CIDB MALAYSIA

COST-BENEFIT OF QLASSIC APPLICATION IN AFFORDABLE HOUSING PROJECTS

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PREFACE

Quality Assessment System in Construction (QLASSIC) was introduced to the Malaysian construction industry to address the issue of quality in building construction projects. Since its introduction in 2007, many developers of properties in housing and real estate has reported better demand and sales of their properties through the reduction of defects during the Defects Liability Period (DLP) and lesser end-user complaints. In conceiving the benefit of applying QLASSIC from these projects, coupled with the continuing issue of quality which has been inherent in affordable housing projects, the government is considering the application in affordable housing projects.

This paper presents the study conducted to provide further in-sights to this viability of QLASSIC application in affordable housing projects. The aim was to establish the difference in the defects between QLASSIC applied and non-QLASSIC applied projects by drawing data from available government and private affordable housing projects.

EXECUTIVE SUMMARY

The objective of the Malaysian housing policy is to ensure that all Malaysians, particularly the low income groups, have access to adequate and affordable shelter and related facilities. The national housing policy is emphasised through housing programmes and strategies outlined in the country's development plan. While this has seen a significant increase in the numbers of affordable housing built over the last decade, the issue of quality particularly in affordable housing projects have frequently been reported. Responding to this, the Ministry of Works and the Ministry of Housing and Local Government is considering to make the application of Quality Assessment System in Construction (QLASSIC) for affordable housing projects. QLASSIC was developed based on the Construction Industry Standard (CIS 7:2014) in 2006 by the Construction Industry Board Development (CIDB) in collaboration with the industry stakeholders to evaluate construction workmanship quality.

The suggestion for making QLASSIC mandatory have raised concerns among some developers and contractors in the construction industry. They claim that because of the tight construction cost, they face a daunting challenge to deliver the houses that meets the industry quality standards. Conversely, proponents for making QLASSIC mandatory have argued that the cost of QLASSIC application is not very significant. This is because the quality standard stipulated in construction contracts are the same, regardless of the type of building project. Furthermore, if there is any actual cost increase, the cost affected are only the cost of engaging more skilled workers for QLASSIC applied elements only. This difference would be negligible if factored with the total construction cost.

This project was mooted to investigate the validity of the claims. The aim of the study is to establish the cost and benefit of affordable housing projects which applied QLASSIC. The scope of the study are affordable housing projects developed by the government and private sector in 2018-2019. The findings suggest that there is a significance difference in the defects between QLASSIC applied and non-QLASSIC applied projects, and affordable housing projects developed by the private sector by renowned developers tend to register lesser % cost of defects rectification compared to government projects.

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1.0 Background

Affordable housing can be defined as housing which is deemed affordable to those with a median household income or below as rated by the national government or a local government by a recognized housing affordability index, and this varies with location. For this research, the classification of affordable housing was drawn from the data produced by the Ministry of Local Government as shown in Figure 1.

