to parks dictates a higher market value for potential homeowners who are willing to pay a premium to enjoy this amenity. However, there are hardly any study available on determining amenity values of these parks inside malls or commercial developments, mainly because these are dictated by and exclusive to their respective private developers and would entirely depend on their product branding and established priorities in space planning, classified competitive information that is not made readily available for public consumption.

Moreover, although these civic spaces to a certain extent belong to the public realm, they are nevertheless privately-owned, precluding possibility of fiscal attention from government in the form of subsidies or tax shields, as in the case of public parks. Depending on their location, whether in a CBD of prime property or in the outskirts of a city, their values can be extremely high, such that a large allocation of space could mean sunk investment or lost business opportunity for the mall developers, owing to the conversion of use from potential revenue-generating units to common areas made accessible for the public to enjoy at no added cost to these users.

Real estate market value will be the most direct measure of the economic value of open space, which is the cash price that a buyer pays a seller in an open and competitive market. In urban or urbanizing regions, where highest and best use (as determined by the market) has usually been development, as in the case of Makati CBD where Greenbelt and Glorietta parks are located, or of Quezon City where SM Sky Garden and TriNoma Roofdeck Garden are found, the open space value of land should be separated from its development value. Paradoxically, developing these spaces into parks (though non-revenue generating) would lead to an appreciation of their economic value as they become nodes of social interaction and focal points of interest.

Research Problem

The main research problem hinges on finding out to what extent parks in shopping malls contribute to the increase in level of patronage of shops and restaurants within proximate distance to the park.

As for the sub-problems, the following questions were formulated:

- In examining the costs of land, development and maintenance of these parks, how do the mall developers get a return on their investment considering the lost business opportunity for revenue-generating units and the fact that these amenities are offered to the public at no added cost?
- How can the value of the land being occupied by the park (per sqm) be monetized in terms of: capital investment, operations/ maintenance expenses, cost of improvements, amenity values and, eventually, return-on-investment (ROI)?
- What is the strength of the relationship between the monthly rental fees of these tenants largely affected by their proximity to the park, i.e. the closer to the park, the higher the rental? How do these fees compare with shops or restaurants located inside the mall with no views of the park?
- To what extent does the park act as a node, i.e., is it a strong magnet for customers, generating volume of foot traffic for the shops and restaurants located contiguous to it?

Hypothesis

In evaluating the sustainability of these green open spaces in mall developments, the basic assumption is that the park acts as a magnet to generate a volume of foot traffic which spills over to the shops and restaurants located nearest to it, especially those found on the ground floor, immediately contiguous to the open area. It is hypothesized that the shops and restaurants nearest the park are charged a premium rental fee per month. Nevertheless, despite the higher fees, they are able to recover their expenditures in a few weeks due to their strategic location and the volume of foot traffic generated by these nodes or magnets.

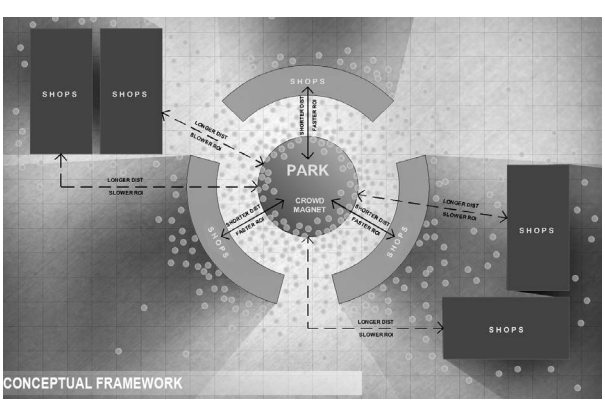


Fig. 1 2D Conceptual Diagram Model of the Sustainability of Parks in Malls

Research Methodology

Research Design: 3 Phases

Phase 1: Mapping Inventory/ Comparative Analysis

A handful of initial case studies was done for a background, specifically on the following: (a) Ayala Greenbelt Park in Makati, (b) Glorietta Parks in Ayala Center Makati, (c) SM North Sky Garden and (d) Trinoma Roof Deck Garden. However, it is the Ayala Greenbelt Park which will be the main focus of study, as it has the highest percentage allocation of green open space in relation to the building footprint and the entire property area.

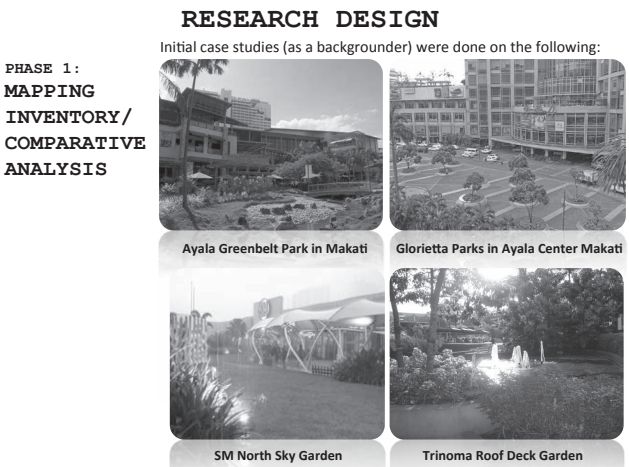


Fig. 2 Phase 1 - Photos of shopping malls studied from the mapping inventory angle

