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Collective action components of low-cost housing: an empirical analysis using Ostrom's SES framework

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Abstract

Purpose – To date, low-cost housing held under the common-property regime is faced with various collective action or management issues in relation to common facilities. Understanding and unpacking key collective action components in a multi-dimensional and systematic fashion that help explain the status quo of the complex low-cost housing management is crucial, particularly in identifying potential factors contributing to the suboptimal self-governing outcome. Therefore, the purpose of this paper is to investigate the collective action of low-cost housing in Malaysia using Ostrom's institutional analysis development and social-ecological system framework (IAD-SES framework) as a theoretical framework.

Design/methodology/approach – First, a mixed-method research design was adopted where issues relating to the management of common properties of low-cost housing were identified in the Malaysian context. Second, the components of Ostrom's IAD framework relevant to collective action were identified. Third, after interviewing six experts in the housing industry via semi-structured interviews, two more components (historical development/adaptability to new environment and ethnicity) were added to the questionnaire survey. From here, 633 respondents who lived in four low-cost housings in Kuala Lumpur from 1,598 households were surveyed in 2012. We then merged the IAD framework with the SES framework. Factor analysis and Cronbach's alpha analysis were conducted to uncover the underlying variables and the social ecological clusters that they belonged.

Findings – With average Cronbach's alpha of 0.83, the seven key SES components identified are able to cumulatively explain 71% variance of local collective action components. Based on the cumulative percentage explained, the top five key SES components are as follows: context (social, economic and political settings); ethnicity; outcome; resource system; and users characteristics.

Originality/value – This study identifies key components related to the collective action issues of low-cost housing management, where two additional components were also suggested to be added to the SES framework. Apart from the theoretical contribution, the study, serving as insights and potential solutions, is also of practical significance to the existing management practices of low-cost housing in Malaysia where policymakers and management corporations may prioritize primary SES components, helping them govern common properties more efficiently.

Keywords Collective action components, Low-cost housing, Common properties, SES framework, Malaysia, Common pool resource

Paper type Research paper

1. Introduction

"The problem of faulty and inefficient lifts often shackles multi-storey residential owners but unwittingly it stemmed by their own attitude in failing to pay the maintenance fees to the housing managements." Not a surprise to many property practitioners, the preceding statement depicts one aspect of maintenance and management problem of high-rise residential building in Malaysia (Malaysian Institute of Estate Agents (MIEA), 2020) with a bang. The problems of maintenance and management are varied, complex and multifaceted depending from which angle you are looking. Many researchers concluded that irrespective

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of the type of development (low-cost, medium-cost or condominiums) and the year in which a project was completed, house-buyers earned the legitimacy of filing their complaints against the management (Tiun, 2009; Che-Ani *et al.*, 2009; Abdul Aziz *et al.*, 2014; Yuen, 2016; Wahi *et al.*, 2018).

On the other hand, from the management point of view, many researchers cited the poor collection of maintenance fees/service charges as one major reason that explained maintenance and management could not be carried out efficiently (Ariff and Davies, 2009; Che-Ani *et al.*, 2009; Abd *et al.*, 2017; Wahi *et al.*, 2018; Musa *et al.*, 2020). In a survey involving 50 respondents who were property managers of high-rise condominiums in Malaysia, 66% of the respondents found collection of service charges as the most excruciating experience (Latif Azmi, 2006). This phenomenon is particularly prominent in low-cost housing; low-cost housing in Malaysia context are houses whose selling price is RM42,000 a unit or below depending on location, with a design specification of 650 square feet (Ariff and Davies, 2009).

Maintenance and management problems do not go unnoticed by policymakers. The first law on maintenance and management was included as part of the Strata Titles Act 1985 (Act 318). As the said Act favored more toward developers insofar as property management was concerned (Tiun, 2009), the Building and Common Property (Maintenance and Management) Act 2007, Act 663 (BCPMM Act, 2007) was enacted to improve matters. Under the BCPMM Act 2007, the Commissioner of Building (COB) and the Joint Management Body (JMB) were the added features with the consequence that the power of developers was reduced when they acted as the management (Abdul Aziz *et al.*, 2014). In July 2015, the government repealed the BCPMM Act 2007, and in its place the Strata Titles Act 2013 (Act 757) and Regulations were enacted. The comprehensive law comprises the Strata Titles Act 2013 (Act 757), the Strata Management (Strata Management Tribunal) Regulations 2015 and lastly the Strata Management (Maintenance and Management) Regulations 2015. Henceforth, conflicts arising from maintenance and management can be filed with and resolved at the Strata Management Tribunal. See Sia *et al.* (2018) on the functions of the management in various Acts.

Despite the improvements made in the law, maintenance and management problems persisted over the years even after 2015. The complaints filed with the Tribunal were 2,642 cases in 2016, 4,964 cases in 2018 (Aziz, 2019) and 5,675 cases in 2019 (MIEA, 2020). Hence on 9 July 2018 the Urban Wellbeing, Housing and Local Government Ministry appointed an additional 10 Housing Tribunal Presidents to the existing 29, in light of increasing number of complaints. At the core, law change will not reduce the number of conflicts in the management of housing projects. Hence, we need to dissect the problems differently by employing the new institutional economics theory encompassing collective action, institutional analysis development (IAD) framework and common-pool resources (CPR) concepts. The problems are primarily related to management of shared properties (see the concept of CPRs-being unexclusive and rivalrous in nature), such as the car-parks, community halls, corridors, staircases, lifts, lift-lobbies, landscape, rubbish bin centers and lightings in carparks and corridors, etc. The shared properties are in fact the "action arenas" in Ostromian parlance where parcel holders socialize, enjoy the shared properties or *fight* (Ostrom *et al.*, 1994, p. 28).

