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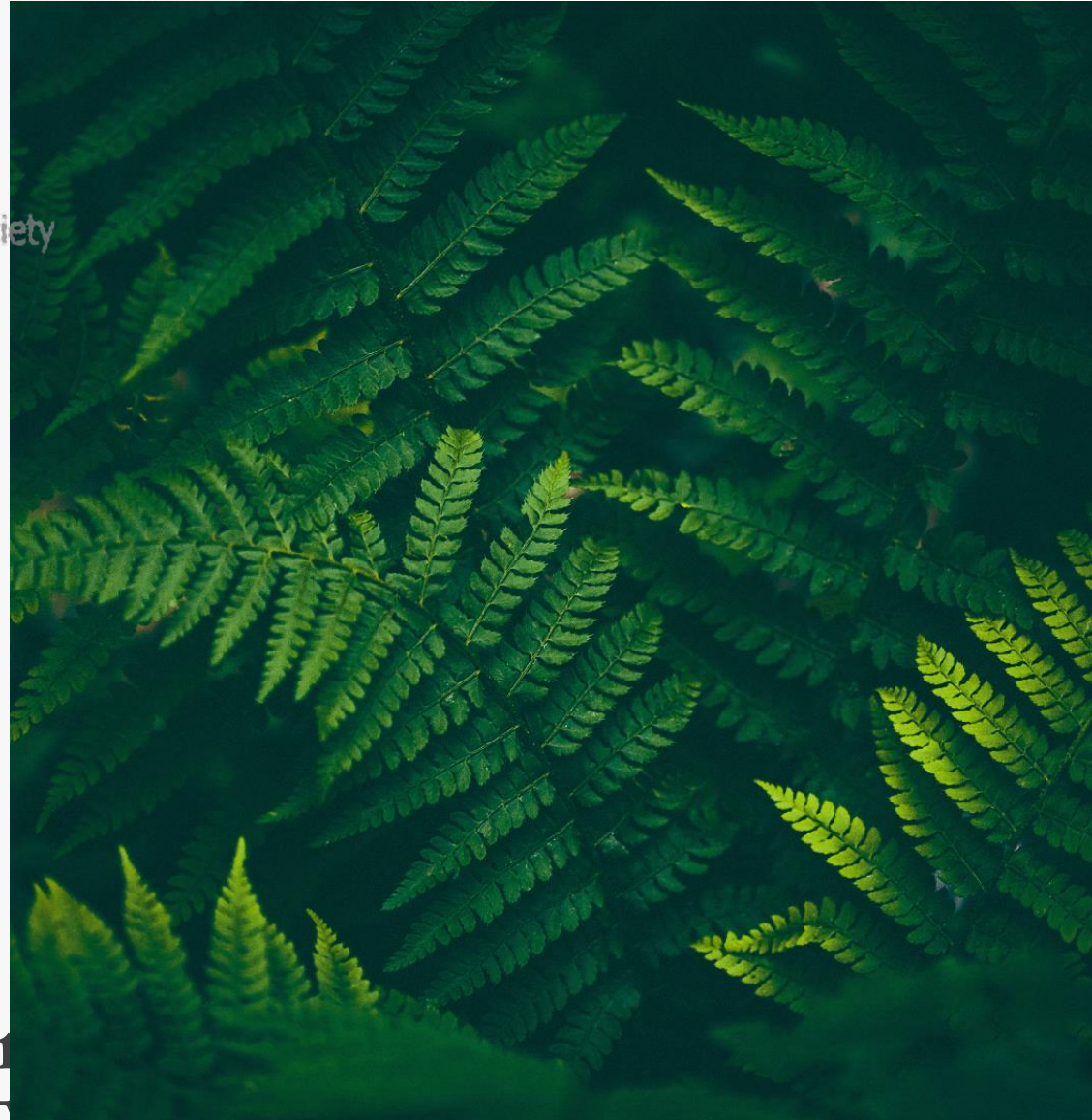
European Real Estate Society

