BUILT ENVIRONMENT SRI LANKA 2023, VOL. 14, NO.1, 22, 31-48
https://doi.org/10.4038/besl.v14i1.7679

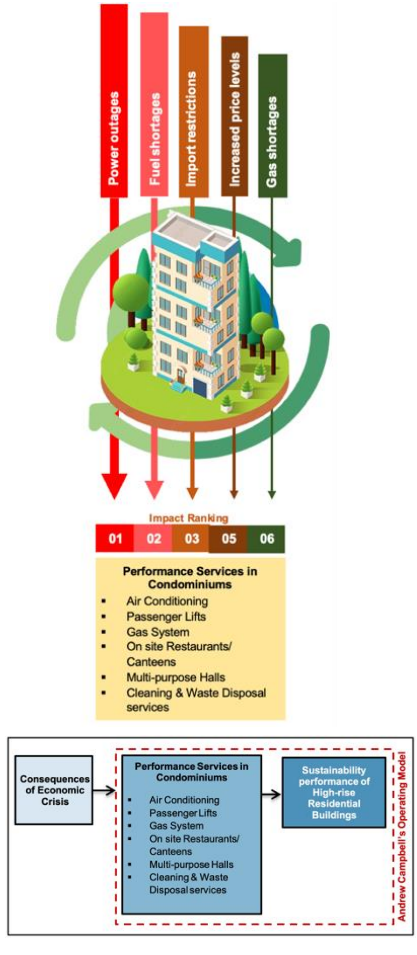
Impact of Economic Crisis on Sustainability of Performances in High-rise Residential Buildings in Colombo Urban Area

Wickremasinghe, H. T.[1] and Dushmila, D.[2]

[1,2] Department of Estate Management and Valuation,
University of Sri Jayewardenepura, Sri Lanka

ARTICLE HISTORY
Received January 18, 2023
Accepted May 08, 2023

KEYWORDS
Colombo, economic crisis, high-rise buildings, performances, residential, Sustainability



ABSTRACT

Economic crisis is one of the most important concepts in considering economic growth and development. It affects all sectors including housing in a country. With accelerating urbanization, high-rise residential buildings have become the solution for the increasing housing demand in urban areas. Consequently, number of such buildings have emerged around the world during the past decade. As many people inhabited these residential buildings, providing required facilities continuously is vital. Thus, the performances of these properties are required to be maintained at a standard level. However, it can be challenging to do during an economic crisis. Despite the large amount of research devoted to examining the impact of economic crisis on housing sector, the insights on its impact on sustainable performance pertaining to high-rise residential buildings are rare. Therefore, this study aimed at examining the impact of economic crisis on the sustainability of performances in high-rise residential buildings in Colombo urban area. Using inductive approach and qualitative method, primary data were collected from representatives of management corporations of seven high-rise residential properties located in Colombo. Collected data were analysed using descriptive analysis, content analysis methods and Operating Model Canvas developed as the theoretical basis. Study findings revealed that all the selected buildings were equipped with all the required services for expected performances. Moreover, air conditioning, intercom, waste water disposal, cleaning service and garbage collection are the leading performances that have been negatively affected by consequences of economic crisis mainly due to fuel shortage and power failure.

1. Introduction

The phenomenon where the economy of a nation significantly and continuously declines is referred to as an economic crisis (International Monetary Fund, 2013). An economic crisis adversely affects both economic and urban development of a country leading to severe negative effects such as increased unemployment, weaker domestic currencies, financial deficit, heavy external debt burden, inflation, and high cost of living (Koutrolikou, 2015). Urban development is a process that coincided with economic development and impacts of each generate consequences to each other. Due to high urbanisation in cities around the world, high-rise buildings have become the sole solution for catering to the increasing housing demand and they are often referred to as condominium properties. A condominium property or high-rise housing building is a property division method in which an individual holds title to a portion of a building, or a "unit," as well as a share of the remaining property that is shared by all individual unit owners (Condominium Management Authority, 2023). As many people inhabited these residential buildings, providing required facilities continuously is vital. Thus, the performances of these properties are required to be maintained at a standard level. However, it can be challenging to do during an economic crisis.