In short, collective action becomes problematic when appropriators of CPR (e.g. common properties/facilities in low-cost housing) transitioning from club goods (see Club good theory, Buchanan, 1965; Ling, 2019) fail to "organize and govern themselves to obtain continuing joint benefits when all face temptations to free-ride, shirk, or otherwise act opportunistically," Ostrom (1990, p. 29). Some scholars also believe that a CPR is always in a state of flux, turmoil and panarchy (Kiesling, 2000, p. 14; Holling, 2001). For instance, Tiun (2009) identifies low-cost housing problems as: lack of planning, ignorance of buyers, lack of regulation on property managers, insufficient legislation and lastly ineffective management. Musa *et al.* (2020) highlight the CPR problems as: issues of building repair, poor collection of service charge, poor

management of sinking fund, management and house–buyers relationship, vandalism of common properties and lack of mechanism to promote community living. In sum, issues raised by both Tiun (2009) and Musa *et al.* (2020) were related to users' behavior (not paying fees, vandalism, etc.), and the management (not attending to repair, poor management of sinking fund, etc.).

As such, understanding and unpacking key collective action components in a multi-dimensional and systematic fashion (i.e. via the IAD Framework) that help explain the status quo and determine the condition of the complex low-cost housing management is crucial, particularly in identifying potential factors contributing to the suboptimal self-governing outcome of CPRs. Table 1 shows maintenance and management issues may be grouped under Ostrom *et al.*'s (1994, p. 37) IAD framework.

The IAD components in Table 1 are context, attributes of community, attributes of physical worlds and rules-in-use (Ostrom *et al.*, 1994, p. 37). They are the first-tier variables of IAD framework. IAD is used to study the self-organization of common resources which are shared by appropriators (parcel holders in this paper). Although the IAD framework has a clear analytical logic for particularly explaining institutional impacts on resource collective action, it is difficult to comprehensively encapsulates and explains the complexity of commons (common property) management issues. Therefore, this study adopts the social-ecological system (SES) framework, building on the IAD framework with more detailed variables, more systematic and holistic in analyzing the problems of commons/CPR management via the intertwined institutional-social-ecological dimensions (see Ostrom, 2007). Strata high-rise low-cost housing is a SES by Moffatt and Kohler's (2008) definition.

Table 1. Issues of maintenance and management in high-rise low-cost housing

IAD components	Key issues faced	References
Housing context	Many low-cost housings were mandated to build by private developers Upon completion, maintenance was not given high priority by developers When the maintenance was shifted to parcel holders later on, funding would become a glaring problem	Strata Management Act Strata Titles Act 2013 (Act 757) and Regulations
Attributes of community	Nature of neighbors or neighborhood	Ardeshiri *et al.* (2016)
	Degree of community participation	Ariff (2018); Bilai *et al.* (2019); Mohd-Rahim *et al.* (2019); Hauashdh *et al.* (2020); Musa *et al.* (2020)
	Degree of civic consciousness	Ariff and Davies (2009); Shuid (2016); Ariff (2018)
	Demographics	Wang (2013)
	Degree of vandalism	Musa *et al.* (2020)
Attributes of physical world (common properties)	Quality of housing units owned by parcel holders	Othman *et al.* (2014); Abd Wahab *et al.* (2017); Wahi *et al.* (2018); Ariff (2018)
	Cost of lift maintenance	Au-Yong *et al.* (2018); Wahi *et al.* (2018); Mohd-Rahim *et al.* (2019)
	Standard of maintenance of common properties	Abd Wahab *et al.* (2017)
	Location of low-cost housing	Karim (2012)
	Sufficiency of common properties	Abd Wahab *et al.* (2017)
Rules-in-use	Quality of management provided by developer, JMB or MC as the case maybe	Khalid *et al.* (2017); Hauashdh *et al.* (2020)
	Degree of government support	Hauashdh *et al.* (2020)
	Transparency of accounting statement by the management	Wang (2013)

In the CPR research, condominium/apartments (i.e. urban and neighborhood commons) are under-represented (10% of total papers published), whereas old or traditional commons covering fisheries have 48% and water irrigations have 43% of the total papers published, respectively (Kremer *et al.*, 2019).

This study significantly contributes to Sustainable Development Goals (SDG 11 on sustainable cities and communities) as well as the New Urban Agenda particularly on the importance of providing safe, inclusive, equitable accessible, green and quality public spaces as well as other common properties. The remainder of the paper is structured into five sections as follows: (1) literature review in which a conceptual framework is formulated; (2) methodology comprising study areas, sampling techniques, data collection strategy, instruments and data analysis; (3) the results and discussions; and lastly (4) conclusion.

2. Literature review

2.1 Conceptual SES framework

For the purpose of conducting a survey, not all second-tier variables need to be considered in the low-cost housing study (Ostrom, 2007). There is no hard and fast rule evolved as yet. The onus is placed on the researchers who have to use their own judgment to determine variables most relevant under a given circumstance. Table 2 is a summary of the relevant second-tier variables for designing survey questionnaire.

In Table 2, five second-tier components are discussed in preparing the survey questionnaire: Outcome (O); resource system (RS); users (U); governance system (GS); and

Social, economic and political settings (S)

- S4–Government resource policies

Resource system (RS)

- RS1–Sector
- RS2–Clarity of boundary
- RS3–Size
- RS4–Human constructed facilities
- RS9—Location

Resource units (RU)

- RU4–Economic value
- RU5–Number of units

(Note: Resource units to be considered together with resource system)

Interaction (I)

- I4–Conflicts among users
- I7–Self-organizing activities

(Note: These two variables will not be further measured)

Related ecosystem (ECO)

- Not applicable

Governance system (GS)

- GS4–Property-rights system
- GS5–Operation rules
- GS6–Collective choice rules
- GS7–Constitutional rules

Users (U)

- U1–Number of users
- U2–Socio-economic attributes of users
- U3–History of users
- U4–Location
- U5–Leadership/entrepreneurship
- U6–Norms/social capital
- U7–Knowledge of SES mental model
- U8–Importance of resource

Outcome (O)

- O1–Social performance measure
- O2–Ecological performance measure
- O3–Externality to another SES

Note(s): Some terminologies to IAD framework have been renamed in SES. Attributes to community is now users. Attributes to physical world is now resource system/resource units. Rules-in-use is now governance system

Table 2. Summary of relevant second-tier variables in low-cost housing

social, economic and political settings (S). Before that three issues deserve special mention, however. The first set of questions centers on the outcome which take the form of direct feedback from parcel holders of low-cost flats, a measure of satisfaction on the upkeep of common properties (Tan, 2008, 2012; Sia *et al.*, 2018).