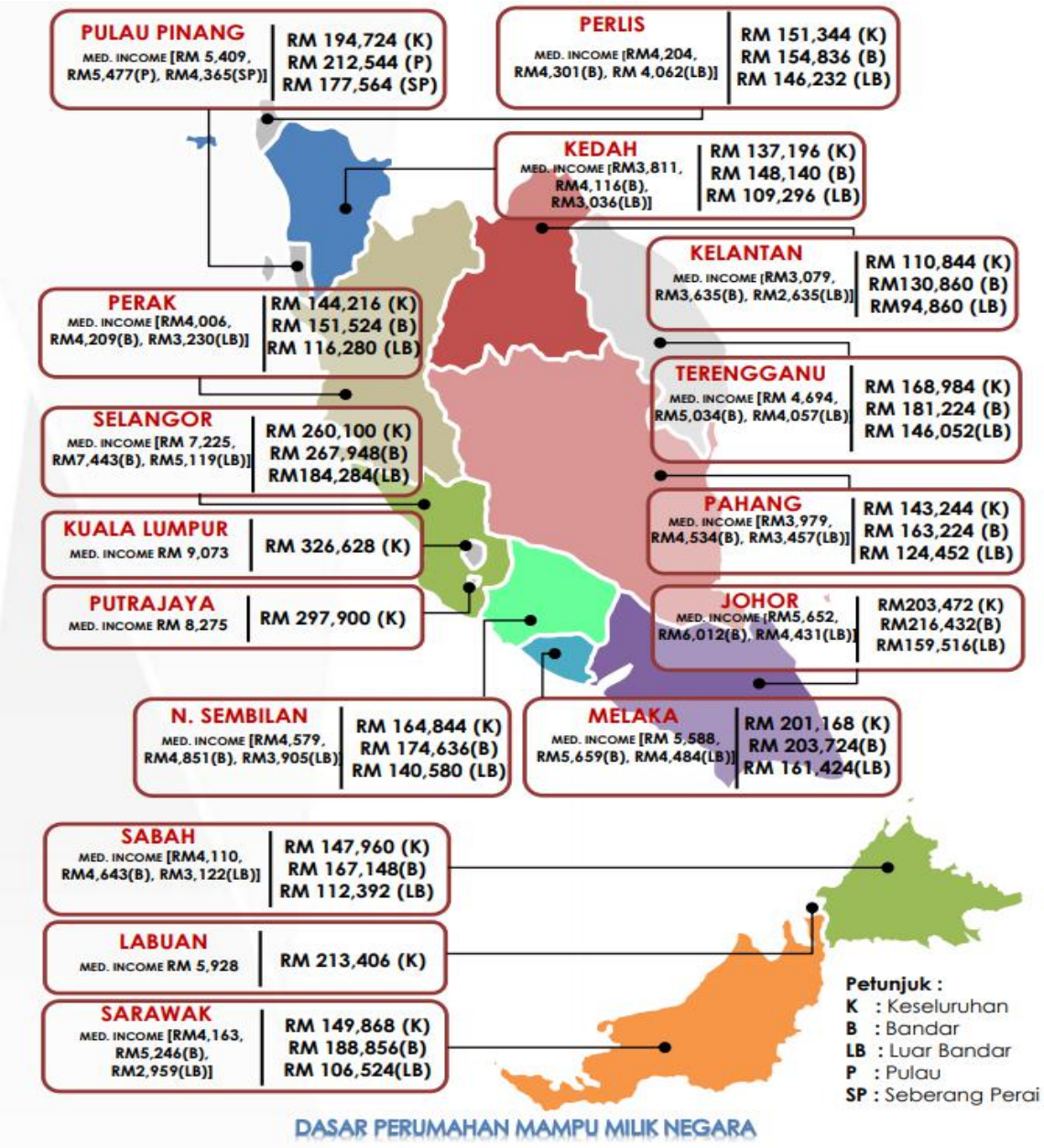

Figure 1: Classification of affordable housing in Malaysia (Source, KPKT, 2019)

This study sets out to investigate the differences between QLASSIC applied and non-QLASSIC applied in government and private affordable housing projects. A total of seventy-six (76) affordable government and private affordable housing clients, developers and contractors were approached but only fourteen (14) responded. To facilitate the analysis, data were grouped and classified as follows:

(i) Government Affordable Housing projects (Table 1),

(ii) Private Affordable Housing projects (Table 2),

(iii) Non-QLASSIC applied projects (Table 3)

(iv) QLASSIC applied projects (Table 4)

Table 1: List of Government Project

No.	Project	Developer	Type of unit	No of Units
1.	Cadangan Pembangunan Perumahan Bercampur-Campur Di Taman Sutera Wangi, Mukim Batu Berendam, Melaka Tengah, Melaka.	Syarikat Perumahan Negara Berhad	Low cost, Single Storey, Double storey	716
2.	Cadangan Pembangunan Rumah Aspirasi Rakyat (Fasa 2) Di Atas Lot 5068 Kuang Mukim Rawang, Daerah Gombak, Selangor	Syarikat Perumahan Negara Berhad	Apartment	1,224
3.	Cadangan Pembangunan Rumah Aspirasi Rakyat Di Atas CL 045335064, KM24, Jalan Tuaran, Telipok, Kota Kinabalu, Sabah	Syarikat Perumahan Negara Berhad	Apartment	618
4.	Vista Perdana Fasa 2, Miri, Sarawak	Syarikat Perumahan Negara Berhad	Single Storey Terrace	318
5.	Program Perumahan Rakyat (PPR) Merotai 1, Tawau, Sabah	Jabatan Perumahan Negara (JPN)	Flat	470
6.	Program Perumahan Rakyat (PPR) Gayang, Tuaran, Sabah	Jabatan Perumahan Negara (JPN)	Flat	418
7.	Program Perumahan Rakyat (PPR), Wakaf Mek Zainab, Kota Bahru, Kelantan	Jabatan Perumahan Negara (JPN)	Flat	1000
8.	Program Perumahan Rakyat (PPR) Merotai 2, Tawau, Sabah	Jabatan Perumahan Negara (JPN)	Flat	470

