

## The ‘Midas Touch’ turns green in Putrajaya

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### Abstract

This paper is an extension of ‘The Midas Touch in a Digital Glove’ project undertaken in 2009 to investigate the public’s viewpoints of welcomed architectural and urban design elements in the development of Putrajaya. Eight proposed street scenes of the Boulevard presented as digital animations were compared to its then existing street quality. This ‘before-after’ comparative study was carried out through a survey. The statistical analysis offered the level of acceptance and perception of the Boulevard’s street quality and walkability among the public. The findings from the survey indicated that the public preferred green-oriented development for the area. Several years have passed and the Boulevard has undergone many changes. Many more buildings are completed along its 2km stretch. The second author has developed an architectural scheme for vertical farming entitled ‘SuperFarm’ as her M.Arch. Design thesis. This scheme has been used in a survey using digital animation to test the public’s receptivity of it as a form of green development within Putrajaya. The findings from ‘The Midas Touch in a Digital Glove’ project served as the base-line comparison. The results from the current survey will validate or modify the findings from ‘The Midas Touch in a Digital Glove’ project and elucidate the appropriateness of this vertical farm for Putrajaya. The research outcomes have provided new insights of what would be public-preferred developments for the future. This will be beneficial for the master-developer of the city, Putrajaya Holdings Sdn Bhd, (PJH), to generate projects that will be people-responsive in Putrajaya. The 3D digital animation and simulated street-scene survey-approach could also be a facilitating participative mechanism for PJH and consultants in designing towards sustainable cities.

*Keywords:* urban design, vertical farm, digital animation, public receptivity, sustainable development.



## 1 Introduction

This paper is an extension of ‘The Midas Touch in a Digital Glove’ project undertaken in 2009 by Ab. Rahman *et al.* [2] to investigate the public’s viewpoints of welcomed architectural and urban design elements in the development of Putrajaya. Eight proposed street scenes of the Boulevard presented as digital animations were compared to its then existing street quality. This ‘before-after’ comparative study was done through a survey. The statistical analysis offered the level of acceptance and perception of the Boulevard’s street quality and walkability. The findings from the survey indicated that the public preferred green-oriented development for the area. Several years have passed and the Boulevard has undergone many changes, including having many more completed buildings along its 2km stretch. The second author has developed an architectural scheme for vertical farming entitled ‘SuperFarm’ as her M.Arch. Design thesis (Figure 1). This current research intends to elicit the public’s perception on two aspects. First is regarding the street quality and walkability of the Boulevard since the 2009 study. Second is regarding SuperFarm as a typology on vertical farming that may fit the idea of green-oriented urban development for Putrajaya. A similar survey approach using digital animation has been adopted in this current study.

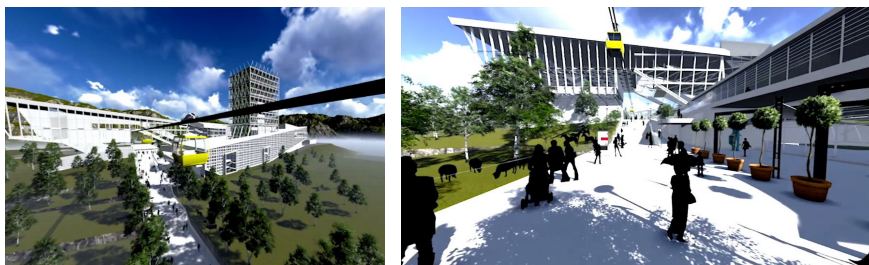


Figure 1: Proposed SuperFarm.

## 2 Urban development and sustainable imperatives

With half of the world’s population currently occupying urban areas, the pressure is felt on fresh water supplies, sewage, living environment and public health within cities according to the United Nations [16]. A louder call for more sustainable approaches to urban development is thus imperative. There are various interpretations to what would make for sustainable cities. A common notion is one where the 3R (Reduce, Reuse, Recycle) approach is practiced. Another, natural resources are harvested for energy potentials and environmental conservation. However, this is tantamount to improving the current situations only. Birkeland [4] feels a more radical but comprehensive way will be first to see cities as open systems that are intrinsically interrelated with open social and ecological system. The truly sustainable development is able to produce a net

increase in two aspects: the total ecological carrying capacity on and off-site, and the total eco-services. Both however, are relative to not only of the total floor area of development but also must be ecologically benchmarked against the pre-industrial ecology rather than the existing conditions. What is given back to nature and community must surpass what has been taken away.