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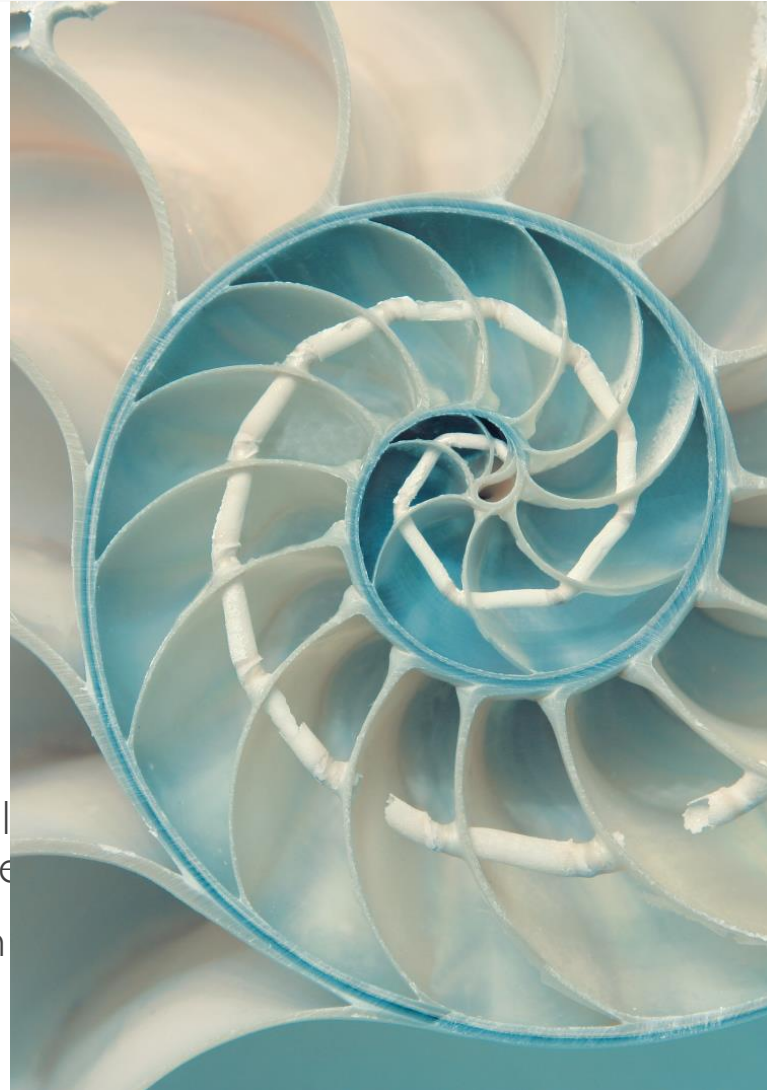
The Effects of Tangible and Intangible Elements on Local Authority Property Tax Assessment Revenue



PROPERTY TAX & GREEN BUILDING

Property tax assessment in Malaysia

- » Main source of income for local authorities (Pawi et al., 2011).
- » All properties holding within local authority jurisdiction region are levied with property tax assessment including green building (Ibrahim et al., 2014).
- » Basis: Annual value (Market value), Improved value (Rental value) (Ariffian and Hasmah, 2014).
- » Any differences in property value will reflect property tax assessment value
- » Property value has positive effect on property tax assessment revenue



Green Building

- » Green building is categorized as an additional factor affecting property value as it gives premium price to a property
- » Green buildings offer several economic or financial benefits; energy saving, water efficiency, health wellbeing
- » Green elements can be further categorized as tangible and intangible green elements based on the characteristics and its features (Nalewaik & Venters, 2010; Liu et. al., 2014).
- » No research has been done regarding the determination of intangible green element of a property and its effects on value

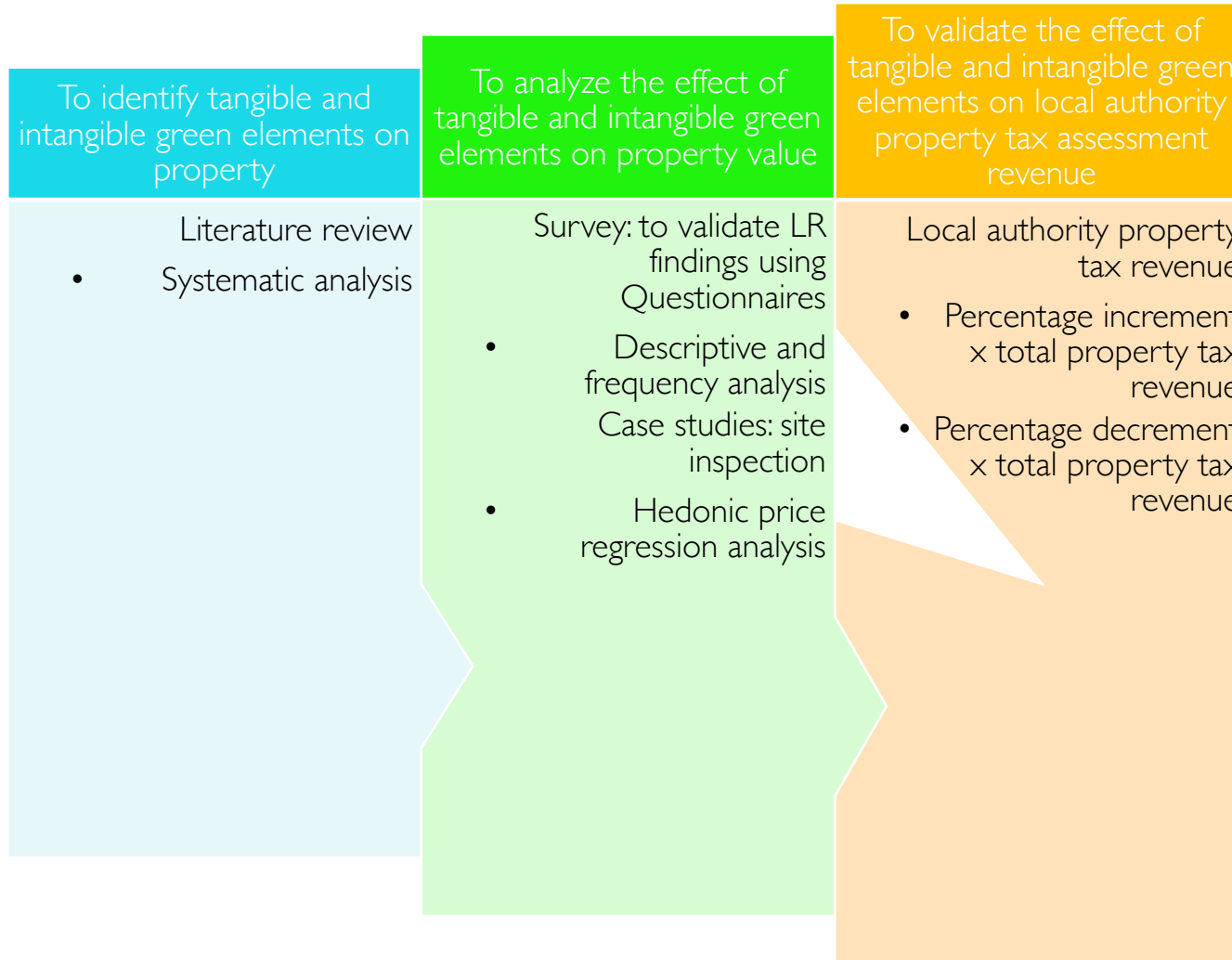
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GREEN BUILDING RATING TOOLS IN MALAYSIA