In early 2022, Sri Lankans started experiencing power cuts and shortages of basics such as fuel (BBC News, 2023). The rate of inflation rose to 60% a year (Central Bank of Sri Lanka, 2022). Sri Lanka also faced the main common negative macroeconomic indicators of an economic crisis (Koutrolikou, 2015); a high public deficit, an increase in unemployment, precarious working conditions, cuts in basic services, and so on. Further, as mentioned by Mitrea (2020) economic crises increase the risk of downward social mobility, worsening citizen living conditions. A major problem caused by the economic crisis is the depreciation of the exchange rate and the sharp decline of foreign reserves. As a result, daily power cuts, domestic gas shortages, and fuel shortages can be identified as the main consequences of the sharp decline of foreign reserves. Similar in other countries, in Sri Lanka also, numerous high-rise condominiums are developed in urban areas catering to the increasing housing demand. In such properties, electricity and gas are two of the most commonly used household energy sources to power appliances such as lifts, refrigerators & cooling systems, lighting systems, heating, cooking appliances, televisions, technological devices, etc. (Nduhuura et al., 2021). Thus, the shortage of energy sources directly affects to the proper and regular functioning of such services in a high-rise building that can lead to failures in overall building performances.

When considering the electricity demand statistics in Sri Lanka for the year 2017, the highest share of sales (37%) was demanded by the household

customers (Sri Lanka Sustainable Energy Authority, 2017). These provide essential services for food preparation and preservation, home-based production and academic activities, safety and security, communication and information access, as well as air conditioning, comfort, and leisure. If there is a power outage, all of these services can be affected. In terms of condominium property performance systems, it is critical to provide and maintain pump water, central AC, electric lift, telephone, lightning conductors, fire extinguishers, etc. (Condominium Management Authority, 2015). In addition, to ensure the sustainable operation of performance systems of high-rise residential buildings and also satisfaction of people living in them, it is vital to provide these facilities and services continuously with standard quality (Sia et al., 2018). However, the sustainable usage and maintenance of these facilities are questionable in the current economic crisis in Sri Lanka. Despite the large amount of research devoted to examining the impact of economic crisis on housing sector, the insights on its impact on sustainable performances pertaining to high-rise residential buildings are rare. That has been identified as the knowledge gap in this study to explore. Therefore, this study aimed at examining the impact of economic crisis on sustainability of performances in high-rise residential buildings in Colombo urban area. The study used an inductive approach and qualitative method, where primary data were collected from representatives of management corporations of seven high-rise residential properties located in Colombo. Further, collected data were analysed using descriptive analysis, content analysis methods and Operating Model Canvas developed as the theoretical basis. The remaining sections of the paper will focus on literature review, methodology, case study area, results, discussion and conclusion.

2. Literature Review

2.1. Consequences of the Economic Crisis in Sri Lanka

The economic crisis is defined as “Indicators of the country's declining economic performance include a decline in production and demand, an increase in unemployment, and business bankruptcies” (Swinnen & Herck, 2009). It is an unplanned event that arises from the internal or external environment, region, or country and has the potential to disrupt operations, endanger people physically and mentally, and jeopardize the viability of entities that are no longer capable of dealing with the crisis.

Considering Sri Lanka, after the year 1977, since the beginning of following the open economic policies, Sri Lanka have faced economic crises due to the various reasons (Hettiarachchi, 2015). Recently, after the Covid-19 pandemic period, Sri Lanka is in the grip of a severe economic crisis as a result of the country's depletion of foreign reserves, which has resulted in a scarcity of

food, fuel, medication, cement, and other necessities. Sri Lanka is experiencing a severe economic crisis as a result of the country's depletion of foreign reserves, which has resulted in food, gasoline, pharmaceuticals, cement, and other essential supplies shortages. Further, the current economic crisis has affected Sri Lanka both micro and macro levels (Yeung, 2022). The result of the economic crisis is that many people are financial instability as well as bankrupt of country. Increased unemployment, weaker domestic currencies, a financial deficit, a large external debt burden, inflation, and an increase in cost of living are just a few examples (Koutrolikou, 2015). Furthermore, the appearance of negative macroeconomic indicators such as a high public deficit, an increase in unemployment, precarious working conditions, cuts in basic services, and so on is evident during an economic crisis. Moreover, fuel shortages and daily power cut are critical and complex impacts of the economic crisis (CNN News, 2022).

