

Lifespan, Maintenance and Refurbishment of Highrise Affordable Housing Buildings (Low and Medium Cost Sector) Malaysia

Extending Building Life Span for Affordable Housing



Objective

In general, building lifespan is defined as a product, building or service over the course of its whole life. Considering the full lifespan of a building by maintenance and refurbishment can help to sustain the structure and improve the long-term financial value of the building.

- To review data available on maintenance and refurbishment costs
- Issues related to proper maintenance
- Government regulations and initiatives from the state and federal government
- Potential solution for maintenance and refurbishment of B40 affordable housing to extend lifespan

Average Lifespan of Building



Ideally, the average lifespan of an apartment is 50-60 years. Independent home ages much slower than an apartment building, because the amenities and common services are shared among the society residents. Their lifespan can be improved by carrying out regular maintenance.

Source:

<https://www.makaan.com/iq/buy-sell-move-property/what-is-the-average-age-of-a-house>



Building lifespan is calculated based on the depreciation of construction investments. It is important to distinguish between the lifespan of the building that the components are used in, and the lifespan of the materials that are used in that component.

Source:

<https://www.linkedin.com/pulse/building-lifespan-function-sustainability-yes-really-rob-marsh/>



For residential property you should put aside about one percent of the building's value every year to ensure you can afford to renovate the property every 30 years.

Source:

<https://www.swisslife.com/en/home/hub/what-is-the-lifespan-of-a-house.html>

Estimated Normal Maintenance Cost

MAINTENANCE SCHEDULE & COSTING							
ESTIMATED MAINTENANCE COST OF AFFORDABLE HOUSING							
Details:							
Size per unit :	900 sq.ft.	Total Units:500 units	Total maintenance:	RM 0.15* 900 sq.ft. = RM 135 Monthly Per Unit RM 135 * 500 units = RM 67,500 Monthly			
Total Size:	450,000 sq.ft.	Average cost for maintenanc e:		RM0.15 per sq.ft	Average to collect per tenant for maintenance : +/- RM 135 monthly		
DESCRIPTION	COST PER UNIT	PER MONTH	PER YEAR	TOTAL COST (10 YEARS)	TOTAL COST (15 YEARS)	AVERAGE COST PER UNIT (PER YEAR)	AVERAGE COST PER UNIT (FOR 10 YEARS)
	RM	RM	RM	RM	RM	RM	RM
(A) General Maintenance							
Landscaping Services		4,000	48,000	480,000	720,000	96	960
Sewerage	6	3,000	36,000	360,000	540,000	72	720
		7,000	84,000	840,000	1,260,000	168	1,680
TOTAL GENERAL MAINTENANCE							
(B) Mechanical & Electric							
Lift Maintenance [8 lifts]	1000	8,000	96,000	960,000	1,440,000	192	1,920
Electrical and Wiring system	50	2,500	30,000	300,000	450,000	60	600
Outdoor Lighting		40,000	480,000	4,800,000	7,200,000	960	9,600
Security System		10,000	120,000	1,200,000	1,800,000	240	2,400
TOTAL MECHANICAL & ELECTRICAL		60,500	726,000	7,260,000	10,890,000	1,452	14,520
TOTAL MAINTENANCE		67,500	810,000	8,100,000	12,150,000	1,620	16,200
TOTAL COLLECTION FROM MAINTENANCE FEE		67,500	810,000	8,100,000	12,150,000	1,620	16,200