Table 2: List of Private Projects

No.	Project Title	Developer	Type of Unit	No of Units
1.	Perumahan Penjawat Awam 1Mamalysia (PPAIM), Pangsapuri *Jintan* Presint 16. Puterajaya	Apex Communication	Apartment	517
2.	Denai Nusantara, Persiaran Denai, Taman, Denai Nusantara, 81550 Gelang Patah, Johor	UEM Sunrise	Apartment	170
3.	Nusa Bayu Phase 6, Jalan Bayu 6/2, Nusajaya Industrial Park 2, 79250 Nusajaya, Johor	UEM Sunrise	Apartment	322
4.	Tropicana Aman, Damansara, Selangor	Tropicana Aman	Apartment	776
5.	Cadangan Membina 80 units Rumah Selangorku Bandar Sungai Chik, Hulu Selangor	PKNS	Terrace Houses	80
6.	Cadangan Membina 189 units Town House Kota Puteri, Rawang	PKNS	Apartments	189
7.	Sky Awani 1 Residences	SkyWorld	Apartment	1226

Table 3: List of non-QLASSIC applied projects

No.	Project	Developer
1.	Cadangan Pembangunan Perumahan Bercampur-Campur Di Taman Sutera Wangi, Mukim Batu Berendam, Melaka Tengah, Melaka.	Syarikat Perumahan Negara Berhad (SPNB)
2.	Cadangan Pembangunan Rumah Aspirasi Rakyat Di Atas Lot 5068 Kuang Mukim Rawang, Daerah Gombak, Selangor (Fasa 2) Berdasarkan Kosep Reka Dan Bina (Laguna Biru)	Syarikat Perumahan Negara Berhad (SPNB)
3.	Cadangan Pembangunan Rumah Aspirasi Rakyat Di Atas CL 045335064, KM24, Jalan Tuaran, Telipok, Kota Kinabalu	Syarikat Perumahan Negara Berhad (SPNB)
4.	Vista Perdana Fasa 2, Miri, Sarawak	Syarikat Perumahan Negara Berhad (SPNB)
5.	Program Perumahan Rakyat (PPR) Merotai 1, Tawau, Sabah	Jabatan Perumahan Negara (JPN)
6.	Program Perumahan Rakyat (PPR) Gayang, Tuaran, Sabah	Jabatan Perumahan Negara (JPN)
7.	Program Perumahan Rakyat (PPR), Wakaf Mek Zainab, Kota Bahru, Kelantan	Jabatan Perumahan Negara (JPN)
8.	Program Perumahan Rakyat (PPR) Merotai 2, Tawau, Sabah	Jabatan Perumahan Negara (JPN)

Table 4: List of QLASSIC applied projects

	Project	Developer
1.	Perumahan Penjawat Awam 1Mamalysia (PPAIM), Pangsapuri *Jintan* Presint 16. Puterajaya	Apex Communication
2.	Denai Nusantara, Persiaran Denai, Taman, Denai Nusantara, 81550 Gelang Patah, Johor	UEM Sunrise
3.	Nusa Bayu Phase 6, Jalan Bayu 6/2, Nusajaya Industrial Park 2, 79250 Nusajaya, Johor	UEM Sunrise
4.	Tropicana Aman, Damansara, Selangor	Tropicana Aman
5.	Cadangan Membina 80 units Rumah Selangorku Bandar Sungai Chik, Hulu Selangor	PKNS
6.	Cadangan Membina 189 units Town House Kota Puteri, Rawang	PKNS

2.0 Methodology

Data collection was carried by approaching the project's Project Managers, Construction Managers, QLASSIC Assessors, and Quality Assurance and Quality Control (QAQC) Officers. A quantitative research method was adopted as shown in Table 5.

Table 5: Summary of research methodology and steps to the analysis

No	Steps	Data Collection	Respondents	Analysis Method
1.	To investigate the difference in the construction cost between QLASSIC applied and non-QLASSIC applied projects	Cost between QLASSIC applied and non-QLASSIC applied projects (Construction cost/m2)	Project Managers, Construction Managers Quality Assurance & Control Officers, QLASSIC Assessors.	Statistical mean analysis
2.	To investigate the number of defects in QLASSIC applied and non-QLASSIC applied projects	Number of defects in QLASSIC applied and non-QLASSIC applied projects (Number of defects based on projects)	Project Managers, Construction Managers Quality Assurance & Control Officers, QLASSIC Assessors.	Statistical mean analysis
3.	To investigate the cost of rectification of defects in QLASSIC applied and non-QLASSIC applied projects	Cost of rectification of defects in QLASSIC applied and non-QLASSIC applied projects (Culmination of data from Step 1 and 2)	Project Managers, Construction Managers Quality Assurance & Control Officers, QLASSIC Assessors.	Statistical mean analysis
4.	To investigate cost/benefit of QLASSIC application in affordable housing projects	Cost of rectification of defects in QLASSIC applied and non-QLASSIC applied projects (Culmination of data from Step, 1, 2 and 3)	NIL	Statistical mean analysis