According to World Green Building Council, green buildings can reduce or eliminate negative impacts on the environment, by using less water, energy or natural resources and cause a positive impact on the environment by generating their own energy or increasing biodiversity. Besides, green building benefits go beyond economics and the environment, and have been shown to bring positive social impacts too.

Types of Green Building Rating Tools				
	Green Building Index (GBI)	Green Real Estate (GreenRE)	MyCrest	PHJKR
Property Type	1.Residential 2.Commercial 3.Township 4.Hotel 5. Retail 6. Resort	1.Residential 2. Non-residential Township	Air-conditioned building Non-air-conditioned building	Non-residential Healthcare services
Green Criteria	Energy Efficiency (EE) Indoor Environment Quality (EQ) Sustainable Site Planning & Management (SM) Materials & Resources (MR) Water Efficiency (We) Innovation (IN)	Energy Efficiency Water Efficiency Environmental Protection Indoor Environmental Quality Other Green Features Carbon Emission of Development	Infrastructure and sequestration Energy performance impact Occupant and health Lowering embodied carbon Water efficiency factors Social and cultural sustainability Waste management Carbon and sustainable initiative	Pengurusan Fasilitas Lestari TL Perancangan & Pengurusan Tapak Lestari KT Pengurusan Kecekapan Tenaga PD Pengurusan Kualiti Persekitaran Dalaman SB Pengurusan Sumber & Bahan PA Pengurusan Kecekapan Penggunaan Air IN Inovasi