Source: (Part)
<http://ratol.jkr.gov.my/>

Estimated Refurbishment Cost

REFURBISHMENT COST AND TENURE							
ESTIMATION FOR REFURBISHMENT COST OF AFFORDABLE HOUSING							
Details:							
Size Per unit:	900 sq.ft	Total Units:	500 units	Refurbishment (Sinking Fund): 10% from maintenance fee (RM 135*10%) = RM 13.50 - Round up to RM 15 monthly Per unit RM 15*500 units = RM 7,500 monthly RM 7,500* 12 = RM 90,000 yearly Average to collect per tenant for refurbishment (sinking fund) monthly = RM 15 per unit			
Total Size:	450,000 sq.ft	Sinking funds:	10% from maintenance fee				
DESCRIPTION	COST PER SQ FT	TOTAL SQ FT	COST FOR 15th YEAR	COST FOR 30th YEAR	COST FOR 60th YEAR	AVERAGE COST PER UNIT (15TH & 30TH & 60TH YEAR)	AVERAGE COST PER UNIT (PER YEAR)
	RM		RM	RM	RM	RM	RM
(A) Civil and Structure							
Roof (Structure and Covering)	47.00	12,600	592,200	592,200	592,200	1,184	79
Drainage System / Structure			9,500	9,500	9,500	19	1
Structure Painting	5.10	450,000	2,295,000	2,295,000	2,295,000	4,590	306
TOTAL CIVIL & STRUCTURE			2,896,700	2,896,700	2,896,700	5,793	386
(B) Mechanical & Electric							
Lift Replacement [8 units] (cost per unit)	500,000.00		4,000,000	4,000,000	4,000,000	8,000	533
Fire Alarm and Fire Fighting System	1.85	450,000	832,500	832,500	832,500	1,665	111
Electrical and Wiring system	10.00	450,000	4,500,000	4,500,000	4,500,000	9,000	600
Outdoor Lighting			120,000	120,000	120,000	240	16
Water Plumbing System	1.21	450,000	544,500	544,500	544,500	1,089	73
Security System			120,000	120,000	120,000	240	16
TOTAL MECHANICAL & ELECTRICAL			10,117,000	10,117,000	10,117,000	20,234	1,349
TOTAL REFURBISHMENT COST			13,013,700	13,013,700	13,013,700	26,027	1,735
TOTAL COLLECTION OF SINKING FUNDS	15	90,000 (per year)	1,350,000	1,350,000	2,700,000	2,700	180
CASH FLOW (total refurbishment - sinking funds)			(11,663,700)	(11,663,700)	(10,313,700)	(23,327)	(1,555)

**** based on current year cost – to be increased for inflation**

Roof = 14 units at the top only
 900 sq.ft*14 units
 = 12,600 sq.ft.

Lift = The lift replacement cost is based on the budget allocation from Selangor State Assembly. The price is depending on the size of lift and its capacity.

Notes:

- No refurbishment costs for the first 15 years
- **RM 26,027** of the total refurbishment @ 15th year is to be **borne by the tenant, which works out to RM 1,735 per year or RM 145 @ RM 150 per month**

Source: <http://ratol.jkr.gov.my/>

The Issues of Building Refurbishment & Maintenance in Malaysia

1 Cost of Refurbishment & maintenance

- Due to all complexities, it could cause project delay and cost overruns
- Some modifications and design requires specific material and methods which can increase the cost
- Every building equipment/common properties have different lifespan – poor planning may affect the refurbishment cost in the future
- The government allocation for refurbishment and maintenance budget is unsustainable in the long run – as many residents still refuse to pay maintenance fee imposed by the management
- The maintenance and refurbishment cost would keep increasing in the future – more holistic approach on cost is needed
- Sinking fund is only 10% from maintenance fee – insufficient for major refurbishment

2 Lack of Information

- Less than 70% of information of the buildings (structure, material, design and facilities) are available for contractors to perform the refurbishment works
- It leads to the lack of understanding of existing structure
- It will cause a delay in maintaining or refurbish the existing building
- Improper modifications will compromise the building's safety and sensitivity.

3 Material use

- Availability of existing material – some existing materials are no longer available.
- Some existing materials are not compatible with the new materials – developer must change the whole design.
- Time consuming to be produced & ineffective cost

4 Building regulations

- It affects the approval process & progress of the refurbishment
- Making several alternation of the existing buildings are difficult as there are more limitation and regulations need to comply [e.g.: SDBA Act 1973]