During the past few years, Sri Lanka restricted the import of raw materials, and electrical equipment due to the scarcity of foreign currency (Silva, 2022). In addition, economic crisis adversely affects the health food scarcity, protection, fuel shortage, power cuts, gas shortage, etc. considering health sector, Al Jazeera News highlighted more than 80% medical supplies are imported. Due to the current economic crisis in Sri Lanka it's unable to import medicines and is facing a shortage of medicines (Al Jazeera News, 2022). Further, as a result of the crisis, there is a shortage of food and cooking gas, with long lines outside shops selling cooking gas cylinders, and it is primarily affecting people who live in apartments (Central Bank of Sri Lanka, 2022). Since February 2022, Sri Lanka has been subjected to daily scheduled power outages due to fuel shortages caused by the country's worsening economic crisis, which has hampered uninterrupted thermal power generation (Jayesinghe, 2022). In addition, economic crisis has resulted in fuel shortages across the country. As a result, fuel prices were increased by over 137% between December 2021 and May 2022 (Ellis, 2022). Further, people across the country had to wait in fuel queues for days to get their fuel tanks filled (Sisodia, 2022). People are still facing a number of negative impacts due to this economic crisis in Sri Lanka.

2.2. High-rise Residential Buildings in Sri Lanka

The high-rise residential buildings are often referred to as condominium properties, where a units of condominiums are owned by individual owners while common areas such as passenger lifts, pools, parking, gardens, etc. are for common usage. As per the statistics of 2017 (Prathapasinghe et al., 2018), there are over 900 condominium complexes in the country having over 15,000 residential units while another 200 condominium projects are in pipe-line with over 13,000 residential units to come. Further,

considering in current condominium market, according to statistics Condominium Management Authority (2022) from 2002 to August 2022, the number of registered management corporation is 673 in the private sector developers and 774 in the government sector accounting for 1,147 corporations in total. Moreover, according to the Central Bank of Sri Lanka, over 7,600 luxury condominium apartments have been built around the capital city in the last decade, with over 14,300 more in pipeline (Central Bank of Sri Lanka, 2022). A high percentage of these are located in the Western province (Condominium Management Authority, 2022).

2.3. Performance Services of High-rise Residential Buildings

Building performance services are required to facilitate condominiums to function at an ideal level while delivering comfortable environments for residents to achieve their maximum performance potential. Thus, clean air, water, lightening, passenger lift, removal of waste produced, optimum thermal & humidity control, etc. are placed top as high prioritised and mandatory services. The typical facilities provided in a condominium building include; swimming pool, gym, lifts, car parking, motorbike parking, multi-purpose hall, retail space, office space, private green space, guard house, children playground, water fountain, closed-circuit television (CCTV), security door entrance, air-conditioning & ventilation, sports facilities, waste disposal services, etc. (Yan, 2015).

In terms of condominium/ residential performance, the building performance services should be maintained as long as residents' satisfaction levels are maintained, as higher the quality of facilities and services provided, the more satisfied residents will be (Sia et al., 2018). Failure to sustain and maintain the setting in high-rise living is likely to lead to decline the residents' well-being (Ariff & Davies, 2009). Thus, appropriate maintenance strategy, therefore, needs to be implemented to ensure that utility significant items and health, safety and environmentally significant items are working in optimal conditions (Horner et al., 1997). Further, it is essential for any condominium to determine appropriate building performance service requirements, methods for delivering the required performance services, and methods for verifying that the required performance has been achieved.

2.4. An Operating Model for Evaluating Performance of High-rise Buildings

An operating model is a supportive system for organisations for effective and efficient daily operation activity. It is a visualization (a model or collection of models, maps, tables, and charts) that explains how an organization operates in order to provide value to its customers or beneficiaries (Campbell, 2017). Operating models support value creation to organisation while supporting to

examine the operating process and progress of any system. The Operating Model suggested by Andrew Campbell (2017) has six components; process, organization, location, information, suppliers and management system.