METHODOLOGY



TANGIBLE GREEN ELEMENTS OF RESIDENTIAL BUILDING



Green roof



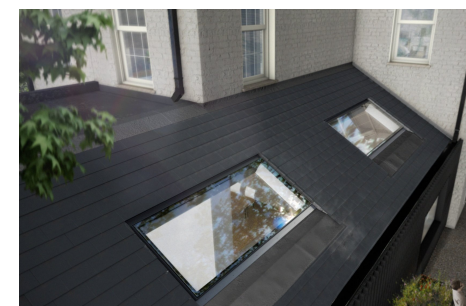
Turbine ventilator



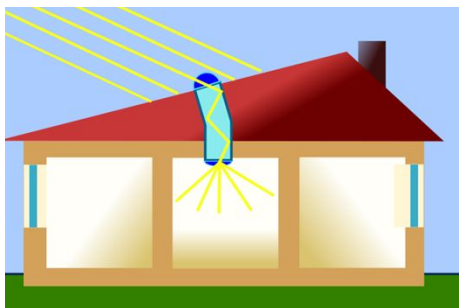
Solar water heating



Solar photovoltaic



Roof skylight



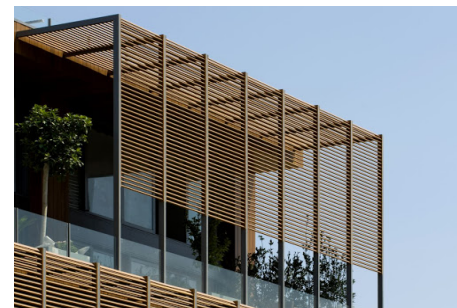
Light pipe



Green wall



Light shelf



Window external shading



Double skin façade glazing

INTANGIBLE GREEN ELEMENTS BASED ON GREEN RATING TOOLS GUIDELINE

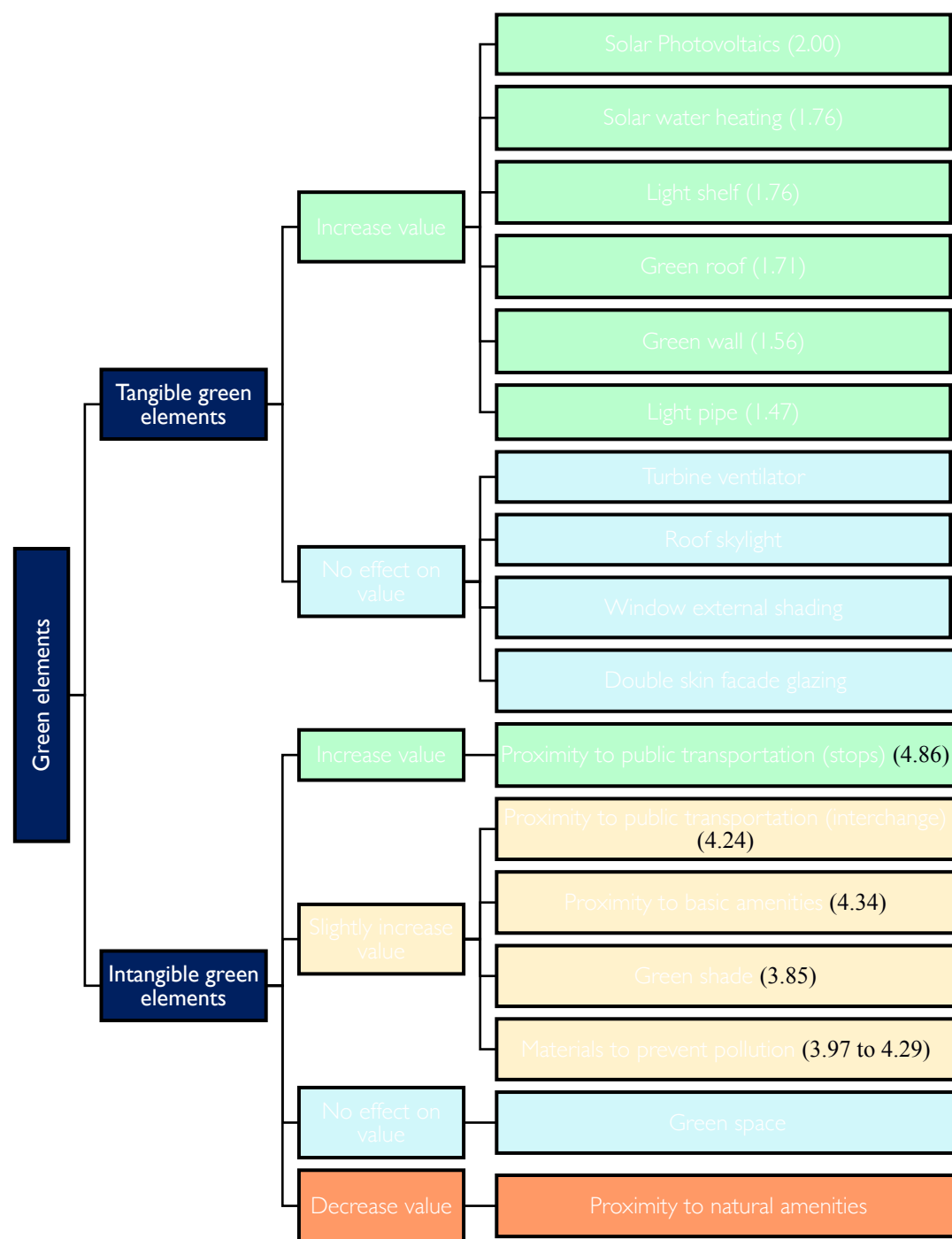
Attribute	Details	Green Building Index (GBI)	Green Real Estate (GreenRE)
Location	Proximity to natural amenities	SM1 – SITE SELECTION AND PLANNING Do not develop building in agriculture land, habitat land with endangered species and within 30 m of any wetlands.	Not stated.
	Proximity to public transportation	SM8 – PUBLIC TRANSPORTATION ACCESS Public transport stops within 500m. Public transport interchange with same mode of transport within 750m. Public transport interchange within more than one mode of transportation within 1km.	RES 3-5 GREEN TRANSPORT Good access (<800 m walking distance) to public transport networks such as MRT/LRT stations or bus stops.
	Proximity to basic amenities	SM3 – COMMUNITY CONNECTIVITY Basic amenities to be provided within 750m.	RES 3-8 COMMUNITY CONNECTIVITY Project located within 1km of at least 10 basic amenities.
Neighborhood	Green space	SM11 – HEAT ISLAND EFFECT Provide greenspace with native & adaptive plants and/or water body to 15/25/35/45/55% of land area.	RES3-3 GREENERY PROVISION Restoration of trees on site, conservation, or relocation of existing trees on site. (at least 20%)
	Green shade	SM8 – PUBLIC TRANSPORTATION ACCESS Dedicated covered walkway with man-made shades or natural shade-providing trees at regular spacings covering at least 70% of the pedestrian access.	Not stated.
	Quality of neighborhood and pollutions	EQ6 – SOUND INSULATION Sound transmission Class (STC) value between dwelling units > = 45	RES3-4 ENV MGMT PRACTICE Provision of facilities or recycling bins at each block of development for collection and storage of different recyclable waste such as paper, glass, plastic etc.
		EQ2 – VOLATILE ORGANIC COMPOUNDS MINIMISATION Reduce the detrimental impact on occupants' health from finishes that emit air pollutants. Low VOC paint and coating to wall and ceilings (at least 90%) or no paint and coating used.	RES4-1 NOISE LEVEL 55dB(6am – 10pm) 45 Db (10pm – 6am)
	SM6 – WORKERS'S SITE AMENITIES Provide proper septic tank.	RES4-2 INDOOR AIR POLLUTANTS Use VOC paints or environmentally friendly adhesive (At least 90%)	