Phase 2: Questionnaire Surveys & Interviews

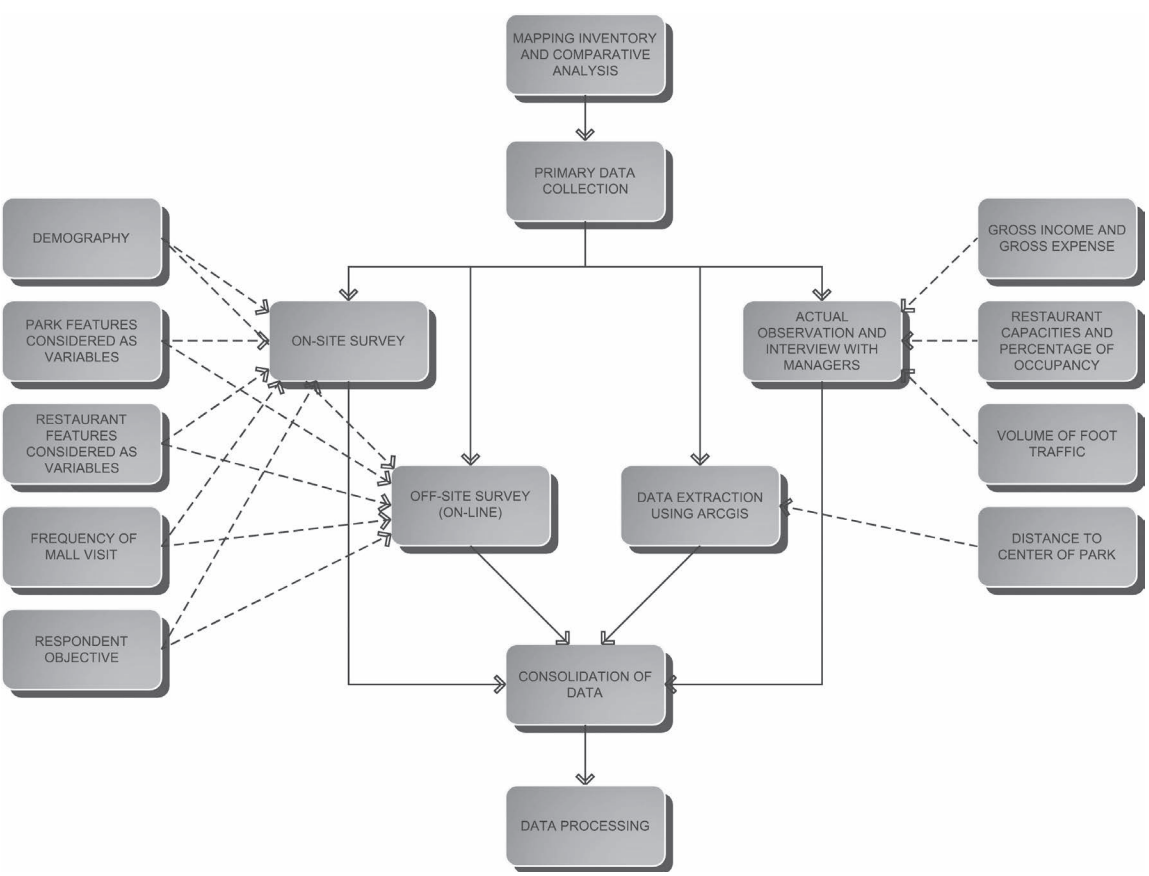


Fig 3 Diagram showing Flow of Data Gathering and Analysis for Phase 1

Phase 3: Factor Analysis and Regression

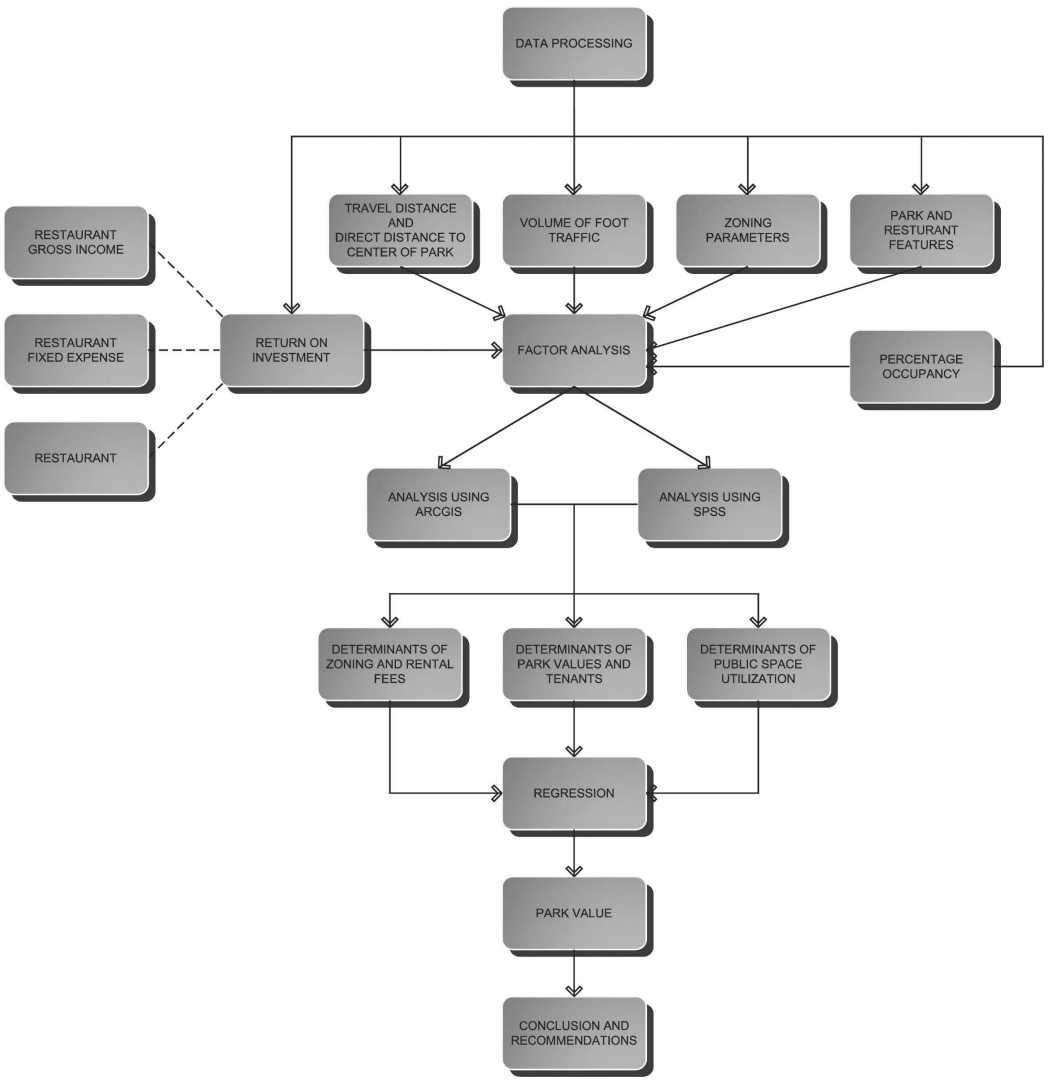


Fig. 4 Diagram showing Factor Analysis of Variables and Regression Process for Phase 3

A shortlist of restaurants and their rental fees was generated, with the volume of customers counted in relation to their proximity to the park. A computation of the footprint area of these open spaces in relation to the total lot and the total commercial development was derived from mapping inventory, the use of CAD and GIS software. Based on a review of literature, interviews and actual observation, the variables which have a strong bearing (strong predictors) of the amenity value of Greenbelt park were determined, after which a correlation among these variables was established. For the correlational strategy, using the Contingent Property Valuation Method, a formula equation combining the variables and their relation to the amenity value was derived.

Hedonic Price Modeling Equations

After getting primary data both from interviews and statistical description from the survey questionnaires, the values were applied to the Hedonic Price Modeling for regression. In this case, the hedonic application was used for determining or at least approximating the economic value of Greenbelt Park. A hedonic model of park-in-mall values was expressed in 2 categories, where one is for the tenant and the other is for the mall owner, as follows:

The primary data gathered from survey questionnaire responses and interviews were analyzed using Statistical Package for Social Sciences (SPSS) and other software used in statistics such as SAS and STATA to get the appropriate tests and results based on the data set and objectives.

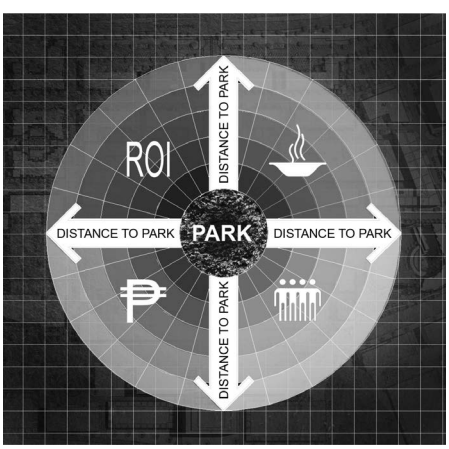