All data collected were sieved and grouped for the analysis. Superfluous data was omitted. The projects are classified as according government project and non-government projects, and QLASSIC applied and non-QLASSIC applied projects. The quantitative data collected were then transferred into a Microsoft Excel and analysed. To operationalize the study, the same sequential approach in analysing the data as adopted as follows:

Step 1: To investigate the construction cost/m2 of projects

Step 2: To investigate the number of defects in the projects

Step 3: To investigate the cost of rectification of the defects

Step 4: To determine the co-relation between defects rectification cost and QLASSIC scores

2.1 Data quality and analysis

As in the case of JKR project data, it was not possible to get access to the project's contract documents and the original defects list form the respondents to precisely ascertain the project cost or the cost for rectification of defects. The data analysed were analyses 'as given' data provided by respondents, which are data summarised from their projects. Comparison between the data collected found the data varied and was inconsistent because of different methods employed by the different projects to capture, record and summarise their data. Similarly, to complete this study, variable data was normalised and categorised into classifications of (i) Floor, (ii) Wall, (iii) Ceiling, (iv) Door and Window, and (v) Fittings. (see Step 2 and 3) to circumvent the inconsistencies. To normalise the cost of rectification defects, the same 2018-2019 Schedule of Rates produced by Jabatan Kerja Raya (JKR) were used to normalise the costs.

3.0 Results from the analysis

Results from the analyses were derived from the sequential analysis of data (underlined in Step1-4, 2.0).

3.1 Step 1 Results: To investigate the construction cost/m2 of the projects

The impact on the cost of QLASSIC application in affordable housing within this research was derived similar to the approach adopted for the JKR QLASSIC applied projects. This was established by the dividing the cost of rectification of the defects (i.e., cost/m2) and with the construction cost (cost/ft2). The detailed discussion on the methods employed are discussed in as follows:

3.1.1 The difference in the construction cost (cost/m2) between QLASSIC applied and non-QLASSIC applied projects

There were several differences in the raw data provided by the respondents. Some of the respondents provided direct data on the construction cost/m2 directly from their projects, while some provided just the project construction cost and the floor area of the affordable housing project. In the latter case, the infrastructure and ancillary cost were deducted from the project construction cost. The costs were then divided by the number of project's units (including corner and intermediate lots for link houses) and the floor areas of the units to established the construction cost/ft2. Attempts were made to solicit data on the amount of cost allowed for QLASSIC assessments, but the respondents were not willing to share the data. The construction costs (cost/ft2) emergent from the analyses is shown in Table 6 and 7.

Table 6: List of construction cost (cost/m2) for QLASSIC applied projects

Project	Type of Unit	Avg. Unit Area (Sq./ft.)	QLASSIC	Const. Cost/Unit	Cost/m2
Nusa Bayu Phase 6, Nusajaya, Johor	Apartment	950	yes	98,173.00	1,112.34
Tropicana Aman, Damansara, Selangor	Apartment	1200	yes	107,165	961.26
Program Perumahan Rakyat (PPR) Merotai 1, Tawau, Sabah	Flat	750	yes	918.61	918.61
Program Perumahan Rakyat (PPR) Gayang, Tuaran, Sabah	Flat	750	yes	2,384.75	2,384.75
Program Perumahan Rakyat (PPR), Wakaf Mek Zainab, Kota Bahru, Kelantan	Flat	750	yes	2,030.34	2,030.34
Program Perumahan Rakyat (PPR) Merotai 2, Tawau, Sabah	Flat	750	yes	918.61	918.61
SKY Awani 1	Apartment	800	yes	184,000.00	2,475.70