STUDIES ON EFFECT OF TANGIBLE AND INTANGIBLE GREEN ELEMENTS ON VALUE

Tangible green elements		Effect on value	Authors
Roof Components	Green roof	Increase property value	Ibrahim et. al. (2014) Rahman et al. (2013) Ichiyara and Cohen (2011) Tomalty et. al. (2010)
		Decrease property value	Chen et. al. (2014)
	Turbine ventilator	Increase property value	Ibrahim et al. (2014)
		No effect on property value	Azis et. al. (2017)
	Solar water heating	Increase property value	Ibrahim et al. (2014)
		No effect on property value	Azis et. al. (2017)
	Solar Photovoltaic	Increase property value	Hoen et. al. (2011) Dastrup et. al. (2012)
	Roof skylight	Increase property value	Sipan et. al. (2014)
		No effect on property value	Ab. Azis et. al. (2017)
	Light pipe	Increase property value	Ibrahim et al. (2014)
No effect on property value		Ab. Azis et. al. (2017)	
Wall Components	Green wall	Increase property value	Manso et. al., 2020 Perini and Rosasco (2013); Des Rosiers et. al., 2002) Gao and Asami (2007)
		No effect on property value	Azis et. al. (2017)
	Double skin façade glazing	No effect on property value	Azis et. al. (2017)
	Window external shading	No effect on property value	Azis et. al. (2017)
	Light Shelf	Increase property value	Sipan et. al. (2014)
No effect on property value		Azis et. al. (2017)	

Intangible green elements	Details	Effect on value	Author
Location	Proximity to CBD	Increase property value	Voltes-Dorta and Sánchez-Medina (2020) d'Acci (2019) Singla & Bendigiri (2019)
		Decrease property value	Holt and Borsuk (2020) Chen and Li (2017) Gibbons et. al. (2014)
	Proximity to natural amenities	Increase property value	Gallo (2020) Cordera et. al. (2019) Mulley et. al. (2018) Camins-Esakov and Vandegrift (2018)
	Proximity to public transportation	Increase property value	Singla and Bendigiri (2019) Chiarazzo et. al. (2014)
		Decrease property value	Holt and Borsuk (2020) Nepal et. al. (2017) Sander et. al. (2010)
Neighborhood	Greenery	Increase property value	Holt and Borsuk (2020) Nepal et. al. (2017) Sander et. al. (2010)
	Quality of neighborhood and pollutions	Decrease property value	Łaskiewicz et. al. (2019) Chen and Chen (2017) Muhammad (2017)

FRAMEWORK OF TANGIBLE AND INTANGIBLE GREEN ELEMENTS EFFECT ON PROPERTY VALUE BASED ON PROFESSIONAL PERSPECTIVE



CASE STUDIES



CASE STUDIES

» SITE INSPECTION CHECKLIST (FACILITIES AND TANGIBLE GREEN ELEMENTS)

No.	Variables	Conventional residential building			Green residential building		
		Molek Pine 1	Molek Pine 2	Molek Regency	Molek Pine 3	Molek Pine 4	Ponderosa Lakeside
1.	Basketball court	✓	✓	✓	✓	✓	
2.	Badminton hall	✓	✓	✓	✓	✓	✓
3.	Playground	✓	✓	✓	✓	✓	✓
4.	24 hours security	✓	✓	✓	✓	✓	✓
5.	Tennis courts	✓	✓	✓	✓		✓
6.	Barbeque Area	✓	✓	✓	✓	✓	✓
7.	Multi-purpose hall			✓	✓		
8.	Sauna	✓	✓	✓	✓	✓	✓
9.	Swimming pool	✓	✓	✓	✓	✓	✓
10	Gymnasium	✓	✓	✓	✓	✓	✓

No.	Variables	Case studies		
		Molek Pine 3	Molek Pine 4	Ponderosa Lakeside
1.	Green roof	✓	✓	
2.	Turbine ventilator			
3.	Solar water heating			
4.	Solar photovoltaics	✓	✓	✓
5.	Roof skylight			
6.	Light pipe			
7.	Green wall		✓	✓
8.	Light shelf			
9.	Double skin façade glass			
10.	Window external shading			

CASE STUDIES

» SITE INSPECTION CHECKLIST (INTANGIBLE GREEN ELEMENTS)

Attribute that affects property value	Guideline by green rating tools	Actual Distance (m)			Variable selection
		Molek Pine 3	Molek Pine 4	Ponderosa Lakeside	
Natural amenities	Do not develop within 30m	1900m	1700m	20m	Included