Recommendation for Maintenance and Refurbishment cost

- Suggest a statutory requirement to conduct a reserve study and evaluate the “common properties” that need to be replaced after 15 years in service – more cost effective
- Establish a framework for collecting the sinking funds for future refurbishment – to avoid instances of insufficient funds and neglect
- Assistance from government is essential if we plan to reduce the maintenance & sinking funds collection per unit. (e.g: TP1M scheme, SMART Scheme & Cerita Scheme) – However, some schemes only cover certain maintenance/replacement of equipment.
- Cooperation and collaboration with the government to cover the cost of maintenance/refurbishment based on current mechanism with more effective approach - e.g; government subsidies or scheme
- Buying rather than renting an apartment, owners believed, transformed a relatively public space into a more private home and helped strengthen a community of neighbors. It also allowed many people to own homes in places they otherwise couldn't afford.
- Paying for services as a group saves money, too. It's cheaper to share lifts, roofs, and janitorial services than to pay for all that on your own. Apartment owners can also share the expense of amenities such as gyms and swimming pools.

Issues Related to Building Lifespan

- Building maintenance needs to be addressed at the early stage after the completion of the building to increase the performance and life span of the building, and helps in term of investments' value
- Lacking on the need for maintenance, which frequently is only realized at the latter stage of deterioration on house components
- House owners do not have any technical knowledge about defects and have zero building construction background
- Resulting in less to non-periodic assessment throughout the life expectancy (LE) of house components
- Maintenance phase falls under the scrutiny of the project owner during Defect Liability Period (DLP) (usually 18 months to 24 months) and legitimate house buyers afterwards
- Estimating life span is difficult as it relates to design, material used, maintenance, availability of replacement parts after 20 years.

Example: Singapore Housing Development Board (HDB)

Life Cycle Cost of flat – The best model to finance 99-year lease

HDB's 1 million flats, 24 towns and 3 estate houses 80% residents and 90% ownership and upgrading to retain the quality and value of flats

- 1st round at year 30-40
- 2nd round at year 60-70
- 3rd round compulsory surrender at year > 70

Prior 1986
HDB flat built:
Year 0

Selective En bloc
Redevelopment Scheme
(SERS) in 1995
Precincts are chosen for redevelopment via compulsory acquisition with compensation. Average 3 per year, initially. Recent example, HDB blocks Bukit Merah to house foreign workers - COVID-19 pandemic)

Round 1: Year 30 – 40 mark
2007 Home Improvement Programme (HIP)¹ - \$4 billion
450,000 of pre-1986 flats upgrading on 75% vote (+230,000 for 1987-1997 built)

1. Essential improvements
2. Optional improvements
3. Enhancement for Active Seniors (EASE)

Government subsidises between 87.5% and 95% essential improvement

Round 2: Year 60 – 70 mark
HIP2 in 2028
2nd round of upgrade and will cost more

Round 3:
Voluntary Early Redevelopment Scheme (VERS) in 2038
Selected precincts **more than 70 years old** to vote for Government buy back

2001 Lift Upgrading Programme (LUP)

1. 5,300 Direct lift access to their flats
2. **Lift access Housing Grant (LHG)** of up to \$30,000 to help them move into a new HDB flat or a resale flat

Funding

1. 15 years and **\$S\$4.8 billion** to retrofit 4,000 HDB flats
2. **\$3,000** fee per owner

In Malaysia, Selangor State Government has a similar programme that focus on upgrading the lift at the low-and-medium cost housing with RM 30 million has been allocated for this programme

Neighbourhood Renewal Programme (NRP)

1. Coordination and integration across neighbouring precincts
2. Block & precinct level
 - a. Drop-off porch
 - b. Covered linkways
 - c. Playground

Fully funded Government

2020 Remaking Our Heartland (ROH)

Rejuvenation blueprint to renew and further develop existing HDB towns and estates reducing energy consumption, recycling rainwater and cooling

- a. elevated cycling and pedestrian paths.
- b. communal spaces, and connectivity networks.

Fully funded Government

The programmes

1. **Essential improvements**, or compulsory improvements necessary for public health, safety and technical reasons, such as the repair of spalling concrete and structural cracks
2. **Optional improvements** that you can opt for at additional cost, such as a new decorative door or grille gate
3. **Enhancement for Active Seniors (EASE)** improvements that seniors can opt for to enhance their safety and comfort, such as grab bars and slip-resistant treatment to bathroom floor tiles.