Table 7: List of construction cost (cost/m2) for non-QLASSIC applied projects

Project	Type of Unit	Avg. Unit Area (Sq./ft.)	QLASSIC	Const. Cost/Unit (RM)	Cost/m2 (RM)
Perumahan Penjawat Awam 1Malaysia (PPAIM), Pangsapuri *Jintan* Presint 16. Putrajaya	Apartment	1200	no	115,756.74	1,038.33
Cadangan Pembangunan Perumahan Bercampur-Campur Di Taman Sutera Wangi, Mukim Batu Berendam, Melaka Tengah, Melaka.	Low cost Single story Double story terrace	1007	no	104,077.61	898.98
Cadangan Pembangunan Rumah Aspirasi Rakyat (Fasa 2) Di Atas Lot 5068 Kuang Mukim Rawang, Daerah Gombak, Selangor	Apartment	850	no	84,940.50	1,075.00
Cadangan Pembangunan Rumah Aspirasi Rakyat Di Atas CL 045335064, KM24, Jalan Tuaran, Telipok, Kota Kinabalu, Sabah	Apartment	850	no	199,274.00	2,545.00
Vista Perdana Fasa 2, Miri, Sarawak	Single Storey Terrace	800	no	187,552.00	1,568.70
Denai Nusantara, Persiaran Denai, Taman, Denai Nusantara, 81550 Gelang Patah, Johor	Apartment	1000	no	133,000.00	1,431.60
Cadangan Membina 80 units Rumah Selangorku Bandar Sungai Chik, Hulu Selangor	Apartment	1200	no	161,280.00	1,446.67
Cadangan Membina 189 units Town House Kota Puteri, Rawang	Townhouse	1750	no	218,050.00	1,341.18

3.2 Step 2 Results: The number of defects in QLASSIC applied and non-QLASSIC applied projects.

The variable data on the number of defects and the approach to normalise the data was highlighted in 2.3. The raw data collected from the respondents were sieved and superfluous were omitted. The selected data were then grouped into classifications as according to QLASSIC defects assessment categories of (i) Floor, (ii) Wall, (iii) Ceiling, (iv) Door and Window, and (v) Fittings. The QLASSIC assessment categories i.e., () External Finishes, (ii) Mechanical and Electrical (M&E) and (iii) External Works were omitted because no data on these elements were provided by the respondents. The findings are as shown in Table 8 and 9, and summarised in Table 10.

Table 8: Number of defects in government projects

Project	QLASSIC	Defects Group					
		Wall	Floor	Ceiling	Door /Window	Fittings	Total
Cadangan Pembangunan Perumahan Bercampur-Campur Di Taman Sutera Wangi, Mukim Batu Berendam, Melaka Tengah, Melaka.	No	2864	2816	1957	1384	1957	10979
Cadangan Pembangunan Rumah Aspirasi Rakyat (Fasa 2) Di Atas Lot 5068 Kuang Mukim Rawang, Daerah Gombak, Selangor	No	5,712	2,448	4,896	1,224	3,672	17952
Cadangan Pembangunan Rumah Aspirasi Rakyat Di Atas CL 045335064, KM24, Jalan Tuaran, Telipok, Kota Kinabalu, Sabah	No	3213.6	4120	2266	1359.6	3419.6	14379
Vista Perdana Fasa 2, Miri, Sarawak	No	50	30	25	14	22	141
Program Perumahan Rakyat (PPR) Merotai 1, Tawau, Sabah	Yes	31,960	12,220	14,570	20,680	10,810	90,240
Program Perumahan Rakyat (PPR) Gayang, Tuaran, Sabah	Yes	12,540	5,434	5,434	8,778	5,434	37,620

Project	QLASSIC	Defects Group					
		Wall	Floor	Ceiling	Door /Window	Fittings	Total
Program Perumahan Rakyat (PPR), Wakaf Mek Zainab, Kota Bahru, Kelantan	Yes	34,000	19,000	14,200	25,000	14,100	106,300
Program Perumahan Rakyat (PPR) Merotai 2, Tawau, Sabah	Yes	17,108	7,614	6,486	11,139	5,640	47,987

Table 9: Number of defects in private projects

Project	QLASSIC	Defects					
		Wall	Floor	Ceiling	Door /Window	Fittings	Total
Perumahan Penjawat Awam 1Mamalysia (PPAIM), Pangsapuri *Jintan* Presint 16. Puterajaya	No	813	393	627	827	460	3120
Denai Nusantara, Persiaran Denai, Taman, Denai Nusantara, 81550 Gelang Patah, Johor	No	6,986	1,763	1,696	1,326	425	12196
Nusa Bayu Phase 6, Jalan Bayu 6/2, Nusajaya Industrial Park 2, 79250 Nusajaya, Johor	Yes	1,253	126	212	-	86	1677
Tropicana Aman, Damansara, Selangor	Yes	3,104	4,656	-	1,552	-	9312
Cadangan Membina 80 units Rumah Selangorku Bandar Sungai Chik, Hulu Selangor	No	11	11	109	17	63	211
Cadangan Membina 189 units Town House Kota Puteri, Rawang	No	453	76	109	41	35	714
Sky Awani 1	Yes	422	319	140	694	427	2002