Attribute that affects property value	Guideline by green rating tools	Actual Distance (m)			Variable selection
		Molek Pine 3	Molek Pine 4	Ponderosa Lakeside	
Public transport stops	Within 500m	120 m	80 m	100 m	Included
Public transport interchange	Within 750m	4200m	4200m	5100m	Not included

Attribute that affects property value	Guideline by green rating tools	Actual percentages (%)			Variable selection
		Molek Pine 3	Molek Pine 4	Ponderosa Lakeside	
Green space	15% to 55% of land area.	30%	25%	20%	Included
Green shade	70% of the pedestrian access.	70%	60%	40%	Included

Attribute that affects property value	Guideline by green rating tools	Actual Distance (m)			Variable selection
		Molek Pine 3	Molek Pine 4	Ponderosa Lakeside	
Highway	Within 750m	4300m	4300m	4000m	Not included
Schools	Within 750m	600m	550m	1700m	Included
Supermarket	Within 750m	170m	130m	1600m	Included
Police Station	Within 750m	2500m	2500m	3700m	Not included
Fire Station	Within 750m	2200m	2200m	3400m	Not included

Attribute that affects property value	Guideline by green rating tools	Actual Data			Variable selection
		Molek Pine 3	Molek Pine 4	Ponderosa Lakeside	
Low VOC paint	Use low VOC paint	Available	Available	Available	Included
Sound transmission wall material	Use sound transmission wall material	Available	Available	Available	Included
Proper septic tank	Provide proper septic tank	Available	Available	Available	Included
Suitable finishes	Reduce finishes that emit air pollutants.	Available	Available	Available	Included

HEDONIC PRICE REGRESSION ANALYSIS

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.772a	.595	.582	121975.753	.595	45.294	5	154	.000

a. Predictors: (Constant), Multi-purpose Hall, Transaction Date, Unit Size, Floor Level, Green Wall

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3369408925276.740	5	673881785055.348	45.294	.000b
	Residual	2291224990979.354	154	14878084357.009		
	Total	5660633916256.094	159			

a. Dependent Variable: Price
b. Predictors: (Constant), Multi-purpose Hall, Transaction Date, Unit Size, Floor Level, Green Wall

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	18099.402 / 5.378	44981.130		179.743	.000		
	Transaction Date	43993.281 / 0.033	4881.319	.463	10.158	.000	.994	1.006
	Unit Size	1579.012 / 0.001	278.311	.320	4.346	.000	.828	1.207
	Floor Level	-510.491 / -8.326	1285.420	-.022	-.097	.923	.878	1.139
	Green Wall	139699.785 / 0.108	24755.525	.340	6.550	.000	.723	1.384
	Green Roof	167851.424 / 0.110	26769.158	.376	6.205	.000	.730	1.370
	Proximity to Natural Amenities	-38077.266 / -.035	14652.948	-.148	-3.616	.000	.806	1.240
1	Proximity to Basic Amenities (Schools)	103769.886 / .073	14496.006	.441	7.159	.000	.684	1.461
	Green Space	-38077.266 / -.035	14652.948	-.148	-2.599	.010	.806	1.240
	Green Shade	103769.886 / 0.073	14496.006	.441	7.159	.000	.684	1.461

a. Dependent Variable: Price

HEDONIC PRICE REGRESSION MODEL

Monetary value model

$$Y = 43993.281 \text{ Transaction Date} + 1579.012 \text{ Unit size} - 82019.553 \text{ Location} - 510.491 \text{ Floor Level} \\ + 139699.785 \text{ Green Wall} + 167851.424 \text{ Green Roof} - 38077.266 \text{ Proximity to Natural} \\ \text{Amenities} + 103769.886 \text{ Proximity to Basic Amenities (Schools)} - 38077.266 \text{ Green Space} + \\ 103769.886 \text{ Green Shade} + 18099.402$$

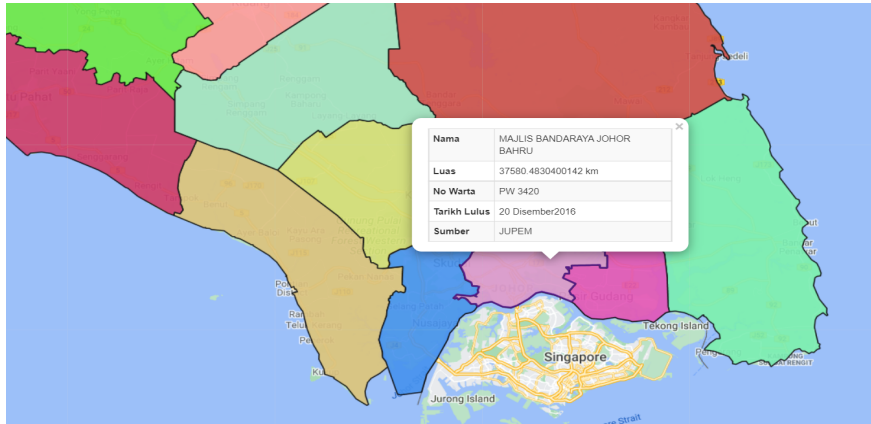
(1)