Second, resource system (RS) and resource units (RU) are combined together; they are the common properties of parcel holders that take the form of common corridors, lifts, lift lobbies, car-parks, landscape, rubbish-bin centers, community halls, common corridor lighting, etc. This operation is based on the logic of the IAD framework, because the essence of the study is the social management problem for low-cost housing.

Third, two additional second-tier variables are being considered: historical development/adaptability to new environment and ethnicity condition, based on the result of face-to-face interviews with a group of six experts on the contributing factors to collective action in the self-organization of common properties in low-cost housing in Malaysia context (see the methodology and results sections below). They are as follows:

In the CPR literature, ethnicity or social heterogeneity affects collective action. The effectiveness of self-governing is largely due to the homogeneity of appropriators using the resource (Baland and Platteau, 1996; Ostrom, 1990). From economic development literature, Easterly (2006) argues that the more fragmented a country is, the less cohesion is expected of its people, and by extension less able to face collective action components. Hence the composition of residents by ethnicity may affect the level of self-governance. Besides, collective action is also influenced by the adaptability of residents to the new environment; one of the better sources that described the inability of farmers who found adapting to living in high-rise flats most challenging was Lee (2000, p. 207).

To sum, altogether seven (7) second-tier components are introduced. Each is broken down to another six (6) third-tier variables/sub-components for measurement. Herein is a brief discussion.

(1) ***Outcome (O), the C1 questions.*** We recognize in the C1 questions that if parcel holders are pleased with the environment they live in, which include the common properties chances are they will recommend the project to their friends, a case of housing satisfaction (O1, social performance). A more satisfied community will produce less collective action. See Tan (2008, 2012).

(2) ***Resource system (RS), the D1 questions.*** Two third-tier variables stand out. First, less units are better (RS3, size). More units exacerbate collective action (Olson, 1965). Second, maintenance of common facilities usable to parcel holders is important (RS4, humanly constructed facilities).

(3) ***Users (U), the D2 questions.*** Social capital has been used as the main measure to test the attributes of community on collective action (U2, users' attributes, U6, norms/social capital). See Grootaert *et al.* (2004) and Tan (2012). Frequency of meetings with one's neighbors is a useful indicator (U7, SES framework mentality). See Ariff and Davies (2011). The role of local leadership in resolving community conflicts will be discussed later (U5, local leadership).

(4) ***Governance system (GS), the D3 questions.*** In duties expected from parcel holders, three types of formal rules are being tested for compliance in the survey questionnaire (GS5, operation rules; GS6, collective-choice rules; and GS7, constitutional rules). If duties are performed, as a reward in time of needs parcel holders are asked where to seek help in community living (Basurto and Ostrom, 2009).

(5) ***Social, economic and political settings (S), the D4 questions.*** D4 contextual questions focus on two aspects. First, on the assistance from local

politicians, local authority and state government (S4, government resources) where ad hoc financial assistance and other advice in the self-organization of common properties may be given. Second, the number of years of living in a particular project influences the attitude of parcel holders toward collective action (Ariff and Davies, 2011).

(6) ***Historical development/adaptability to new environment, the E1 questions.*** This particular third-tier variable flows from face-to-face interviews with a team of experts as earlier discussed. Many parcel holders lived in squatter colonies before being moved to low-cost flats. Adaptation to a new way of living in high-rise flats is a challenge (Lee, 2000, p. 207).

(7) ***Ethnicity, the E2 questions.*** E2 questions are used to test the importance of the homogeneity of parcel holders living in a community. In the CPR literature, a more homogenous community is likely to produce a more harmonious community (Baland and Platteau, 1996; Ostrom, 1990).

We are in a position to consider Table 1 with Table 2 showing components and sub-components of the collective action can be explained by second-tier variables of the SES framework.

3. Research methodology

We adopted a three-stage approach as in any mixed research method. In the first stage, we conducted face-to-face interviews with a panel of six experts and concluded that in addition to the components in the SES framework, two more components (historical development/adaptability to new environment, and ethnicity) had certain roles to play in the collective action.

In the second stage, we conducted a multi-case study by selecting three low-cost housing which were located in the vicinity of Middle Ring Road II of Kuala Lumpur, and the fourth one located in Subang (near Old Kuala Lumpur Airport) following Yin's (2009) replication approach.

In the third stage, as part of questionnaire survey, we compiled a total of seven second-tier dimensions, and in each of them, identified six third-tier variables for conducting factor analysis. See Appendix. As explained by Cohen *et al.* (2011, pp. 674–685): "Factor analysis detects structures and commonalities in the relationships between variables. It enables researchers to identify where different variables in fact are addressing the same underlying concept."

3.1 Face-to-face interviewing experts

Face-to-face interviews were conducted with six expert panelists who were involved in the property development and maintenance of strata buildings such as low-cost flats and condominiums. Respondent A (10 years' experience) and Respondent B (5 years' experience) were Selangor State Government officials. Respondent C (15 years' experience) and Respondent D (25 years' experience) were property managers of several low-cost flats projects. Respondent E (35 years' experience) and Respondent F (25 years' experience) were senior managers of property development companies. All the projects involved were in the Klang Valley.