Fig. 5 Diagram showing Correlation of Variables for Park Value from Tenants' Viewpoint

Park Values for the Tenant:

$$PV_{Tenant} = f\,(Dist, RF, VP, FQ, RA, PA)$$

- PV is the amenity value of the park measured in terms of ROI (Return-on-Investment), which is the variable dependent on the following:
- Dist = the distance from the center of the park and forms part of the location-specific characteristics; distance to the park as a significant predictor, inversely proportional to the ROI, meaning, the closer the tenant is to the park, the higher the rate of ROI
- VP= Volume of Persons or foot traffic generated by the landscape amenity
- FQ = Food Quality
- RF = Rental Fees per month
- RA= Restaurant Amenities (e.g. wifi, ambience of the place, food service)
- PA = Park Amenities (e.g. size, location, landscaping features, covered areas, lounging space, lighting, water features)

Thus, the linear equation for the hedonic price modeling is as follows:

$$y = \alpha + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \ldots \beta_n x_n + \varepsilon$$

This equation is applicable for all the regression models wherein:

y = dependent variable
α = coefficient of regression
β = coefficient of 1st parameter (indep. variable 1)
x = independent variable 1
ε = error term

For the financial viability variables, the following equations are drawn:

- Net Income (NI) = Gross Sales (GS) less expenditure (Exp)
- NI = GS – Exp
- Expenditure (Exp) = Fixed Cost (FC) + Variable Cost (VC)
- Fixed Cost (FC) =Operations Costs (OC) + Maintenance Costs (MC)
- Fixed Exp = OC + MC
- Operations Cost = salaries, utilities (electricity, telephone, water), rental fees, transportation/ delivery costs
- Maintenance Cost = repairs and maintenance of equipment/ vehicles and building interiors
- Variable Cost (VC) = Cost of Goods Sold (CGS) + 5% of Gross Sales (GS)
- CGS = 35% of gross sale