Urban development is a financial investment according to McLaran [14]. Nevertheless, it is not all about the construction of built forms only. The social and community factor also has to be addressed. A pilot study by McClimens *et al.* [13] on “Peace Gardens” in Sheffield was able to elicit the public’s indirect perception on urban green spaces relative to their wellbeing. The study suggests very high levels of public satisfaction with the gardens as apparently the opportunities for social interaction increased. Here, ‘wellbeing’ was examined as a general concept and an interpretative one. The interpretation on immediate mood or ‘hedonic’ affect is part and parcel of general health and wellbeing that are the outcome of inhabiting green public space. Greenery, green spaces and public health are positively intertwined in sustainable cities. Lee and Maheswaran [9] concluded that there is available evidence to suggest this although the direct effect between green spaces facilitating physical activity remains weak. Still, urban development associated with green spaces when elevated beyond landscape redesign may offer natural experiments and research opportunities relative to healthy urban living.

Gaffikin *et al.* [6] recommend, “Any serious reflection on the urban design tradition as it relates to urban public space” must consider at least three key themes: first, the fundamental relationship between the citizen and civic space; second, the implications of the return of the ‘sustainable’ compact city; and third, the temporal and spatial components of urban design – its ‘process’ and its ‘product’. Utility, identity and inclusivity are qualities that must be entrenched within good urban open space. All levels of citizen must be able to make use of, identify with and be free to enjoy such urban public spaces on a regular basis. This needs to be combined with the idea of compaction that facilitates genuine pedestrian environment. Networks of inter-connected urban ‘places’ that relate to the local built environment and achieve a distinctive ‘sense of place’ will reflect this. The concept of ‘process’ on the other hand needs to consider the entire property development process, specifically with the role of urban design within it. The urban designer has a role in terms of his/her ‘interest/influence’. The landowner/developer’s role is one of ‘power’ through initiation. The planner and engineer meanwhile have a role of ‘responsibility’ via control. Urban space as ‘product’ may be viewed from the aesthetic, functional, social and perceptual dimensions.

This idea is echoed by Lee [11] in that the scope of inquiry for landscape knowledge related to urban public spaces must extend beyond matters of form, function and aesthetics of the built environment. The scope instead, needs to encompass multiple uses, experiences, meanings and interpretations generated by different stakeholders and socio-cultural contexts simultaneously as a unit of analysis. This approach he termed as the ‘contextualized approach’. It differs from other landscape research approaches that rely on objective observations,



visual analysis and morphological form studies. What will be beneficial is for the community to realize a new perception of an alternative urban development direction and vision, i.e. one that offers a deeper meaning despite the artificial construct of public urban spaces. Artificial or not, urban parks in the broadest definition are the single most important category of publicly owned open space in American cities according to Talen [15].

A common approach is to study these parks as three entities: first as discrete open spaces to be designed; second as environmental resources that bring 'nature' to the city; or third as spaces with unique social and economic value. A rarity is to study parks from a 'spatial logic' point of view, i.e. how they are, or ought to be, when geographically distributed across the urban landscape. Where people live and work and the goods and services they require for a high quality of life should have greater proximity. Parks also fall under this category of requiring better geographical distribution as these can help achieve urban sustainability goals. The proximity factor (or access) differentiates sprawling from compact urban form. Maximizing proximity means that parks would be spatially distributed to enhance walkability. Factoring urban sustainability, the primary principle implies locating parks and green public spaces where people live, not on the outskirts of town that involve driving. A second principle entails locating parks in diverse urban places, with diversity here referring to social diversity or land use diversity.

### 3 Research methodology

This current research is formulated by bearing the concern for a holistic sustainable development in mind. The concept of SuperFarm is tested to extend beyond being a space for fresh vegetable production. It has been interpreted as a form of potential public green urban space that is more 'product'-based as per Gaffikin *et al.* [6]. The reason being SuperFarm also incorporates public areas such as fresh-produce floor, eco-education exhibition and demonstration floors, health-conscious eateries, actual farming floors and R & D labs (Figure 2).