Table 10: Summary of defects in government and private projects

Project	QLASSIC	Defects Group						
		Wall	Floor	Ceiling	Door/ Window	Fittings	Total	Avg. Total Defects /Project
Private	No	11,840	9,414	9,144	3,982	9,071	43,450	10,863
	Yes	95,608	44,268	40,690	65,597	35,984	282,147	70,537
Government	No	8,263	2,243	2,541	2,211	983	16,241	4,060
	Yes	4,779	5,101	352	2,246	513	12,991	4,330

3.3 Step 3 Results: The cost of rectification of defects in QLASSIC applied and non-QLASSIC applied projects

The cost of rectification of defects in QLASSIC applied and non-QLASSIC applied projects was established by ordering the analyses based on the following approach:

a) Establishing the total cost for defects rectification per project
b) Establishing the average of the cost of rectification over the construction cost/per m2

3.4 Establishing the total cost/m2 for defects rectification

The analyses follow with determining the cost of rectification based on each unit cost.

The steps adopted to normalise the data are as following:

- **Step 1**: The defects to be ratified based on the QLASSIC assessment categories were drawn from 3.2
- **Step 2**: The works needed to ratify the defects are established (eg.to fix unevenness of floor tiles - breaking old tiles and replacing with new tiles; installation; replacing non-functioning fittings - installation of new fittings; defecting paintwork - repainting the wall, etc.).
- **Step 3**: The cost for the works needed to rectify the defects are calculated using the Jabatan Kerja Raya Schedule of Rates (SOR) for Small and Ratification Works (2019) as the standard rate for all rectification works.

The assumption of the quantity of works in establishing the cost to rectify the defects is made based on normal average quantity for occurring defects (e.g. Painting of walls = 1m2, Patching of cracks on wall = 1m2, Replacement of hollowness of tiles = 1m2, etc.). Although the defects may vary between projects, general assumption is made that material, specification and works for the rectification works are standard (e.g., all painting to walls are using emulsion paint with 2 coats on plastered walls; all tiling work for walls are at 200mm x 200mm in dimension; repairing of doors and windows are for one-to-one unit replacement etc.).

The rates were established based on their needed respective work and multiplied by the frequency of defects for each unit recorded in Table 11 & 12. Results for the analysis of the total defects cost/unit are as shown in Table 11 and 12.

Table 11: Total cost for defects rectification for government projects

No.	Project	Type of Unit	Rectification Cost (RM)					
			Wall	Floor	Ceiling	Door/Window	Fittings	Total
1.	Cadangan Pembangunan Perumahan Bercampur-Campur Di Taman Sutera Wangi, Mukim Batu Berendam, Melaka Tengah, Melaka.	Low cost Single story Double story terrace	328,214	279,373	147,758	33,499	15,901	804,747
2.	Cadangan Pembangunan Rumah Aspirasi Rakyat (Fasa 2) Di Atas Lot 5068 Kuang Mukim Rawang, Daerah Gombak, Selangor	Apartment	654,595	242,841	369,648	29,620	29,835	1,326,540
3.	Cadangan Pembangunan Rumah Aspirasi Rakyat Di Atas CL 045335064, KM24, Jalan Tuaran, Telipok, Kota Kinabalu, Sabah	Apartment	368,278.	408,704	171,083	32,902	27,784	1,008,752
4.	Vista Perdana Fasa 2, Miri, Sarawak	Single Storey Terrace	5,730	2,976	1,887	338	178	11,111
5.	Program Perumahan Rakyat (PPR) Merotai 1, Tawau, Sabah	Flat	7,792	2,579	2,340	1,06.	2.75	6,563,162
6.	Program Perumahan Rakyat (PPR) Gayang, Tuaran, Sabah	Flat	3,438	1,289	981	508	3.52	2,642,982
7.	Program Perumahan Rakyat (PPR), Wakaf Mek Zainab, Kota Bahru, Kelantan	Flat	3,896	1,884	1,072	605	3.37	7,572,862
8.	Program Perumahan Rakyat (PPR) Merotai 2, Tawau, Sabah	Flat	4,171	1,607	1,041	573	2.68	3,520,967