The Building Maintenance & Refurbishment in Malaysia

- Government policy under 9th and 10th Malaysia Plan has emphasized and encouraged the building refurbishment rather than new construction
- The government spending in the construction sector has declined (pre-covid era)
- There is an increase pattern on building refurbishment in Malaysia as more fund is allocated for refurbishment
- In maintenance aspects, the government has also allocated scheme for public and private low-and-medium cost housing:
- Collaboration between Federal government, state authority and housing association can be seen in the past decade
- According to the guideline from the Ministry of Housing and Local Government (KPKT), all buildings which have at least 5-storey need to be inspected after the 10th year from the date the first certificate of fitness was issued
- The building maintenance/inspection is not only limited to the equipment/facilities but also the structure of the buildings/ surrounding environment, etc.

Period of full building inspection

	Description	Status
1 st Inspection	All buildings which have at least 5-storey need to be inspected after the 10th year from the date the first certificate of fitness was issued	Mandatory
Next Inspection	Thereafter at interval of not more than 10 years from the date of completion of the last inspection of the building	Mandatory
Additional inspection	Depending on the condition of the building/structure. The owner may request the inspection and inform to the local authority for consideration.	Voluntary

Source: [Guidelines of Periodical Inspection of Buildings KPKT \(2016\)](#) & [Sec. 85A of SDBA Act 1976](#)
[Quality Assessment System for Building Construction Works CIDB \(Official Version /Homeowner version\)](#)

Potential Solutions



Decision-Making

Effective decision-making process is required involvement from all stakeholders



Coordination

There is a need some coordination between all stakeholders and client , ensuring all parties understand the process and proper procedure



Information Technology

Integrate the usage of technology – providing the best design for refurbishment

Cost effective – the developer will be able to get more accurate information about the buildings, material use, and the current conditions



Green Technology

Integrate the usage of green and sustainable technology in maintenance to achieve cost effectiveness

Source: [MATEC](#) (2014) & [MyCREST](#) (2016)

Federal & State Govt Initiatives

Federal & State Govt Initiative

*Program Penyenggaraan Perumahan (PPP)**

- Initiative from federal government to assist state /local authority in maintaining the **public low-medium cost housing**
- The mechanism – 90:10 [90% from KPKT & 10% from state/local authority]
- The government has allocated RM 500 million for this program (2011-2015)

PPR	Number of block	Units	Maintenance cost (Funded by this program)	Maintenance works
PPR Kota Damansara	4	1,152	RM2,313,033.84	Roofing maintenance, fire fighting system, sewerage system, lighting and cleaning works
PPR Kg. Baru Hicom	3	980	RM11,576.55	Lift maintenance and water pump maintenance

Source: [Selangor State Assembly](#) (2015)

Scope covered by both schemes:

1. Lift
2. Roof
3. Stairs & handrail
4. Electrical wiring
5. Slope area maintenance
6. Water piping system
7. Visual (repainting, landscaping, etc)
8. Common property

Program Tabung Penyelenggaraan 1 Malaysia (TP1M)

- **Specifically for private low-medium cost housing** [[Link](#)]
- The mechanism – 90:10 [90% from KPKT & 10% from management/housing association]
- Additional requirements ([Link](#)):
 - The building should more than 10 years old
 - It only covers the maintenance costs more than RM 50,000
 - 10% of fund is required before applying to this program
- This program is an alternative to get an additional fund if the maintenance fees is insufficient to the maintenance or refurbishment cost

Example of the TP1M Program

Flat Taman Kem, Klang

- It received RM 5 million from TP1M program to repair and renovate all infrastructures and facilities at all blocks
- These includes repairing the roof, water tank, handrail and visual improvement

Note: There is no major maintenance has been done before from the past decades. ([Link](#))

Pangsapuri Pendamar, Klang

- It received RM 3 million from TP1M program to repair, replace and maintenance of the existing elevator
- This is an additional fund from the federal government under KPKT as the state government has already funded from the separate program ([Link](#))

Notes:

- Maintenance Fee is based on current rate for PPR: RM 24 monthly per unit ([Link](#))
- Normally, if the maintenance fee is insufficient, the JMB/neighborhood association may apply an additional funds/scheme provided by the authority
- Maintenance cost is an estimation based on affordable housing maintenance cost. The cost may vary depending on the size of the building, type of maintenance, etc.