Figure 2: Integrated sustainable strategies in SuperFarm.

SuperFarm is about tackling the problem of fresh food production in the context of urban areas by minimizing if not 'zero-ing' the number of food-miles to benefit the community through a compact mode of spatial usage. Farming is

cultivated vertically as a strategy to reduce ground surface foot-print. Inherent in this system is the integration of zero-waste through re-cycling based on responsible ecological feed chain. Rain-water harvesting, energy generation, natural ventilation and life-cycle strategies are part of the complete sustainable urban development package. The eco-education exhibition and farming demonstration are part of the strategies in actively involving the public towards a conscious awareness of sustainable living.

The scheme was modeled in 3D using SketchUp and transformed into a video animation using Lumion for the survey. Similar to the 'Midas Touch in a Digital Glove' format, the questionnaire was paper-based whilst the public viewed the animation on a computer – an iPad this time because the keyboard was unnecessary. The animation runs for approximately 1 minute and 45 seconds. The questionnaire had an 'Introduction', 'Part A' for the main enquiry and 'Part B' for demographic data. The 'Introduction' to the questionnaire stated that "The research relates to a proposal about vertical farming entitled SuperFarm". Three objectives were outlined for the survey: to evaluate the architectural appeal of the proposed scheme for the boulevard area at Putrajaya; to ascertain public perception about the scheme within the context of Putrajaya; and to gain public participation in the city design through digital methods. A clause on research confidentiality of the respondents' feedbacks was also included and the first author provided her official e-mail with full contact address and phone number.

The public had to answer Questions 1–10 in Part A first. An intermission in the questionnaire outlined that they would next be shown a project entitled SuperFarm using computer animation. This intermission further reiterated that "SuperFarm is a concept for vertical farming within urban areas." This intermission also highlighted that "The SuperFarm version is a potential proposed architectural development to be inserted within the vicinity of the Boulevard in Putrajaya". There was no detailed description of the SuperFarm other than what was stated on the questionnaire and as the title of the animation. The research helpers for this survey have degrees in Land Surveying. They were briefed not to provide additional clues or explanation of the architectural aspect. This is to avoid their influencing the perception of the respondents. The survey was undertaken from morning to night on a Saturday-Sunday weekend and during the daytime the immediate Monday at two popular locations in Putrajaya. One was on the Boulevard near the main mosque and Perbadanan Putrajaya sites. Another was in what used to be the only shopping mall (Alamanda) in Putrajaya until very recently.

160 questionnaire forms were made available. The survey was only carried out with those who were readily agreeable. From these, 10 forms were returned with too many incomplete responses and demographic section not answered. Only 54 were returned fully answered with complete demographic information. Despite this rather small sample size, based on a worst case scenario of 50% sampling responding with a similar answer, at 95% confidence level for a total Putrajaya resident and working population of 107,000 a sample size of 54 people would have given a confidence interval of 13.3 according to the 'Sample Size Calculator' by Creative Research System [5]. The confidence interval is still the

same when the population is set at 72,000 for residents only. The combined figure of working and resident population is used because the respondents included visitors to Putrajaya. Furthermore, despite the simple statistical analysis to be observed, the nature of this survey is also qualitative. In studies of qualitative nature, a sample size of about 30 would have sufficed.

The key intention of this study is to get a snapshot of the public's feedbacks of the current Boulevard and SuperFarm. Excluding the questions on demographic data, this was elicited through a combination of 29 open-ended and closed questions. The open-ended questions required very short answers or gave an opportunity for the respondents to voice their personal comments relating to the study. The closed questions had three variations. Twelve required a rating on a scale of 1 to 5 for responses such as Not Appealing-Highly Appealing; Not Friendly-Highly Friendly; Very Poor-Very Good; Not Enjoyable-Highly Enjoyable; Very Poor Orientation-Very Good Orientation; Very Unsafe-Very Safe; Very Difficult-Very Easy; and Very Useless-Very Useful. These questions followed closely the earlier enquiry carried out in 'The Midas Touch in a Digital Glove' study. However, unlike in the earlier survey, the question on preferential ranking was omitted because only one scheme was being examined this time. A second closed-type question required a firm 'Yes' or 'No' response. The third closed type had multiple choices. The respondents could tick as many relevant words to describe their emotional response to the animation on SuperFarm. The results from the current survey will validate or modify the findings from 'The Midas Touch in a Digital Glove' project and elucidate the appropriateness of the SuperFarm as a future development for Putrajaya in addition to eliciting the current evaluation of street quality and walkability of the Boulevard.