By relying on IAD-SES framework, interview questions were raised about the collective action and which variables affected the self-governance of low-cost flats ($N = 633$). In general, three observations may be made. First on the outcome (O), three categories of low-cost flats could be classified: Good, average and poor collection of monthly service charges.

Good maintenance of common properties was made possible due to prompt payment of monthly service charges. As will be discussed later, Nursa Kurnia was well maintained due to the management's ability to collect 85% of the monthly billing.

Second, the type of resource system (RS) influenced the maintenance of common properties, years of completion, with or without lifts (costs of lifts maintenance were high), location – distance to work in the city capital of Kuala Lumpur affected the service charge collection.

Third, the attributes of users (U) such as the history of the community, local leadership and presence or otherwise of local/foreign tenants had impacts on self-governance.

3.2 Multi-case study

Figure 1a and b shows the location of four low-cost housing. Plate 1 shows the perspectives of Nursa Kurnia (regarded as well maintained) and Cemara I and II (regarded as acceptable in maintenance). Plate 2 shows the perspectives of Tujoh Ratus and Vista Subang (both were poorly maintained).

The detailed description of each low-cost flats (location, number of floors, with lifts or without lifts, quality of local leadership, composition of the community by ethnicity, percentage of owner-occupiers vs tenants, etc.) was beyond the scope of this paper.

3.3 Conducting field survey: population and sample size

The population in each of the four case studies was the number of households. In this study 200 (Nursa Kurnia), 488 (Cemara I and II), 700 (Tujoh Ratus) and 210 (Vista Subang). In compliance with the requirement of Cavana *et al.* (2001, p. 278) on the generalized scientific guidelines for sample size, we selected samples as follows: 114 (Nursa Kurnia), 188 (Cemara I and II), 214 (Tujoh Ratus) and 117 (Vista Subang). Hence the total population was 1,598, while total sample size was 633 ($N = 633$).

4. Results and discussions

There are two parts in this section: demographics of respondents and exploratory factor analysis.

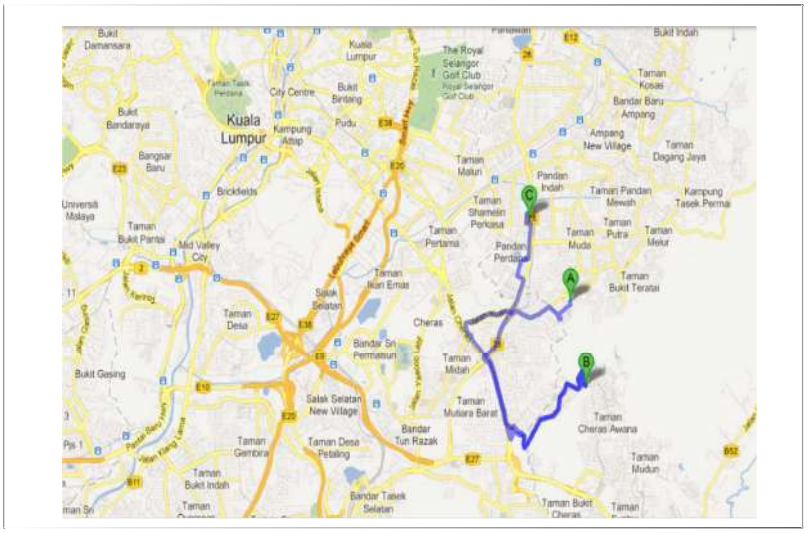
4.1 Demographics of respondents

Table 3 presents the background of 633 respondents from a population of 1,598 who were residing in four low-cost flats in Selangor (Nursa Kurnia, Cemara I and II, Tujoh Ratus and Vista Subang).

Demographic factors are a set of users' characteristics under the SES framework and since the four case-studies displayed different outcomes in the state of health of a common (outcome of self-organization, a measure of sustainability and robustness of the upkeep of common properties), much could be learned from the data when we focus on the quality of local leadership. The quality of local leadership was observed as: Nursa Kurnia (high), Cemara I and II (medium) and both Tujoh Ratus and Vista Subang (low). See the concept behind theoretical replication in conducting multi-case study (Yin, 2009, p. 54).

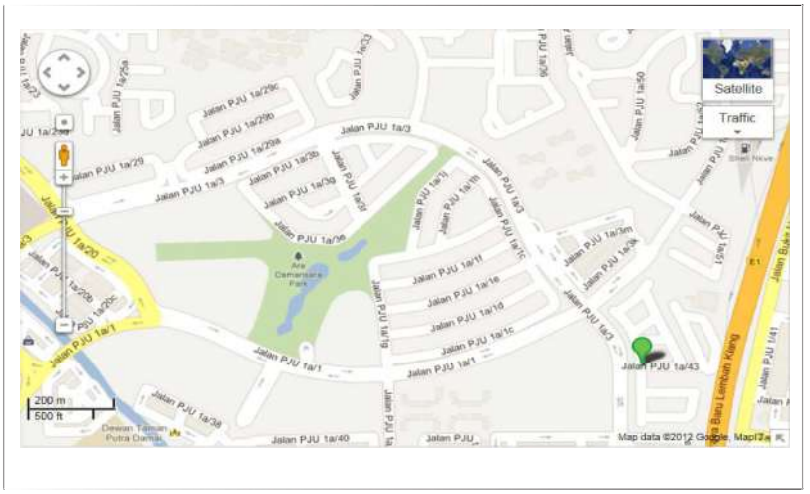
First, on age of housing, intention to upgrade to a better housing, mean values of income, and purchase price, the age of the head of household reflected in unison the age of housing. The mean value of the age of Nursa Kurnia was the youngest (39.72 years) compared to Tujoh Ratus (48.37). When asked when they planned to move to another house, Nursa Kurnia parcel holders appeared more confidence (4.21 years), a sign of stronger financial standing.