Park Values for the Mall Owner:

- PVMall = ROIMall = (a) > [(b) + (c)]
- Revenues (Rev) of the Mall = [percentage of gross income of tenants (5% GI) + monthly rental fees (MRF) + Other Income (OI)]
  - **Revmall = 5% GI + MRF + OI (a)**
- Capital Outlay (CO) = [cost of land investment (LIn) + land improvements, i.e., trees, soil, utilities, etc. of the park (LImp)]/ Time (T)
  - **CO = [LIn + LImp] (b)**
    T
- Expenditure (Exp) = operations (OC) + maintenance costs (MC)
  - **Exp = OC + MC (c)**

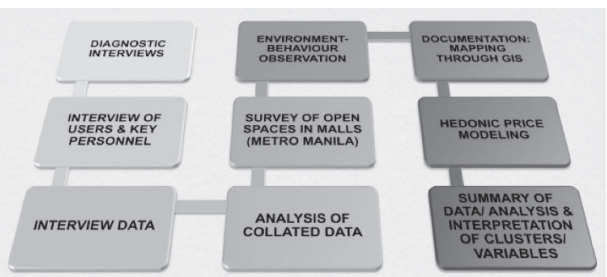


Fig. 6 Process in Collecting and Analyzing Primary Data

Primary data gathered from survey questionnaire responses and interviews were analyzed using Statistical Package for Social Sciences (SPSS) and other software such as SAS and STATA to get the appropriate results based on the data set and objectives. Respondents consisted in actual on-site customers of Greenbelt 3 restaurants with 60% occupancy, through convenient sampling, as the researchers approached the potential respondents already seated in their respective restaurants of choice.

Summary of Findings/ Results

Phase1: Geographical & Social Considerations

The quantitative comparative analysis is based on footprint area taken from satellite maps. A computation of the area utilization is itemized according to the following:

- building footprint area
- total open spaces within lot (TOSL) is further broken down into:
  - unpaved surface areas (USA) and
  - impervious surface areas (ISA)

Since the impervious surface areas refer to the parking lots, access roads, driveways and circulation areas, pedestrian walkways, cemented grounds, etc., the computation of the park or green open spaces was limited to the unpaved surface areas with actual trees and plants contained in its environs.

A comparison of the case studies regarding space allocation of the 4 Malls (Greenbelt Makati, Glorietta, SM North and TriNoma) shows the biggest ratio of park areas to total lot area in Greenbelt Makati, at 33-35%. The 3 other malls allotted a range of 5-7% of green open space in relation to total lot area. Building footprint ratio to open space is largest in Glorietta at 83%, hence the decision to focus on Greenbelt Park. (Fig. 7, 8, 9)

The Greenbelt Park has a total of 3.3 hectares, a substantial area coverage given the total lot area of Ayala Malls at 11 hectares. This allocation of space approximates 30% of the total lot area of Ayala Greenbelt Development. Compared to the building footprint area, the Unpaved Surface Areas (USA), which constitute the park, is equivalent to 35%, while the Impervious Surface Areas (ISA) amount to about 16%.

Phase 2a: Data from Questionnaire Surveys

There were 2 types of surveys conducted depending on mode of data extraction: (a) on- site—within Greenbelt Complex premises, using the printed questionnaire survey form, and the other set, (b) off-site/ online—where the respondents were asked to fill out an electronic survey form. From the months of October through December 2012, a total of 346 responses were gathered from on-site data collection. However, after filtering the survey forms (removing those that had several blanks or unanswered items), about 327 were considered valid responses. In January 2013, an online survey was conducted, and a total of

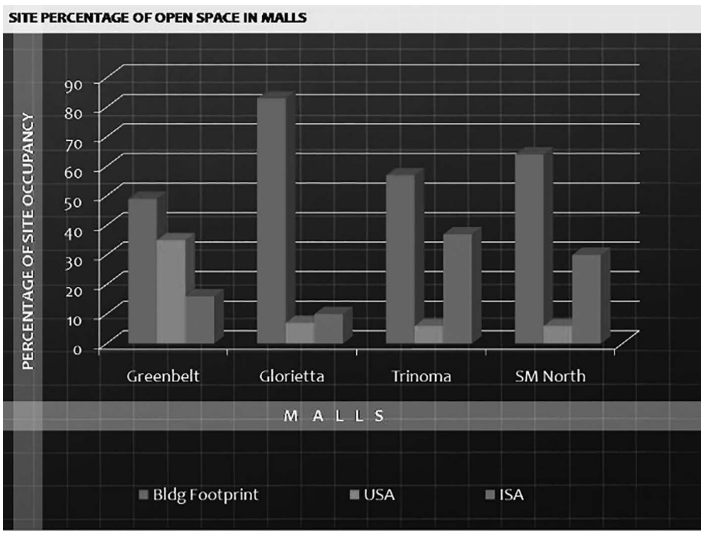


Fig. 7 Comparative Chart showing the Allocation of Building Footprint vs. Total Open Space of the 4 Mall