## 4 Results and discussion

The data generated from the survey is far richer than what is reported in this paper due to the limitation on page-number. The aspects discussed here are focused on the theme of the conference on sustainable cities. The findings from 'The Midas Touch in a Digital Glove' project served as a base-line for comparison. From this current study, the demography of the respondents consists of 61% Malaysian visitors to Putrajaya; 32% local Putrajaya residents and 7% international tourists. Out of 54 respondents, 31 (57%) were female (N1) and 23 (43%) were male (N2). The value of the Harmonic Mean based on  $(2)(N1+N2)/(N1+N2)$  indicates that the study has the power of a study with equal sample sizes of about 26.4 in each sub-group, giving a total of around 53 that approximates the actual number of respondents as per Aron *et al.* [3]. 66.7% were between 21–40 years old; 29.6% were 20 years and below; and 3.7% were 41 years and above. The youngest age bracket corresponds with those having at least a high-school certificate/diploma (27.8%). This figure is somewhat similar to those surveyed in 2009 at 29%. The majority (68.5%) had college or university level diploma, first degree or master's degree. This trend also reflects the statistics of 2009 (67%). The main difference is 3.7% respondents indicated having PhDs. The education-level suggested that the respondents would have

had a degree of exposure to environmental issues at least during secondary school.

Not surprisingly, 100% of the respondents noted that they were familiar with phrases such as ‘Sustainable Development’, ‘Green Architecture’ and ‘Eco-friendly Building’. The respondents’ rated a mean value 3.30 (stdev 0.86) for level of knowledge of these phrases (1 ‘Very Poor’-5 ‘Very Good’). This mean value is on the average scale and reflects the 57.4% who indicated they were familiar with all three phrases, 33.3% with at least two of these phrases and 9.3% with at least one phrase. 78% were able to give acceptable responses on one of these phrases although 22% did not jot down any response. Sample responses included, “It’s a concept that will develop resources and reduce the global warming” (R3); “Green architecture incorporates green elements in developing the land without jeopardising the nature and its surrounding. Promote sustainable development” (R4); “Sustainable dev. means consider the next generation needs” (R11); and “Consideration of ecosystem thru development” (R26). The sample responses illustrated a degree of awareness about sustainable environment and provided an interesting measure for understanding the public’s perception towards the development of the Boulevard and SuperFarm. Although recorded by a new group of respondents, positive changes are perceived in the Boulevard area after a lapse of four years (Table 1). The rating on architectural appeal resembles closely what the public rated for the 2009 simulated best street-scene scheme. The current pedestrian-friendliness marked a positive improvement not only from the 2009 real street quality and walkability, but also surpassed what the public rated for the 2009 simulated best street-scene version. The current respondents also indicated a willingness to spend a few minutes longer than in 2009. However, the duration is much shorter than the 2009 simulated version.

Table 1: Comparative results of 2013 and 2009 scenes.

(Based on 1 to 5-point scale with 5 indicating the most positive response)	2013 Real Scene		2009 Real Scene		Difference	2009 Simulated Best Development	
	Mean	Stdev	Mean	Stdev		Mean	Stdev
Architectural Appeal	4.07	0.54	3.5	0.88	+0.57	4.1	0.57
Pedestrian Friendliness	3.81	0.78	3.0	0.96	+0.81	3.5	0.82
Duration for Walking in the Area	28.69 mins	-	25.00 mins	-	+3.69 mins	41 mins	-

A quick glimpse of what the current respondents do not like about the Boulevard may inform additional improvements required (Table 2).

These have been categorised under five sub-groups for easier comparison with the 2009 study. In the previous study, the public indicated their ‘Like’ in the architectural design aspect (49%), followed by the landscape features (24%), emotional effect (19%), facility (7%) and activity (2%) by frequently mentioning

Table 2: Dislike about current Boulevard.