Second, on employment, education, residence status and satisfaction of living in the flats, the majority of parcel holders appeared to be gainfully employed in private sector, rather than



(a)

Note(s): Nusa Kurnia (A), Cemara I & II (B), and Tujoh Ratus (C). All are accessible from Middle Ring Road II (MRR II), Kuala Lumpur



(b)

Note(s): Vista Subang, Jalan PJU 1a/ 43, Petaling Jaya. Accessible from Ara Damansara, via Subang Airport Road

Figure 1.
(a, b) Location plans

in civil service (46.3% in Nursa Kurnia and 74.4% in Vista Subang). In terms of highest education attained, there were sharp differences, however. For example, 22.6% of Nursa Kurnia received STPM/university education, whereas it was about 9.4 and 9.8% for Vista Subang and Tujoh Ratus.

(a)

Note(s): Nusa Kurnia is adjoining to Taman Industri Bukit Permata, off Jalan Kuari (and accessible from Middle Ring Road II, Kula Lumpur). Service charge collected on billed: 85%

(b)

Note(s): Cemara I & II is in the vicinity of Bukit Segar Jaya 2, Ampang. Access is from Jalan Manis/Jalan Lemak, near Cheras Leisure Mall. Service charge collected on billed: 60%.

Plate 1.
Nursa Kurnia, Ampang and Cemara I and II, Ampang

(a)

Note(s): Tujoh Ratus is adjoining to ShamelinPerkasa, and is accessible from Jalan Perdana 9/5, Ampang. Service charge collected on billed, about 40%

(b)

Note(s): Vista Subang is accessible from Jalan PJU 1a/ 43, PetalingJaya. It is in the vicinity of Ara Damansara. Servicee charge collected on billed, about 40%

Plate 2.
Tujoh Ratus, Ampang, and Vista Subang, Petaling

On outcome (housing satisfaction), clearly Tujoh Ratus and Vista Subang were weak, showing 53.1 and 46.2% approving rates. Asked if the previous residence was squatting, Nursa Kurnia had the lowest percentage (39.7%), compared to Tujoh Ratus (74.3%) and Vista Subang (71.8%).

In sum, although all parcel holders might come from the same socioeconomic bracket, there were subtle differences. Each was different from the other. Nursa Kurnia appeared to show a number of positive attributes that explained by the parcel holders' willingness to

	N	Nursa Kurnia	Cemara I and II	Tujoh Ratus	Vista Subang
Population, count	1,598	200	488	700	210
Sample size, count	633	114	188	214	117
Stratified sampling	–	–	–	–	–
Malays, count/%	340/53.7%	69/60.4%	113/60.5%	64/29.9%	94/80.3%
Chinese, count/%	207/32.7%	34/29.9%	56/29.8%	103/48.6%	14/13.7%
Indians, count/%	86/15.5%	11/9.6%	19/9.6%	47/21.5%	9/6.0%
Total, count/%	633/100%	114/100%	188/100%	214/100%	117/100%
Level of treatment of independent variable: local leadership	–	High	Medium	Low	Low
Percentage of service charge collected monthly on billed	–	85%	60%	40%	40%
Mean values					
Age of the head of household, yr		39.72	45.54	48.37	42.93
Number of dependents		4.08	3.88	4.29	4.93
Number of children		2.43	2.43	2.51	3.29
Years of residence in current unit		3.48	4.33	11.12	5.52
Plan to move to another house, yrs		4.21	4.80	8.34	6.58
Gross monthly income, RM		2064.20	1753.51	2111.68	1880.84
Purchase sum of the unit, RM		54780.49	72985.29	63910.34	66094.59
List number of non-housing loans		2.29	1.75	1.60	1.56
Gender	–	–	–	–	–
1. Male	77.5%	80.7%	74.6%	76.2%	77.8%
2. Female	22.5%	19.3%	25.4%	23.8%	22.2%
Occupation	–	–	–	–	–
1. Civil servant	8.4%	16.1%	1.8%	7.5%	4.3%
2. Private sector	53.2%	46.3%	58.8%	44.9%	74.4%
3. Retired	4.1%	0.5%	2.6%	10.3%	0%
4. Self-employed	31.6%	35.6%	29.8%	36.0%	18.8%
5. Unemployed	2.7%	1.6%	7.0%	1.4%	2.6%
Highest education	–	–	–	–	–
1. None	5.5%	16.1%	3.5%	0.5%	0%
2. Primary school	9.7%	0.5%	8.8%	12.1%	20.5%
3. PMR	30.1%	20.4%	27.2%	34.6%	40.2%
4. SPM	42.5%	40.3%	57.8%	43.0%	29.8%
5. STPM	3.2%	7.5%	0%	1.4%	2.6%
6. College/university	9.0%	15.1%	2.6%	8.4%	6.8%
I would recommend my relatives	–	–	–	–	–
1. Yes	65.9%	74.2%	97.3%	53.1%	46.2%
2. No	34.1%	25.8%	2.7%	46.9%	53.8%
Previous type of residence	–	–	–	–	–
1. Squatter	65.4%	39.7%	83.9%	74.3%	71.8%
2. Rented room in a flat	7.3%	10.3%	0.9%	8.4%	6.8%
3. Rented room in a house	9.6%	8.2%	1.8%	11.7%	15.4%
4. Others	17.7%	41.8%	13.4%	5.6%	6.0%
My hometown is greater KL	–	–	–	–	–
1. Yes	25.3%	21.3%	13.2%	39.3%	17.9%
2. No	74.7%	78.7%	86.8%	60.7%	82.1%

Table 3.
Demographic profile of 633 respondents

(*continued*)

	N	Nursa Kurnia	Cemara I and II	Tujoh Ratus	Vista Subang
Residence status	–	–	–	–	–
1. I am a tenant	37.9%	52.1%	40.4%	26.6%	33.3%
2. I am the owner	62.1%	47.9%	59.6%	73.4%	66.7%
Finance					
Satisfaction of service charge amt	–	–	–	–	–
1. Yes	87.7%	96.6%	100%	99.4%	42.9%
2. No	12.2%	3.4%	0%	0.6%	57.1%

Table 3.

recommend the housing to their relatives (reflected in better self-organization): better education and smaller number of squatting backgrounds.