Percentage value model

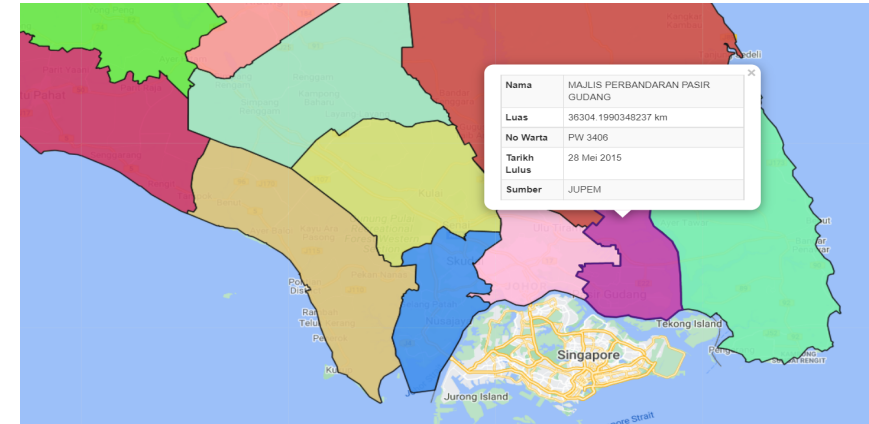
$$Y = 0.033 \text{ Transaction Date} + 0.001 \text{ Unit size} - 0.116 \text{ Location} - 8.326 \text{ Floor Level} + 0.108 \text{ Green} \\ \text{Wall} + 0.110 \text{ Green Roof} - 0.035 \text{ Proximity to Natural Amenities} + 0.073 \text{ Proximity to Basic} \\ \text{Amenities (Schools)} - 0.035 \text{ Green Space} + 0.073 \text{ Green Shade} + 5.378$$

(2)