Architectural Design and Planning	So many stairs to [go] through it; distance; Empty landed in between buildings [ <i>un-developed vacant lots</i> ].
Landscape	It should have more trees along the street; Some area has less [few] trees; <i>kurang pokok hijau di tengah2 bangunan [lacking greenery within building complex]</i> .
Emotional	Sometimes it was too hot; panas [hot]. The smoke; the smoke [ <i>smog from Indonesia's fire</i> ]; people smoke. Sometimes look messy; not clean enough; rubbish; trash; dog.
Facility	They are not user friendly, one can easily get lost; signage. The parking lots; traffic light; traffic light; too much traffic light.
Activity	There is no safety; boring and less people; <i>sunyi [too quiet]</i> .

the items within each sub-category. The bulk of the current dissatisfaction appears to be related to landscape factor and emotional effects. There have not been many changes on facilities and diversity of activities since 2009 either.

On the acceptance level of SuperFarm, 52 respondents (96%) said 'Yes' to it whilst 4% said 'No'. From this, 83% indicated positive first impression; 4% negative first impression and 13% didn't indicate any. The respondents chose the cable car (30%); the green environment within and surrounding (22%), building concept (15%), animals freely roaming the land (13%), attractiveness of the scheme and scenery (8%), innovative technology (6%), and a sense of crowd and hospitality to the people, including pedestrian-friendliness (6%) as the most memorable aspects of SuperFarm. The choice of the cable car implies the importance of accessibility and facilitating options. This result corresponds with the respondents' comment about non-user friendly facilities, the stairs/steps and long travel distance in the Boulevard area. The green environment, the building concept, animals and beautiful scenery when combined suggest that the public do look out for nature-connectedness. This again reflects the respondents' comments on trees and greenery that are much needed for the Boulevard area. The note on innovative technology implies an understanding on eco-friendly efforts. The mention on the sense of crowd and hospitality to the people affirms the importance of urban citizens as the completing ecological chain within sustainable cities.

Unsurprisingly, the architectural appeal for SuperFarm was at mean value higher than the current Boulevard's and also the 2009 simulated version's (Table 3).

Its pedestrian friendliness was also perceived as better than both albeit slightly. Although the respondents were willing to spend longer time at SuperFarm than they would at the Boulevard area by almost 10 minutes, the duration is shorter than the walkability appeal of the 2009 simulated street-scene. An explanation could be due to the variety of envisaged building forms along the 'new' Boulevard compared to only one monumental structure for SuperFarm. The variations could have been perceived as being able to offer diverse activities, facilities, emotional excitement, as well as landscape features. Additionally, the

Table 3: Comparative results of 2013 Boulevard and SuperFarm.

(Based on 1 to 5-point scale with 5 indicating the most positive response)	2013 Boulevard Real Scene		SuperFarm		Difference	2009 Simulated Best Development	
	Mean	Stdev	Mean	Stdev		Mean	Stdev
Architectural appeal	4.07	0.54	4.20	0.76	+0.13	4.1	0.57
Pedestrian friendliness	3.81	0.78	3.94	0.71	+0.13	3.5	0.82
Duration for walking in the area	28.69 mins	-	38.20 mins	-	+9.51 mins	41 mins	-

survey elicited the level of enjoyment, sense of orientation and safety for walking at SuperFarm comparative to the 2009 simulated street-scene. This was based on Guo and Ferreira Jr. [7] and Passini [10] on aspects related to the pedestrian environment. The results recorded positive responses in all accounts (Table 4).

Table 4: Comparative enjoyment, orientation and safety.

(Based on 1 to 5-point scale with 5 indicating the most positive response)	2009 Simulated Best Development		2013 SuperFarm		Difference
	Mean	Stdev	Mean	Stdev	
Level of enjoyment	4.00	0.60	4.06	0.66	+0.06
Sense of orientation	3.73	0.66	3.89	0.66	+0.16
Safety for walking	3.74	0.72	3.87	0.80	+0.13