4.2 Exploratory factor analysis

"Factors analysis is a statistical technique applied to a single set of variables when a researcher wants to discover which variables in the set form coherent subsets that are relatively independent of one another," opine Tabachnick and Fidell (2007, p. 607). Table 4 shows the Kaiser–Meyer–Olkin (KMO) for the 42 variables measure of sampling adequacy of 0.850 which is higher than 0.40 needed for factor analysis (George and Mallery, 2008, p. 278; Yap *et al.*, 2017). See Appendix. Our 633 samples are deemed more than adequate (Meyers *et al.*, 2006, p. 467). Also, Barlett's test is a measure of multivariate normality of distribution. Its test of sphericity has significance of $p = 0.000$, pointing to the correlation matrix is significantly different from an identity matrix (Ye *et al.*, 2014). In the research, the principal component analysis (PCA) produced 7 components with eigenvalues greater than 1.0, the cut-off point to determine the number of components (Ye *et al.*, 2014). Also, to arrive at a reliable conclusion the initial eigenvalues percentage of component whose variance must account for more than 10% (Zeynivandnezhad *et al.*, 2019). It is 24.988% for component F1 in our case. The seven components account for 70.85% of the total variance explained, which is more than 60% needed for adequate construct validity (Hair *et al.*, 2010; Yap and Cheah, 2019). Zeynivandnezhad *et al.* (2019) argue that in human science, if components can explain 50%–60% of variance are deemed acceptable. The factor loadings for all variables exceed 0.5 for accepted variables except for three variables showing 0.44 to 0.48. Meyers *et al.* (2006, p. 507) characterize coefficients of 0.45 as fair. To provide a good explanation for each component, factor rotation is needed (Ye *et al.*, 2014).

Table 5 shows the final rotated component matrix for items with loading values greater than 0.5 (except for three variables). Loading is the correlation of a variable with a component (Agresti and Finlay, 2009, p. 533). As an example, component F1 has six variables. The highest has a loading of 0.850, while the lowest 0.527. The seven components were named after we studied the composition of variables in-line with the SES framework (Cohen *et al.*, 2011, p. 680): F1 (social, economic and political setting), F2 (ethnicity condition), F3 (outcome),

Kaiser–Meyer–Olkin measure of sampling adequacy	0.850
Bartlett's test of sphericity	
Approximate chi-square value	9382.397
Degree of freedom	406
Probability value	0.000

Table 4.
The result of KMO and Barlett's tests

	Component						
	F1	F2	F3	F4	F5	F6	F7
D4.3. Local politicians have been supportive of problems raised by the residents	0.607						
D4.4. The Local authority/Office of the Commissioner of building have been supportive to many activities organized by the residents	0.732						
D4.5. The State government has been paying attention to our welfare	0.817						
D4.6. The Federal government has been paying attention to our welfare	0.850						
E2.1. I am happy because the same law applies to everyone regardless of ethnicity	0.645						
E2.3. I have close friends who belong to other ethnic groups	0.527						
E2.2. Despite the difference, people with different ethnic groupings live well together		0.492					
E2.4. I feel safe when I am alone at home		0.683					
E2.5. Realizing the sensitivity of culture one has, I try not to do anything that hurts other ethnic groupings		0.750					
D3.6. Officially the law is there to enforce the payment of service charge		0.752					
D4.1. The average household size is reasonable here ranging from 1 to 5 children		0.611					
C1. I would recommend my friend to buy a unit			0.803				
C2. I would recommend my friends/ relatives to move into my neighborhood			0.760				
C3. My life happiness is higher as a homeowner			0.803				
C4. I like to stay longer as I am satisfied with the environment in my community			0.764				
D1.1. The total number of units in the scheme is just about right				0.800			
D1.2. The common facilities are adequate				0.782			
D1.3. The standard of workmanship of the unit is acceptable to me				0.784			
D2.1. I trust the people I come into contact with in the community					0.823		
D2.2. Whenever I need some forms of help, I can always expect help to come					0.882		
D2.3. If there is a common problem facing the community; we will put our heads together					0.767		

Table 5.
Rotated component matrix and factor loading

(*continued*)

	Component						
	F1	F2	F3	F4	F5	F6	F7
D3.1. I hold the community leaders in high esteem because they are capable of managing the common- area						0.716	
D3.2. I observe house rules because I know everyone else follow them too						0.814	
D3.3. The house rules are reasonably set because they are good for us						0.468	
D1.6. Where applicable, the lifts are working well most of the time e good for us?						0.484	
E1.3. I find it hard to adapt to living in a flat environment							0.529
E1.4. Living in a flat is not compatible with my culture							0.671
E1.5. I do not follow the advice of my local leadership most of the time							0.728
E1.6 Since paying service charge is a private matter; I decide to pay, or not to pay entirely on my own							0.442
Eigenvalues	7.247	5.080	2.414	1.959	1.608	1.138	1.101
% of variance explained	24.988	17.516	8.325	6.754	5.546	3.925	3.796
Cumulative % of variance explained	24.988	42.504	50.829	57.583	63.129	67.054	70.850
Cronbach's alpha (reliability test)	0.856	0.790	0.917	0.862	0.889	0.683	0.805

Table 5.

F4 (resource system), F5 (users), F6 (governance system) and F7 (historical/adaptation to new environment). Henceforth we used components to name F1 to F7 to avoid confusion.