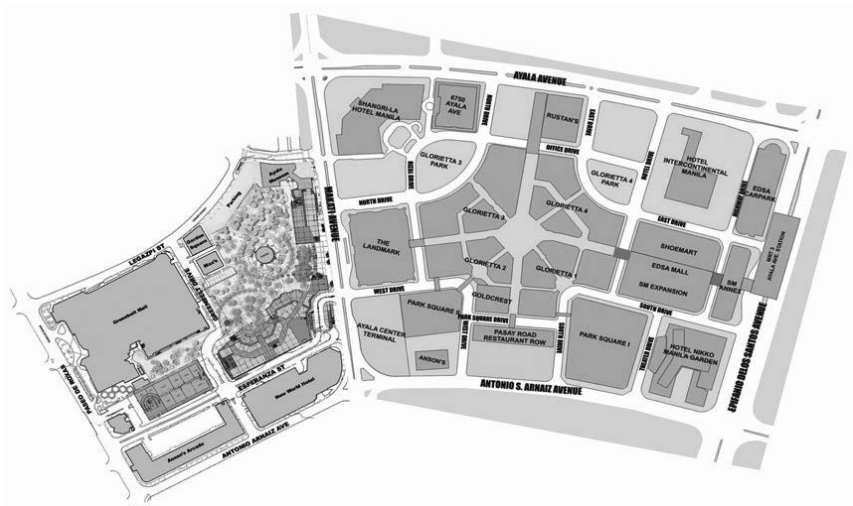


Fig. 8 Map showing location of Greenbelt Park in relation to the Ayala Greenbelt & Glorietta Malls Development

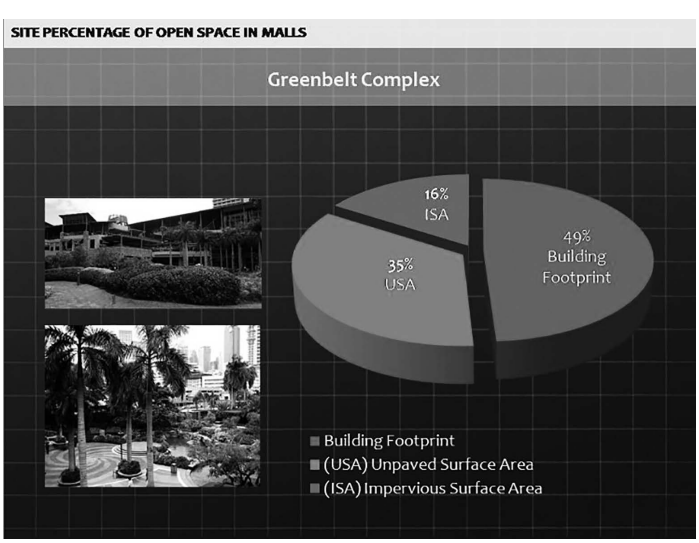


Fig. 9 Ratio of Open Space to Building Footprint—Greenbelt Park

Table 1 Tabulation of Restaurants Studied in Detail

RESTAURANTS STUDIED IN DETAIL									
No.	Establishment	Location	Floor Level	Capacity			Area (sqm)		
				Total Capacity	Indoor	Outdoor	Indoor	Outdoor	Total
1	Coffee Bean	GB 3	G/F	**135**	55	80	213	40	**253**
2	Starbucks	GB 3	G/F	**114**	44	70	134	63	**197**
3	Cafe Havana	GB 3	G/F	**160**	48	112	189	82	**271**
4	Seattle's Best	GB 3	G/F	**155**	35	120	97	90	**187**
5	Banana Leaf	GB 3	2/F	**100**	68	32	159	24	**183**
6	Serenitea	GB 3	3/F	**28**	4	24	22	26	**48**
7	Figaro	GB 3	3/F	**52**	40	12	90	15	**105**
8	J.CO Donuts and Coffee	GB 3	3/F	**44**	32	12	136	19	**155**
9	Krocodile Grille	GB 3	3/F	**250**	150	100	187	58	**245**
10	Seafood Island	GB3	3/F	**110**	50	60	110	50	**60**
11	Red Mango	GB3	4/F	**52**	35	17	55	38	**93**

154 responses were gathered. Eliminating those who left blank more than 3 questions, the valid responses were narrowed down to 146. All in all, total number of respondents was 492, but we retained 473 valid responses.

Phase 2b: Data from Questionnaire Surveys

A total of 4 interviews from top-level executives of Ayala Land and Greenbelt Mall management were conducted. Interviews were conducted with the VPs, managers and the chief architect, which provided insight on the history and paradigm shift to alfresco (outdoor) dining in Makati despite the tropical climate, as well as restaurant managers. The purpose of the interviews was to obtain data on the economic aspects of the restaurants which will be used in the quantitative analysis relating to ROI, rental rates, peak hours and percentage occupancy. These will complement the data obtained from the surveys rating the park amenities and restaurant features. Some managers were generous enough to disclose the breakdown of expenditures, i.e. salaries, operations/ maintenance expenses, costs of goods (food & beverage), common area dues (security, janitorial services, waste disposal, building costs) as well as the revenues (gross sales, net income, ROI), which were a great help for this section of the quantitative analysis.