Table 12: Total cost for defects rectification for private projects

No.	Project	Type of Unit	Rectification Cost (RM)					
			Wall	Floor	Ceiling	Door/Window	Fittings	Total Cost (RM)
1.	Perumahan Penjawat Awam 1Mamalysia (PPAIM), Pangsapuri *Jintan* Presint 16. Puterajaya	Apartment	93,169	38,985	47,338	20,013	3,737	203,244
2.	Denai Nusantara, Persiaran Denai, Taman, Denai Nusantara, 81550 Gelang Patah, Johor	Apartment	800,595	174,889	128,048	32,089	3,453	1,139,075
3.	Nusa Bayu Phase 6, Jalan Bayu 6/2, Nusajaya Industrial Park 2, 79250 Nusajaya, Johor	Apartment	143,593	12,499	16,006	-	698	172,797
4.	Tropicana Aman, Damansara, Selangor	Apartment	355,718	461,875	-	37,558	-	855,152
5.	Cadangan Membina 80 units Rumah Selangorku Bandar Sungai Chik, Hulu Selangor	Apartment	1,260	1,091	8,229	411	511	11,504
6.	Cadangan Membina 189 units Town House Kota Puteri, Rawang	Townhouse	51,913.8	7,539	8,229	992	284	68,959
7.	Sky Awani 1	Apartment	48,36	31,644	10,570	16,794	3,469	110,840

3.4.1 Establishing the average percentage (%) of the cost of rectification.

Data established from 3.3.1 and 3.3.2 are culminated to determine the cost of rectification of defects in QLASSIC applied and non-QLASSIC applied projects. This was undertaken by simply dividing the ratification cost/unit with the construction cost/ft2. The results are as shown in Table 13 and 14.

Table 13: The % of cost of defects rectification over the construction cost for government projects

No.	Project	Type of Unit	Rectification Cost / m2 (RM)	Construction Cost/m2 (RM)	% Defect Cost/ Construction (RM)
1.	Cadangan Pembangunan Perumahan Bercampur-Campur Di Taman Sutera Wangi, Mukim Batu Berendam, Melaka Tengah, Melaka.	Low cost, Single story, Double story terrace	12.02	898.98	1.3%
2.	Cadangan Pembangunan Rumah Aspirasi Rakyat (Fasa 2) Di Atas Lot 5068 Kuang Mukim Rawang, Daerah Gombak, Selangor	Apartment	13.72	1,075.00	1.3%
3.	Cadangan Pembangunan Rumah Aspirasi Rakyat Di Atas CL 045335064, KM24, Jalan Tuaran, Telipok, Kota Kinabalu, Sabah	Apartment	20.67	2,545.00	0.8%
4.	Vista Perdana Fasa 2, Miri, Sarawak	Single Storey Terrace	0.47	1,568.70	0.2%
5.	Program Perumahan Rakyat (PPR) Merotai 1, Tawau, Sabah	Flat	81.09	918.61	8.8%
6.	Program Perumahan Rakyat (PPR) Gayang, Tuaran, Sabah	Flat	120.05	2,384.75	5.0%
7.	Program Perumahan Rakyat (PPR), Wakaf Mek Zainab, Kota Bahru, Kelantan	Flat	116.45	2,030.34	5.7%
8.	Program Perumahan Rakyat (PPR) Merotai 2, Tawau, Sabah	Flat	43.50	918.61	**4.7%**
				Average	**2.81%**

Table 14: The % of cost of defects rectification over the construction cost for private projects

No.	Project	Type of Unit	Rectification Cost / m2 (RM)	Construction Cost/m2 (RM)	% Defect/ Construction Cost (RM)
1	Perumahan Penjawat Awam 1Mamalysia (PPAIM), Pangsapuri Jintan Presint 16. Puterajaya	Apartment	2.38	1,038.33	0.2%
2.	Denai Nusantara, Persiaran Denai, Taman, Denai Nusantara, 81550 Gelang Patah, Johor	Apartment	72.12	1,431.60	5.0%
3.	Nusa Bayu Phase 6, Jalan Bayu 6/2, Nusajaya Industrial Park 2, 79250 Nusajaya, Johor	Apartment	6.08	1,112.34	0.5%
4.	Tropicana Aman, Damansara, Selangor	Apartment	11.00	961.26	1.1%
5.	Cadangan Membina 80 units Rumah Selangorku Bandar Sungai Chik, Hulu Selangor	Apartment	1.29	1,446.67	0.1%
6.	Cadangan Membina 189 units Town House Kota Puteri, Rawang	Townhouse	3.95	1,341.18	0.3%
7.	Sky Awani 1	Apartment	1.22	2,475.70	0.01%
Average					1.02

The average of the percentage of rectification cost/construction cost for government projects and private projects were contrasted and tabulated for comparison and are as shown in Table 15 and 16.