Eigenvalue for a particular component summarizes the percentage of variability of the variables explained by that component. Eigenvalue for F1 is 7.247 as shown in Table 5.

In this Discussion Section, we would like to link results in Table 5 to the second-tier variables of IAD-SES framework in Table 2. If they do, then the phenomenon of collective action can be explained by Ostrom's SES framework, an approach little travelled by researchers of low-cost housing maintenance. Table 5 highlights the resultant components are having a much smaller number of 29 variables or sub-components whose loading were 0.5 or more (except for three variables).

Table 6 shows a list of components and their related third-tier variables.

4.2.1 F1: Social, economic and political settings. In a typical SES framework S4 (second-tier variable) measures the context. F1 accounted for 24.988% of the total variance explained.

Components	Construct measured	Original elements in the survey questionnaire (see Appendix)
F1	Social, economic and political setting	D4.3, D4.4, D4.5, D4.6, E2.1 and E2.3
F2	Ethnicity condition	E2.2, E2.4, E2.5, D3.6 and D4.1
F3	Outcome	C1, C2, C3 and C4
F4	Resource system	D1.1, D1.2 and D1.3
F5	Users	D2.1, D2.2 and D2.3
F6	Governance system	D3.1, D3.2, D3.3 and D1.6
F7	Historical development/adaptation to new environment	E1.3, E1.4, E1.5 and E1.6

Table 6.
Components and sub-components after re-alignment

The availability of low-cost housing was due to the government policies that helped the poor wherein private developers were mandated to provide low-cost housing for the bulk of low-income group (Abdul Aziz, 2007; Abdullahi and Abdul Aziz, 2011; Wang, 2013). Hence it came as no surprise that on the whole parcel holders of low-cost housing were grateful to the government, state officials and local politicians. In particular, Selangor State government through its Selangor Housing Board and Local government provided regular counsel and assistance to the needs of parcel holders (Wang, 2013). F1 measured mainly context as seen from four out of six measuring variables. The highest loading (0.850) was from variable D4.6 "the Federal government has been paying attention to our welfare". Close at the heel, variable D4.5 showed (loading 0.817) "the State government has been paying attention to our welfare".

4.2.2 F2: Ethnicity condition. F2 was not in a typical SES framework but related to homogeneity of parcel holders. F2 accounted for 17.516% of the total variance explained. In the literature, the mainstream thinking is a more homogeneous community is likely to produce a more harmonious community (Baland and Platteau, 1996, p. 49; Grootaert *et al.*, 2004; Poteete *et al.*, 2010, p. 44). Credit must be given to Malaysians who can live in harmony in a social-setting despite the fact that they are from different ethnicities. F2 measured ethnicity condition accounting for three out of five elements. In terms of loading however, some of them were not high. Variable E2.5 showed (loading 0.750) "Realizing the sensitivity of culture one has, I try not to do anything that hurts other ethnic groupings". Variable E2.4 (loading 0.683) "I feel safe when I am at home" recorded a low score, pointing to concern for neighborhood safety.

4.2.3 F3: Outcome. O1 measures social performance in a typical SES framework (second-tier variable). F3 accounted for 8.325% of the total variance explained. In the multi-case study involving Nursa Kurnia, Cemara I and II, Tujoh Ratus and Vista Subang, the outcome in each case was measured in two ways. Firstly, as observed from the upkeeping of common properties, what was the state of condition? And secondly, was there a relationship of state of condition to do with the service charge payment? See the five types of outcomes in Ostrom (2005, p. 66) and Wang (2013). The result supported the CPR theory in that collective-action problem (Ostrom, 1990, p. 5; Ostrom *et al.*, 1994, pp. 297–299). Only in exceptional case could effective local leadership revert the deteriorating condition by promoting "credible commitment" as seen in Nursa Kurnia and Cemara I and II (Shepsle, 1989; Ostrom, 1990, p. 43).

F3 measured the dependent variable of the state of health of the commons (quality of upkeep of common properties). High loading for four measured elements showed the augmented IAD model was robust. As an example, variable C1 (loading 0.803) "I would recommend my friend to buy a unit" showed on the whole respondents were happy to live there, where the alternative option could be worse. Variable C3 (loading 0.803) "My life happiness is higher as a homeowner" made sense as otherwise house-democracy was wrong.

4.2.4 F4: Resource system and units. As for the size of CPR, it is measured under RS3. More units mean more challenges in management. RS4 (also second-tier variable) measures condition of the facilities. A badly managed common properties will discourage parcel holders from paying their service charge. F4 accounted for 6.754% of the total variance explained. Can collective goods be regarded as neglected goods? See Kiesling (2000). First, in the literature we established that the more the units in a given low-cost housing scheme, the harder was the self-organization due to high subtractability and low excludability nature of CPR (Olson, 1965, p. 53; Ostrom *et al.*, 1994, p. 7). Olson's (1965, p. 53) observation was corroborated in our multi-case study. As an example, Nursa Kunia was a relatively small community (200 units) compared to Tujoh Ratus (700 units).

F4 measured physical/material condition with three elements recorded high loading figures. The highest variable was D1.1 (loading 0.800) "the total number of units in the scheme is just about right". Next variable D1.3 measured (loading 0.784) "the standard of workmanship of the unit is acceptable to me".

4.2.5 F5: Users. In the framework, U2 (second-tier variable) measures social attributes, U5 (second-tier variable) measures local leadership, U6 (second-tier variable) measures norms and lastly U7 (second-tier variable) measures knowledge of collective-action. F5 measured attributes of community where social capital was used as proxy. If a community possessed certain traits such as shared identity, understanding, norms, values, trust, cooperation and reciprocity, then its social capital was said to be high (DiClemente *et al.*, 2002, Chapter 9; Perkins *et al.*, 2002; Valentinov, 2004). In our multi-case study, only three elements were left with passable scores. As an example, respondents appeared positive that help would come in times of need (variable D2.2, loading 0.882). Also, variable D2.1 (loading 0.823) "I trust the people I come into contact with in the community".