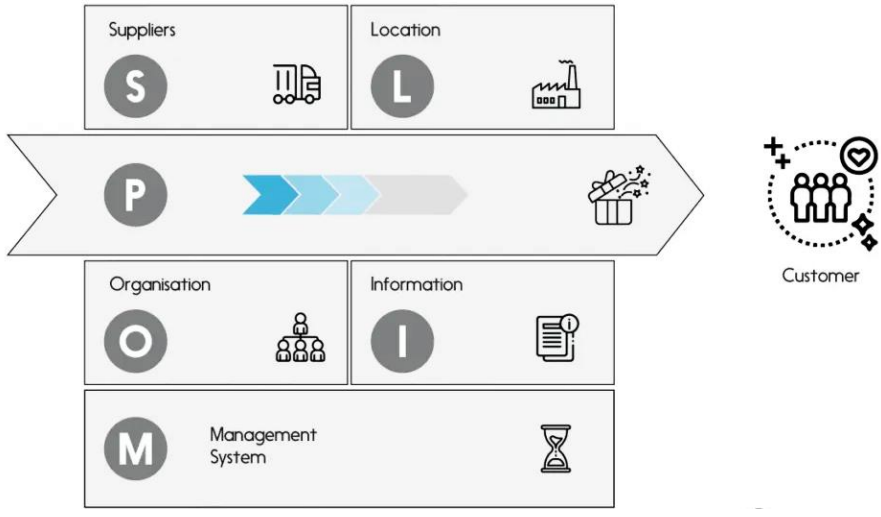


Figure 01: Andrew Campbell's Operating Model (2017)

Table 01: Components in Andrew Campbell's Operating Model

Component	Description
Process	The key work activities and machinery needed for value creation and delivery process.
Organisation	The organisational structure, people who do the work and how are they organised.
Location	Where is the work done, and what assets are required and available in these locations.
Information	The information systems that support the work and value delivery.
Suppliers	The key partners who help in value creation and delivery.
Management System	Planning, budgeting, performance, risk management, continuous improvement and people management processes that the organisation utilises.

Source: Campbell (2017)

In the high-rise condominium context, the process component can be explained as the work steps and machinery used to provide facilities from installation to disposal. The organization may explain the people involved for providing facilities again from installation to disposal. For an example, when there is a maintenance issue in a facility, the people involve in doing the maintenance. Considering the component of location, where the exact location(s) certain activities would be done. In an installation of a system instance, what would be the exact location its central systems would be located within the building and which type of resources are available for the particular activity. In information system component, it explains the information system supports used for different purposes, for an example system used in identifying exact servicing periods of AC systems in the building. Considering the suppliers component, the suppliers can range from the ones who involve in providing required energy sources like electricity to minor facilities such as cleaning liquid suppliers. Finally, the management system may include all the management processes that condominium management corporations utilise.

Accordingly, the conceptual model was developed as follows considering the common performance services in high-rise residential buildings.