Flat Taman Kem	
Age	40 years
Number of blocks	5 blocks
Number of units	104 units per block
	520 units (total all 5 blocks)
Average unit size (sq.ft.)	484 sq.ft. per unit
Average fund allocated for each block for maintenance	RM 900,000
Average maintenance cost per unit (based on fund received)	RM 8,653

CASH FLOW	Year (RM)				Total (RM)
	0	10	20	30	
Cash Inflow					
Maintenance fee (RM 24 Per Unit) - 520 units		2,995,200	2,995,200	2,995,200	8,985,600
Total Inflow [A]		2,995,200	2,995,200	2,995,200	8,985,600
Cash Outflow					
Maintenance Cost (Estimate)		3,000,000	3,000,000	3,000,000	9,000,000
Total Outflow [B]		3,000,000	3,000,000	3,000,000	9,000,000
Net Cash Flow [A-B]		(4,800.00)	(4,800.00)	(4,800.00)	(14,400.00)

State Initiative (Selangor)

Ceria Scheme

- **Ceria Scheme is a loan program from state government** to help the JMB & MC in maintenance cost of the facilities.
- All high-rise residential with strata titles are eligible to apply but priority will be given to the low-and-medium cost housing. *(currently, 254 high-rise residential are eligible to receive this scheme)*
- JMB & MC only need to pay back 20% (for low-cost) and 40% (other types of high-rise residential) from the loan received. **[RM 5 per unit of house] – Suggested by State Gov.**

Source: [Selangor State Assembly](#) (2017)

Smart Lift Improvement for Quality Life (SMART)

- It is a scheme **specifically for lift maintenance for low-cost housing scheme in Selangor**
- The State government allocated RM 30 million and it can help JMB and MC to save the maintenance cost of lift, up to RM 100,000 per year

Example of allocation of fund for SMART Scheme

Jurisdiction	Apartment Name	Number of Lift	Estimated fund yearly (in RM)
MBPJ	Damansara Bestari (Block C)	2	18,876.48
	Damansara Bestari (Block D)	2	17,604.48
MBSJ	Pangsapuri Belimbing Cempaka	2	19,200.00
	Ukay Indah	6	37,540.00
	Bukit Segar (Block A1)	2	11,130.00
	Blok Tanjung	2	51,007.20

Source: [Selangor State Assembly](#) (2017)

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Sustainable Affordable Housing project based on Whole Lifecycle Cost (WLCC)

Property developer's costing fundamentals and assumptions

1. AH Project Model
 - a. 500 units of 900 sq ft
 - b. Price at RM250,000
 - c. 5-acre with density of 100 units per acre
2. Discount rate: 1.75% per year
 - a. Hurdle based (e.g. FD) rate that foundation is willing to accept
3. Year 0 (Y0) upon project completion
 - a. GDV (i.e. RM250,000 x 500 units) RM125,000,000
 - b. Construction cost (total development) **(RM110,125,000)**
 - c. Developers profit (11.4% pre-tax) RM 14,875,000
4. **Annual Maintenance cost** RM 810,000
5. **Year 15, 30 and 60**
 - a. **Major upgrade and repair cost** RM 39,041,100

No	Year	Assumption	
1	Annual	Discount Rate	1.75%
2	0	Gross Development Value (GDV)	125,000,000
3	0	Construction	(110,125,000)
4	0	Profit (i.e., pre-tax at 11.9%)	14,875,000
5	Annual	Maintenance cost (Per year)	810,000
6	30 & 60	Refurbishment 15,30 & 60 years)	39,041,100

WLCC – Whole Life Cycle Cost GDV – Gross Development Value

<https://corporatefinanceinstitute.com/resources/knowledge/finance/discount-rate/>

<https://ringgitplus.com/en/fixed-deposit/12-month/> <https://loanstreet.com.my/learning-centre/best-fixed-deposit-promos>

Cost model of AH

What is cost structure of affordable housing?