Based on a series of interviews and actual observations, 4 zoning categories were drawn up. These zones coincide with what Ayala Management calls "prime" and "super-prime" areas. In principle, according to Greenbelt Mall manager, all the shops in Greenbelt 3 are prime. These enjoy the amenity value of the park and they benefit from the view to the landscaped areas. Those that are on the ground floor, however, are considered "super-prime," owing to the volume of foot traffic generated with all the ingress/ egress points plus the proximity and direct access to the park. Those located at the second floor may still be considered part of the "super-prime" areas since these benefit from the flow of customers coming from the elevated walkway connecting Greenbelt to the rest of the Ayala offices and Landmark/ Glorietta Malls all the way to EDSA MRT. The shops on the 3rd and 4th levels can be considered "prime" as these catch the spillover of persons coming from the cinemas on the 4th level.

For purposes of comparative analysis, the following zoning categories were drawn up:

Table 2 Zoning Categories with Specific Parameters

Zone Category	Description/ Parameters
Zone 1	Ground floor restaurants with indoor/ outdoor seating in Greenbelt 3 that have direct access to the park and very high volume of foot traffic
Zone 2	Second floor restaurants with indoor/ outdoor seating in Greenbelt 3 that have a fairly good view to the park and high volume of foot traffic
Zone 3	Third and fourth floor restaurants with indoor/ outdoor seating in Greenbelt 3 that have some view to the park and moderate volume of foot traffic
Zone 4	Restaurants that are distant from and do not have a view to the park (e.g. indoor restaurants in Greenbelt 1 (with moderate volume of foot traffic)

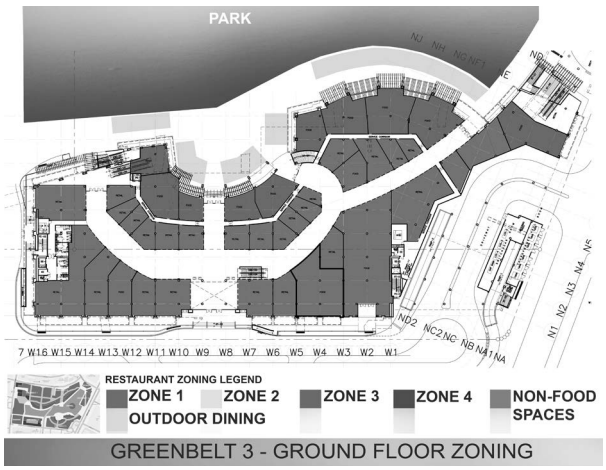


Fig. 10

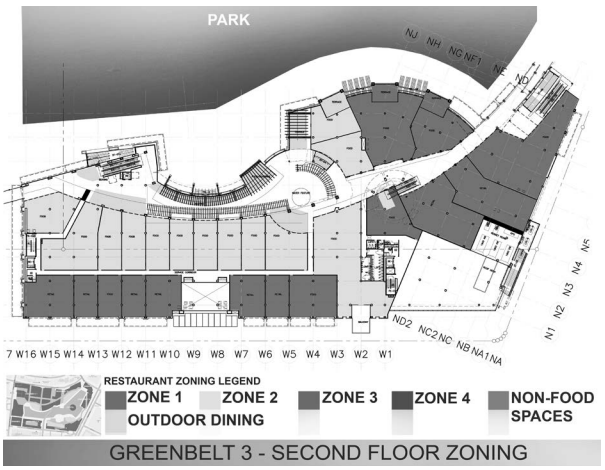


Fig. 11

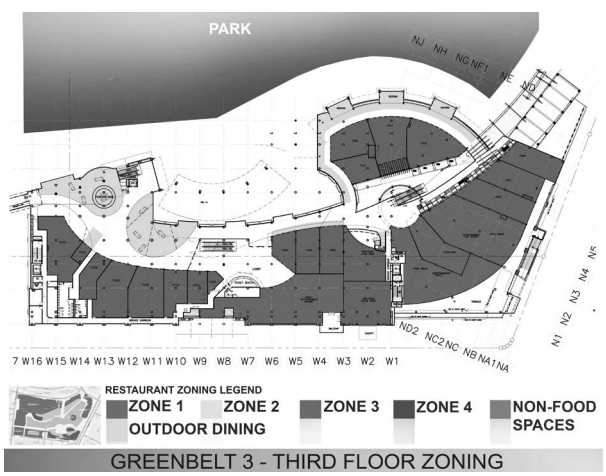


Fig. 12

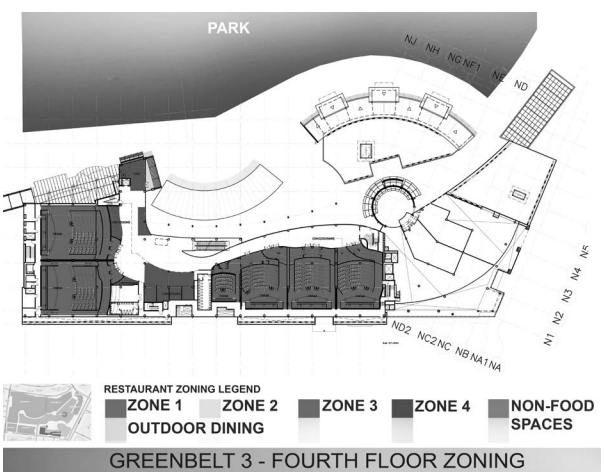


Fig. 13

Fig. 10-13 Zoning Map of Ayala Greenbelt Malls categorized according to Zones 1 to 4.

From the zoning parameters, a zoning map was generated for the entire Greenbelt Complex (cf. Figs. 11-14 below), as well a s a series of tables were drawn which reflected the following: volume of foot traffic, area of restaurants, capacity and percentage occupancy, rental rates, itemized expenditures and ROI. These data were used as the basis for identifying the zones and for Phase 3 statistical analyses.