Table 15: Percentage of Summary private projects

No.	Project	Developer	QLASSIC	% Rectification / Construction Cost	Avg.	Total Avg.
1.	Perumahan Penjawat Awam 1Mamalysia (PPAIM), Pangsapuri *Jintan* Presint 16. Puterajaya	Apex Communication	No	0.2%	1.4%	1.1%
2.	Denai Nusantara, Persiaran Denai, Taman, Denai Nusantara, 81550 Gelang Patah, Johor	UEM Sunrise	No	5.0%		
3.	Nusa Bayu Phase 6, Jalan Bayu 6/2, Nusajaya Industrial Park 2, 79250 Nusajaya, Johor	PKNS	No	0.1%		
4.	Tropicana Aman, Damansara, Selangor	PKNS	No	0.3%		
5.	Cadangan Membina 80 units Rumah Selangorku Bandar Sungai Chik, Hulu Selangor	UEM Sunrise	Yes	0.5%	0.6%	

6.	Cadangan Membina 189 units Town House Kota Puteri, Rawang	Tropicana Aman	Yes	1.1%		
7.	Sky Awani 1	Skyworld	Yes	0.0%		

Table 16: Percentage of Summary Government projects

No.	Project	Developer	QLASSIC	% of Rectification / Construction Cost	Avg.	Overall Avg,
1.	Cadangan Pembangunan Perumahan Bercampur-Campur Di Taman Sutera Wangi, Mukim Batu Berendam, Melaka Tengah, Melaka.	Syarikat Perumahan Negara Berhad	No	1.3%	0.9%	3.48
2.	Cadangan Pembangunan Rumah Aspirasi Rakyat Laguna Biru	Syarikat Perumahan Negara Berhad	No	1.3%		
3.	Cadangan Pembangunan Rumah Aspirasi Rakyat Kota Kinabalu Berdasarkan Konsep Reka Dan Bina	Syarikat Perumahan Negara Berhad	No	0.8%		
4.	Vista Perdana Fasa 2	Syarikat Perumahan Negara Berhad	No	0.2%		
7.	Program Perumahan Rakyat (PPR) Merotai 1, Tawau, Sabah	JPN	Yes	8.8%	6.1%	
8.	Program Perumahan Rakyat (PPR) Gayang, Tuaran, Sabah	JPN	Yes	5.0%		
9.	Program Perumahan Rakyat (PPR), Wakaf Mek Zainab, Kota Bahru, Kelantan	JPN	Yes	5.7%		
10.	Program Perumahan Rakyat (PPR) Merotai 2,Tawau, Sabah	JPN	Yes	4.7%		

4.0 Conclusion

In concluding the analysis of data for affordable housing projects, the findings emerge to suggest that there is a significance difference in the defects between QLASSIC applied and non-QLASSIC applied projects as found as follows:

a. The % of defects rectifications cost/construction cost for government projects tends to be higher at 3.48% as compared to 1.1% for private projects.

b. The incidence of private projects having lower % of defects rectifications cost/construction cost can be attributed to the experience and ability of the private project owners i.e., Sky World, UEM, PKNS, Tropicana Aman and Apex Communications with quality.

c. This contrasts with the government project owners in the study i.e., SPNB and JPM who are not renowned to possess a strong quality management experience and capability.

d. Government projects tend to have higher % of rectification cost/construction cost needs. This suggests that there could be possible 'intervening' variable factors that could have impacted the inter-relationship between QLASSIC application and reducing defects. The suspected variables propositioned for further study are the capability of the project owners' Quality Assurance and Quality Control (QA/QC), consulting team and selection of the right contractor appointed to undertake the project.

GLOSSARY

CIDB	Construction Industry Development Board, Malaysia
CIS	Construction Industry Standard
DLP	Defects Liability Period
JKR	Jabatan kerja Raya
KPKT	Kementerial Perumahan dan Kerajaan Tempatan
PKNS	Perbadan Kemajuan Negeri Selangor
QAQC	Quality Assurance and Quality Control
QLASSIC	Quality Assessment System In Construction
SPNB	Syarikat Perumahan Negara Berhad
SOR	Schedule of Rates

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