Compliance cost impact on property prices

Example:

Conversion Agriculture to Residential land in Klang Valley

- 500 units of 900 sq ft
- Price at RM250,000
- 5-acre with density of 100 units per acre.

Total compliance costs and capital contributions of the apartment project is estimated at **RM8.23 million, or about 6.6%** of the RM125 million GDV of the project (Table on the right).

<https://www.edgeprop.my/content/1454158/compliance-cost-and-what-it-means>

ITEM	NUMBER OF APARTMENTS TO BE BUILT	COST PER UNIT	TOTAL GDV	
Gross development value (GDV)	500 units	RM250,000	RM125,000,000	
COST COMPONENT	COSTING		TOTAL COST	COST TO GDV
Total building cost			RM61,650,000	49.3%
Apartments	450,000 sq ft (500 x 900 sq ft)	*RM95 psf	RM42,750,000	
Car park podium	1,050 bays	*RM18,000 per bay	RM18,900,000	
Total land cost	5 acres of Land	*RM110 psf	RM23,958,000	19.2%
Total infrastructure cost			RM9,250,000	7.4%
Road, drainage and road services	5 acres of Land	*RM1,000,000 per acre	RM5,000,000	
Landscaping	5 acres of Land	*RM650,000 per acre	RM3,250,000	
Upgrading cost for traffic disbursement	–	–	*RM1,000,000	
Total capital contributions & compliance costs			RM8,231,200	6.6%
Land conversion premium (agriculture to residential)	–	15% of the land value	RM3,593,700	
Development order/planning fees	500 units of apartments	RM50	RM25,000	
Building plan and infrastructure fees	500 units of apartments	RM150	RM75,000	
Survey fees	5 acres of Land	RM5,000	RM25,000	
Strata title application	500 units of apartments	RM1,200	RM600,000	
ISF contribution – road	450,000 sq ft (500 x 900 sq ft)	RM500 for every 1,000 sq ft	RM225,000	
ISF contribution – drainage	5 acres of Land	RM5,000	RM25,000	
Development charges	–	1.5% of GDV	RM1,875,000	
Contribution to TNB	500 units of apartments	RM450	RM225,000	
Contribution to IWK	–	1% of GDV	RM1,250,000	
Contribution to SYABAS – residential project	–	0.25% of GDV	RM312,500	
Total facilities cost			RM340,000	0.3%
TNB sub-station	1 unit	*RM150,000	RM150,000	
Refuse chamber	1 unit	*RM80,000	RM80,000	
Surau	1 unit	*RM50,000	RM50,000	
Guard house	1 unit	*RM60,000	RM60,000	
Total of other soft costs			RM6,643,272	5.3%
Professional fees		* About 6% of construction ^{***} cost	RM4,768,272	
Sales and marketing and administration cost		*1.5% of GDV	RM1,875,000	
Developer's pre-tax profit margins (net profit margin 7.7% + tax 4.2%)				11.9%
Total cost to GDV				100%

• **GDV 100% at RM125 mil (RM277 psf)**

• **Building cost 49.3% at RM61.7 mil**

• **Land cost 19.2% at RM24 mil (RM110 psf)**

Infrastructure cost 7.4% at RM9.25 mil

• **Capital contribution 6.6% at RM8.23 mil and compliance cost**

• **Soft cost 5.3% at RM6.43 mil**

• **Net profit margin cost 7.7%**



Article (philadelphia inquirer)

- Pitfalls of condominiums and other forms of [co-ownership](#) in which each unit in a multifamily building is individually owned, while the structure itself is owned, and managed, collectively.
- Buying rather than renting an apartment, owners believed, transformed a relatively public space into a more private home and helped strengthen a community of neighbors. It also allowed many people to own homes in places they otherwise couldn't afford.
- Paying for services as a group saves money, too. It's cheaper to share boilers, roofs, and janitorial services than to pay for all that on your own. Apartment owners can also share the expense of amenities such as gyms and swimming pools.