In the zoning diagram, we recorded both the travel distance and the straight distance. However, for purposes of analysis and regression, we opted for the straight distance since it represents the access to view of the park measured to its center.

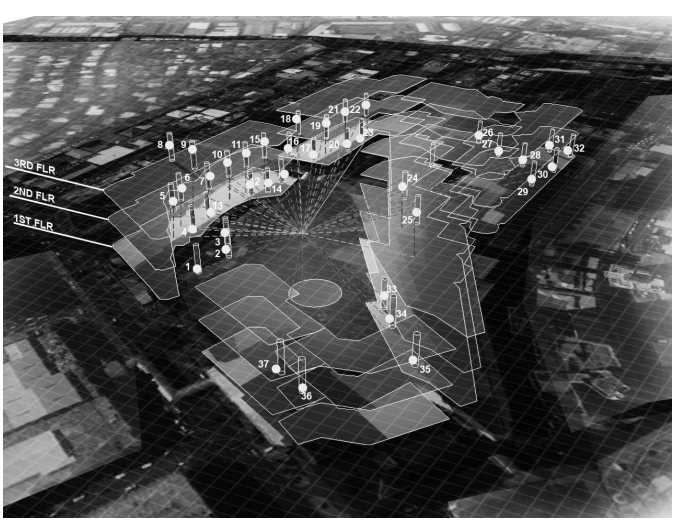


Fig. 14 A 3D Exploded View of Greenbelt Floor Plans Showing Straight Distances from Restaurants to Center of Greenbelt Park

Phase 3: Factor Analysis and Regression

Phase 3 mainly consists of the quantitative analysis of this research study, wherein two statistical methods were used: (1) factor analysis and (2) regression analysis.

The objective of factor analysis was to determine which variables from among the park and restaurant features are important as deemed by the survey respondents. The strong correlation that exists among the variables was determined and these were reduced to 4 dimensions, those considered most important, starting from Factor 1, descending in importance till the last.

Factor 1 (physical setup): view_to_park, furniture_ layout, privacy, lights, ambience, bright_colors, music_sounds, acoustics, independent access

Factor 2 (restaurant service): friendly_service, prompt_response, wifi, affordable

Factor 3 (restaurant image): smoking_area, storefront, social_status, size_space

Factor 4 (food quality): good_food, variety, food_ presentation

Table 3 Rotated Factor Matrix with Varimax/ Kaiser Normalization

	Factor			
	1	2	3	4
good_food	.171	.302	-.106	.625
variety	.160	.181	.110	.748
food_presentn	.170	.038	.276	.612
ind_access	.395	.108	.312	.405
view_to_park	.470	-.005	.329	.207
furn_layout	.559	.148	.196	.252
privacy	.650	.317	.091	.096
lights	.731	.199	.207	.182
ambience	.486	.385	.154	.141
bright_colors	.525	.200	.407	.089
music_sounds	.485	.305	.330	.209
acoustics	.392	.276	.351	.137
friendly_service	.319	.564	.058	.255
prompt_response	.186	.800	.048	.242
wifi	.213	.522	.255	.086
smoking_area	.319	.058	.551	.099
affordable	.157	.622	.406	.083
storefront	.115	.524	.539	.113
social_status	.326	.234	.676	.125
size_space	.187	.483	.586	.080

The outcome of the Factor Analysis is that of reducing the 20 variables of the restaurant features into 4 factors or dimensions, wherein Factor 1 figures as the most important set of elements a customer is looking for in a restaurant. ***View to the park is included in Factor 1.***

The objective in regression analysis is to model the relationship between a dependent variable and one or more predictor/ independent variables. We used a stepwise regression procedure to select a subset containing only significant predictors. From the actual data tabulation of both on-site and online surveys, a merged data set consisting of 327 respondents was used as reference for the regression analysis of 80 variables obtained from the questionnaire regarding park features and restaurant features. (Table 4, 5)

Even the regression analysis shows that the view of the park figures as a high preference among the customers. The interpretation of the relationship between this variable and distance to the park is interpreted as follows: When a customer has a high preference for the view of Greenbelt Park, the distance of the restaurant decreases by 41.2144m relative to Greenbelt Park, holding all other variables constant. (Table 6)

The coefficient of multiple determination measures the percentage variation in ROI that can be explained by the independent variables. It can be said that this is the BEST model we have, wherein ALL variables are significant, where 94.63% of the variation in ROI can be explained by all of the variables included in the regression equation which are: capacity, rent, zone1, zone2 and zone3. (Fig. 15)

Conclusion and Recommendations

The factor analyses show that the physical set-up with the feature of view to the park is a significant variable for the restaurant customers, alongside ambience, inviting storefront, social class image, furniture layout and bright colors, among others. The regression results corroborate the initial hypothesis

Table 4 Regression Results using Distance as Dependent Variable (vs Park Features: 80 variables)