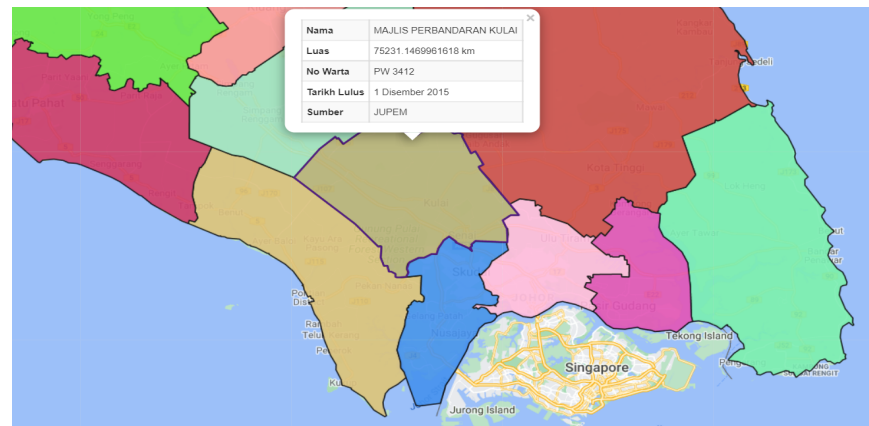
LOCAL AUTHORITIES IN JOHOR BAHRU, MALAYSIA



MAJLIS BANDARAYA JOHOR BAHRU



MAJLIS PERBANDARAN PASIR GUDANG



MAJLIS PERBANDARAN KULAI

POSITIVE EFFECT OF GREEN ELEMENTS ON LOCAL AUTHORITY PROPERTY TAX REVENUE

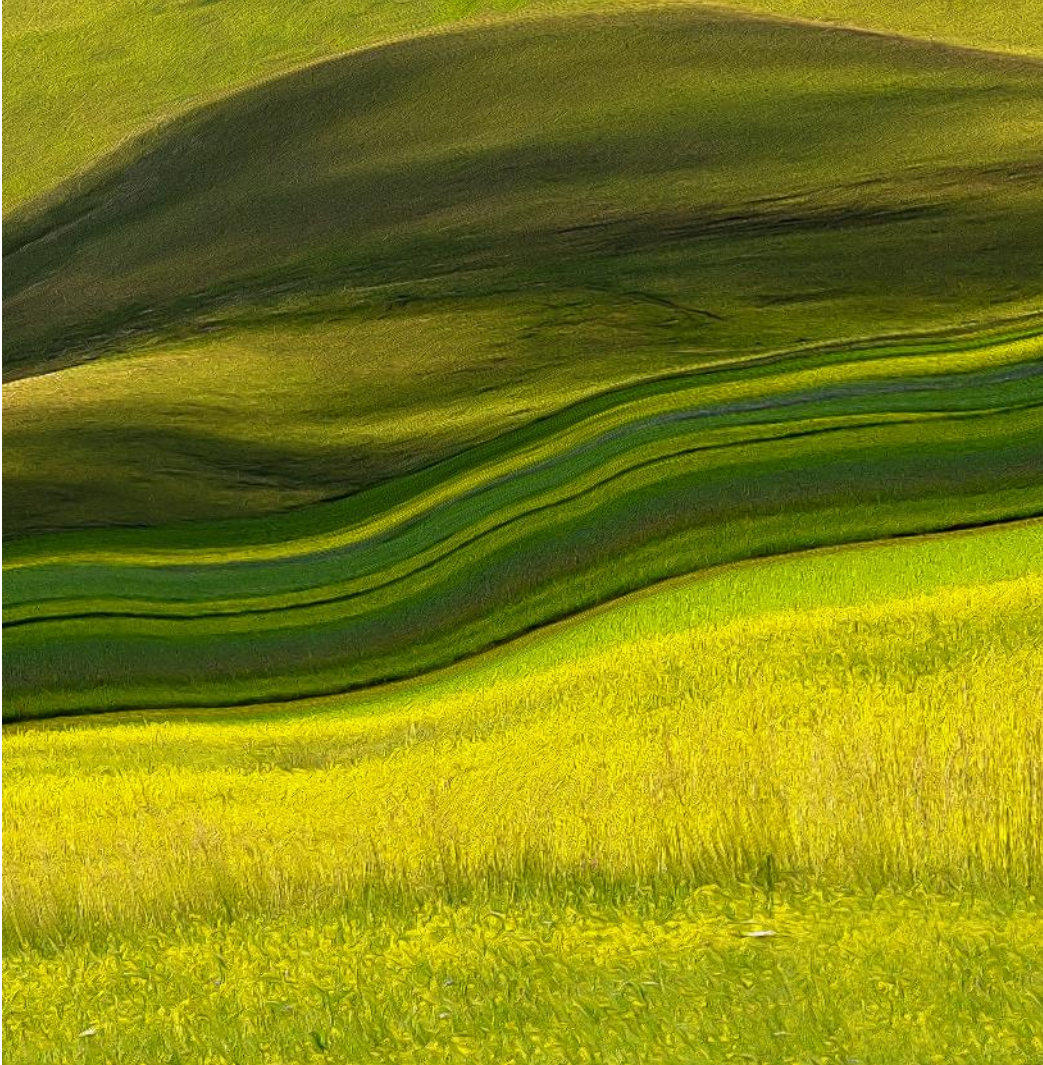
Green elements	Percentages (%)	MBJB		MBPG		MPKu	
		Current revenue: RM 74,775,136.64		Current revenue: RM 21,244,783.36		Current revenue: RM 26,476,673.90	
		Increment	Revenue increment	Increment	Revenue increment	Increment	Revenue increment
		(RM)	(RM)	(RM)	(RM)	(RM)	(RM)
Green roof	11.00	8,225,265.03	83,000,401.67	2,336,926.17	23,581,709.53	2,912,434.13	29,389,108.03
Green wall	10.80	8,075,714.76	82,850,851.40	2,294,436.60	23,539,219.96	2,859,480.78	29,336,154.68
Proximity to basic amenities	7.30	5,458,584.97	80,233,721.61	1,550,869.19	22,795,652.55	1,932,797.19	28,409,471.09
Green Shade	7.30	5,458,584.97	80,233,721.61	1,550,869.19	22,795,652.55	1,932,797.19	28,409,471.09
Overall	36.4	27,218,149.73	101,993,286.37	7,733,101.14	28,977,884.50	9,637,509.30	36,114,183.20
Total revenue increment		101,993,286.37		28,977,884.50		36,114,183.20	

NEGATIVE EFFECT OF GREEN ELEMENTS ON LOCAL AUTHORITY PROPERTY TAX REVENUE

Green elements	Percentages (%)	MBJB		MBPG		MPK _u	
		Current revenue:		Current revenue:		Current revenue:	
		RM 74,775,136.64		RM 21,244,783.36		RM 26,476,673.90	
		Decrement	Revenue decrement	Decrement	Revenue decrement	Decrement	Revenue decrement
		(RM)	(RM)	(RM)	(RM)	(RM)	(RM)
Proximity to natural amenities	-3.5	-2,617,129.78	72,158,006.86	-743,567.42	20,501,215.94	-926,683.59	25,549,990.31
Green space	-3.5	-2,617,129.78	72,158,006.86	-743,567.42	20,501,215.94	-926,683.59	25,549,990.31
Overall	-7	-5,234,259.56	69,540,877.08	-1,487,134.84	19,757,648.52	-1,853,367.18	24,623,306.72
Total revenue decrement		69,540,877.08		19,757,648.52		24,623,306.72	

CONCLUSION

- » This study validates the effect of tangible and intangible green elements of green residential building for taxation purposes.
- » This validation is made to analyze the property tax revenue levy by local authorities due to the implementation of tangible and intangible green elements on the residential buildings under their jurisdiction area.
- » This study proves that tangible and intangible green elements of residential buildings significantly affect the property value and taxation.
- » The implementation of green elements on the residential buildings provides economic, environmental and social benefits not only towards the occupants of the residential house but also to the society and local authorities.



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Thank You