4.2.6 F6: Governance system. GS5 (second-tier variable) measures the operation rules. In Malaysia, formal laws are in-placed that guide, monitor and enforce the management of low-cost housing (Ariff, 2011). As in elsewhere, these have created three levels in application of laws (Ostrom, 2005, p. 59): operational rules (lowest level, such as house rules set by individual management of low-cost housing); collective-choice rules (middle level, such as those contained in the Strata Titles Act 2013 (Act 757) and Regulations; and constitutional rules (highest level, such as the country law that is supreme). While formal laws maybe created, their effectiveness depends on many variables: size, homogeneity of the community, effectiveness of local leadership, nature of the common property, etc.

F6 measured rules-in-use with two elements scored reasonably well. From the questionnaire survey, variable D3.2 (loading 0.814) "I observe house rules because I know everyone else follow them too" made sense. Variable D3.1 (loading 0.716) "I hold the community leader in high esteem because they are capable of managing the common area." The findings show parcel holders are aware of the house rules and they need to observe them, or in default, face some kind of penalties.

4.2.7 F7: Historical development/adaptation to new environment. F7 was not in a typical SES framework but nevertheless an important factor. F7 measured historical development which was an indication of respondents' adaptability into the new environment of strata living. The challenges faced by the management of low-cost high-rise housing were many, from poor quality of buildings, to high cost maintenance of common properties and to collection of monthly service charges (Azian *et al.*, 2020). In Malaysia, low-income parcel holders did not choose to live in high-rise housing but due to economic consideration. Many were previous urban squatters who moved into the highly subsidized high-rise low-cost housing built by the private developers/the government agencies (Abdul Aziz, 2007).

In line with the literature, respondents seemed agreeable that adaptation was difficult. As an example, variable E1.4 (loading 0.671) showed "Living in a flat is not compatible with my culture". From the field survey and factor analysis performed, evidences were there that showed issues of collective-action could be explained by second-tier variables of SES framework.

5. Conclusions

Self-organizing and managing a community is a challenging task as numerous collective action problems are posed. A well self-managed shared community is akin to good collective action that results in a healthy environment in a peaceful setting. Via a mixed method design, the paper explored the outcome from such human-ecological system based on four low-cost housing schemes in and around Kuala Lumpur. We first assembled a panel of six experts and identified historical development/adaptation to new environment and ethnicity condition as additional variables to the IAD-SES framework. The final components were outcome, physical conditions, attributes of community, rules-in-use, context, historical development/adaptation to environment and ethnicity. We next conducted questionnaire surveys of the

said four low-cost housing schemes from a total of 633 respondents (see Appendix). We merged IAD framework into SES framework and performed factor analysis. The five most important components were in the order of relevance (see Table 6): context (social, economic and political setting) (F1), ethnicity (F2), outcome (F3), resource system (F4) and users characteristics (F5).

Based on the study, what follows are five key findings. First, this paper highlighted the relevance of context, which measures political setting and its impact on collective action. Parcel holders were grateful to the assistance rendered by the government since they were privileged to buy low-cost housing units which were highly subsidized. Second, the issue was related to the ethnicity condition. Parcel holders appeared sensitive to the multi-ethnic community living where each ethnic group had its own culture, preferences and idiosyncrasies. Third, the standard of maintenance under self-organization arrangement affected the living environment. On the whole parcel holders found the maintenance standard acceptable. Fourth, from the multi-case study, high-rise buildings with lifts resulted in costly maintenance (Tujoh Ratus, Vista Subang were examples). Fifth, from the multi-case study, parcel holders of Nursa Kurnia were said to display a higher level of social capital (shared identity, norms, values and trust). But the pre-condition was an effective local leadership.

The study is deemed novel and significant because few if none past researchers rely on IAD-SES frameworks to assess management performance. Some may have done using factor analysis, but not based on IAD-SES frameworks. In any problem-solving situation, such as managing the CPR, a holistic view is important. CPR literature explains what components are that influence outcome. By amending the law alone is only addressing part of the challenges. Feedback from 633 parcel holders threw new lights as how parcel holders perceived the condition under self-organization of CPR. In this paper, we do not claim we have identified what caused common properties degradation, if any. Through the five top components identified (F1 to F5), we highlight which variables under which components are relevant in maintenance and management.

Conceptually, IAD-SES frameworks encourage researchers to treat strata high-rise low-cost housing as something complex, multi-levels and adaptive. Law change (taken as institutional change) alone will not result in improved governance. For instance, context appears as the most important component to parcel holders (F1), followed by ethnicity condition (F2).

However, this study is not without limitations. Although the study involved a wide range of social-ecological factors on the impact of self-organization in low-cost housing, the study did not do relevant research on the interaction of variables in the IAD-SES frameworks. Additionally, 2012 data was used. In the authors' zealousness to introduce IAD-SES frameworks for future researchers, it is worth our efforts to produce this paper. Research conducted before and after the introduction of Strata Titles Act 2013 (Act 757) and Regulations showed the challenges of self-organization remained.

This paper has certain practical application value; as discussed elsewhere in the paper, few if any of previous research done on the woes of self-organization of high-rise low-cost housing based on IAD-SES frameworks, much less factor analysis. Moreover, this paper added two more variables to the IAD-SES frameworks (historical development/ adaptation to new environment, and ethnicity). For future, similar research may be conducted in Malaysia and other South East Asian countries of similar housing type involving self-organization of parcel holders. And lastly, bear in mind that the findings add to the richness of knowledge pertaining to the challenges of self-organization in high-rise low-cost housing by treating such social-ecological system as complex, multi-levels and adaptive.

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Appendix

Appendix contents are available in online for this article.

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