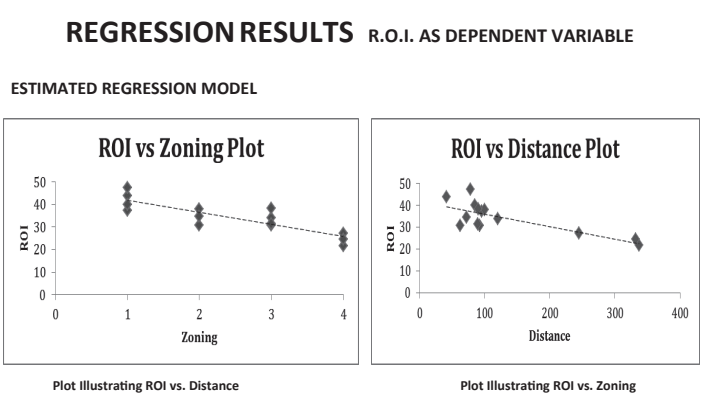
Distance	Coeficient	Std Error	T Critical Value	P-value	[95% Confidence Interval]	
pa16	-46.1140	10.8023	-4.2700	0.0000	-67.3669	-24.8610
ra5	194.3065	53.5555	3.6300	0.0000	88.9386	299.6744
ra7	-79.0182	25.8034	-3.0600	0.0020	-129.7851	-28.2513
ra10	-41.2144	12.1296	-3.4000	0.0010	-65.0789	-17.3500
ra30	-24.2699	11.9015	-2.0400	0.0420	-47.6856	-0.8543
ra34	44.3936	14.0312	3.1600	0.0020	16.7878	71.9994
ra36	29.9716	14.4440	2.0800	0.0390	1.5538	58.3894
ra38	-39.6813	13.1010	-3.0300	0.0030	-65.4568	-13.9058
_cons	176.2003	12.9271	13.6300	0.0000	150.7668	201.6338

Table 5 Listing of Extracted Significant Independent Variables and their Codes

Variable	Definition
pa16	High park smoking customer preference
ra5	Low food presentation customer preference
ra7	Low Independent access to restaurant customer preference
ra10	High view to park customer preference
ra30	High restaurant wifi access customer preference
ra34	High affordable restaurant customer preference
ra36	High inviting storefront of restaurant customer preference
ra38	High reflective of social class/status of restaurant customer preference

Table 6 Regression Results using ROI as Dependent Variable (vs Zoning, Rental Fees, Restaurant Capacity)

	Coefficient	Std Error	T Critical Value	p-value	[95% Confidence Interval]	
capacity	0.01854	0.00369	5.02000	0.00000	0.01128	0.02580
rent	-0.00003	0.00000	-30.84000	0.00000	-0.00004	-0.00003
zone1	18.03012	0.36296	49.68000	0.00000	17.31604	18.74421
zone2	11.87875	0.35772	33.21000	0.00000	11.17498	12.58252
zone3	1.58226	0.43933	3.60000	0.00000	0.71793	2.44659
_cons	34.14409	0.27785	122.89	0.00000	33.59745	34.69072



By inspecting the graphs of the plots, it can be seen that Foot traffic and Rent have direct proportionality to ROI, while Zoning & Distance are inversely proportional to the ROI, meaning, the nearer the distance to park, the faster the ROI.

Fig. 15 Regression Results Graphs (ROI as dependent)

that the nearer the restaurants and shops are to the park, the higher their zoning classification (Zone 1 highest to Zone 4 lowest) which translates to higher rental fees. But due to an expected higher volume of foot traffic and the attraction of the park, these restaurants with higher rental fees are able to recover their investment and expenditures and have a faster rate of return (RR) or return on investment (ROI). Using equations from hedonic price modeling, a rule of thumb is established among the correlated variables in the study of ROI, using volume of foot traffic, rental fees, zoning, capacity and percentage occupancy of restaurants vis-à-vis their proximity to the amenity (in this case, the park). An incremental pattern is shown in the regression tables, where increase or decrease in a certain variable affects the other aspects of the study by a concrete quantitative factor. Therefore, the relationship between distance to the park and ROI is a negative relation, inversely proportional to each other, since the lower the distance (the nearer to the park), the higher the rate of return. ***This strong correlation illustrates the economic and social sustainability of the Greenbelt Park from the point of view of the tenants as well as for the mall owners.***

This research will contribute to mall developers and designers in their economic feasibility studies prior to setting up a commercial development and will be a guide in space allocation of green open spaces within the premises. Since their sustainability (social, environmental and economic viability) as well as feasibility in space planning have already been validated by this extensive study, it will hopefully encourage urban planners and mall developers to allocate a more generous portion of parks and landscape in the commercial master plan (whether footprint of the lot or floor area of the entire building).

It is proposed that local codes/regulations be revised to mandate commercial establishments to allot a higher percentage of unpaved surface areas, from a staggering 5-10% to a minimum of 10-15% or even higher of Total Open Spaces within Lot (TOSL) and Total Lot Area (TLA). Section 803 of the The National Building Code (PD 1096) could be reviewed and revised to increase this space allocation and specify them as green open spaces & permeable surfaces instead of limiting it to a general classification of Unpaved Surface Areas (USA).

This will redound to the general welfare of its users, increase revenues and ROI for the mall owners, while improving the ecological balance of the environment, working towards increasing the ratio of green spaces per person and improving air quality as well as enhancing sense of place.

Repercussions of this study could enhance the "malling" experience not only in the Philippines but in the rest of Asia and the entire world as well, contributing to upgrading the lifestyle of shoppers and diners, with a view to greater interaction of customers with the natural environment, planting and nurturing the seed towards an earth-friendly consciousness in families: a blueprint for sustainable patterns and green lifestyles for the future of our planet earth.

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