The next category of results intended to evaluate SuperFarm's relevance as a new typology of urban green. The results are enthusiastic. 87% of the respondents thought the new urban park typology is very appealing, although 2% were not persuaded whilst 11% chose the middle ground. The rated mean value was 4.28 over 5 (stdev 0.81). Those who were positive about the idea also thought being able to pick live vegetables fresh from the garden plots within the SuperFarm very appealing (81%). They rated a mean value of 4.26 over 5 (stdev 0.87) for the idea being appealing. Should the project materialise, this will endear to the quest of literally zero-ing on the food-miles and the carbon-footprints for Putrajaya. SuperFarm as a form of vertical farming brings to mind the romantic notion of the 'Hanging Gardens of Babylon'. Similar to the historical reference, this hybrid development could easily be part of the urban green and so contributes towards sustainable cities conception. Kullman [8] called for "expanding the greenway nomenclature to reflect the actual diversity of the genre". The stacked farm areas contribute to the effort in extending the greenways or green networks to enhance community and urban connectivity as per Ab. Rahman and Mohd Fauzi [1]. Instead of the current trend on ground surface urban parks, there is an opportunity to weave an egress through, over and

under cities and the entire green network within. SuperFarm may offer just the kind of diversity needed in urban park genre.

As a form of valued public resources, parks have to be better connected to people so that these resources are located where they are needed most. Although Putrajaya may not be a contested city, an income-level division within the city does exist. Two respondents from this survey shared a similar sentiment. “I think the idea [of SuperFarm] is nice and brilliant but I think if this idea is working, only the rich people can use this beautiful farm” (R32); “I would like to recommend, this project should be target[ed] at residence area like apartment. Focus on low income” (R54). On a similar vein, based on the principle of social need, Talen [15] recommends that urban parks are more valuable when located closer to lower-income neighbourhood because areas of higher density housing lack private outdoor space per unit. If SuperFarm is parallel to urban public spaces as ‘products’ (e.g. markets) that Gaffikin *et al.* [6] suggest, it is better off located on borders between the higher and lower social strata in order to encourage inter-community activity rather than placed in the centre of a neighbourhood that will foster group isolationism. Such a spatial distribution will enhance the public value of urban parks. Public value means the function and service contributions of the parks as a public entity according to Wolf [17]. Unlike forest reserves and wild land, urban parks and public green typically do not generate harvestable goods. This trend may be modified once urban green spaces are conceptualized more like the SuperFarm.

The final part of the survey also re-tested the digital animation as a facilitating ICT tool towards conceptualizing the sustainable city (Table 5).

Table 5: Digital animation as facilitating tool.

(Based on 1 to 5-point scale with 5 indicating the most positive response)	2009 Simulated Best Development		2013 SuperFarm		Difference
	Mean	Stdev	Mean	Stdev	
Ease of viewing ‘new’ environment	3.46	1.07	3.96	0.78	+0.50
Usefulness of digital animation to imagine ‘new environment’	3.78	0.92	4.13	0.70	+0.35
Readiness to explore digital animation	67% Yes	-	76% Yes	-	+9%

The results indicate positive improvement from the study held in 2009. 87% respondents also noted memorable elements from the animation. The comments from those who had wanted to explore the animation further also reflected the attraction to the scheme and wanting to know more and see more details about it.

## 5 Conclusion

This study is part of an ongoing research. The outcomes at this point have given new insights of what would be public-preferred developments for the future. The



public's receptivity to SuperFarm is clearly enthusiastic. The most supportive comments such as "I like the idea and can't wait for the implementation (R5); "Besarkan skop [enlarge the scope] (maybe apply to all Putrajaya)" (R27); "I want this thing to happen!" (R43), speak loudly of what the public felt. The findings will be beneficial for the master-developer of the city, Putrajaya Holdings Sdn Bhd, (PJH), to generate projects that will be people-responsive in Putrajaya. The 3D digital model and simulated street-scene survey-approach could also be a facilitating participative mechanism for PJH and consultants in designing towards sustainable cities. Being a city that is still under development, Putrajaya has an edge in that there is still an opportunity to bypass such urban pressure confounding other world cities. Unlike cities elsewhere where private developers motivated primarily by profits are the *de facto* city builders as claimed by Loukaitou-Sideris [12], Putrajaya has a unique position. The larger city-wide vision of the administrative capital city is well understood by the city's master developer and its local authority. In this respect, SuperFarm is a category of urban processes that may impact Putrajaya's urban form. As a specialized type of design strategies, the scheme may 'accentuate or mitigate certain material conditions of the city'. It is also one with political-social-economic and environmental implications worth investigating further. At the very least, a new perception of an alternative urban development direction and vision for a sustainable city has been offered.

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