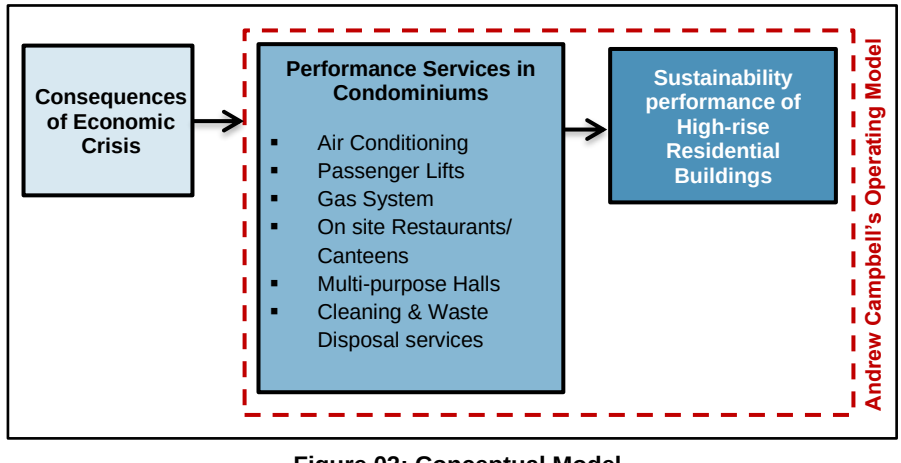


Figure 02: Conceptual Model

3. Methodology

This research used an inductive approach research and a qualitative method. This research was conducted using a mono method research and observations were done on cross- sectional time horizons. Both primary and secondary data were utilised for the analysis. This research used case study as the strategy to collect data. Due to time and cost constraints, the study using non-probability sampling technique drew a sample of 07 apartments as cases to collect primary data. On the request of respondents, the names of

the selected condominium properties were not revealed and pseudonyms (P1 to P7) were used.

The interviews were conducted using a semi-structured interview guide with facility and admin managers, charted valuation survey, property managers, general managers, chief operating officers of the condominium properties. The secondary data was gathered from a journal article, conference report, website, and research report, which are currently published. The main secondary data used are the annual report of the condominium property-related institute and the reports that are currently published by those institutes. The information obtained from the apartment management corporation and some experts were analysed using descriptive methods, thematic data analysis techniques of qualitative data analysis methods. The secondary data were analysed using descriptive data analysis techniques. The Andrew Campbell's Operating Model (2017) was used as a theoretical reference.

3.1. Case Study Area

Table 2 shows the details of the selected condominium properties and their management corporations. As per shown details, the number of floors of buildings range from 10 to 47 floors and number of units range from 46 to 172. Further, the price levels range from 45 to 80 million. Most of the condominiums are fully occupied. Average unit occupancy members are 2 to 4 and most buildings are constructed within 2014 to 2022 within the last decade.

Table 02: Details of the Condominiums and their Management Corporations

	Property 01 (P1)	Property 02 (P2)	Property 03 (P3)	Property 04 (P4)	Property 05 (P5)	Property 06 (P6)	Property 07 (P7)
Details of Condominium Property							
Nearest town	Jawatta	Kelaniya	Rajagiriya	Nugegoda	Kollupitiya	Rajagiriya	Rajagiriya
Name of developer	Home Land Holding	CK homes (Pvt) Ltd	Atlanties Developer	Homeland Holding	International Construction Consortium	Maga Engineering and Milroy Perera Associates	Prime Group
Year of completion	2020	2019	2014	2020	2008	2017	2015
No. of floors	10	11	24	16	25	47	14
No. of units	46	61	172	63	110	164	72
Average Floor area	950 to 1500 sqft	-	1200 to 2000 sqft	950 to 1500 sqft	2000 sqft	1800 to 2000 sqft	1500 to 2000sqft

per unit							
Price level	45 million 70	50 million	-	45 million 70	80 million	50 to 80 million	50 to 80 million
Occupation level	Fully Occupied	50% Occupied	Fully Occupied	Fully Occupied	Fully Occupied	75% Occupied	80% Occupied
Residents' job titles	Doctors, Engineers Business Owners, Officers in Forces, Company Managers	Retired People, Businessman, Executive Level Employees	Businessman, Doctors, Bankers, Lawyers, Engineers, Politicians	Doctors, Engineers Business Owners, Officers in Forces, Company Managers	Foreign Embassy Employees, Businessman Doctors, Bankers, Lawyers, Engineers Politicians	Businessman Doctors, Bankers, Lawyers, Engineers, Foreigners	Businessman, Executive Level Employees, Doctors, Engineers
Residents' family size	2 to 4	2 to 3	2 to 4	2 to 4	2 to 3	2 to 4	2 to 4
Details of Management Corporations							
Establishment date	2021 January	2022 January	December 2015	2021 January	2011 February	2017 January	2018 January
Number of members	04 members	04 members	07 members	04 members	06 members	08 members	06 members
External parties' involvement	No	No	No	No	No	No	No

Source: Interviewed Data (2023)

4. Results and Discussions

4.1. Respondents' Profiles

The table 03 below shows the details of the respondents. As shown, majority are with over 03 years of experience in full time employments in private sector companies and age ranges from 30 to 60 years. All the respondents have bachelor and above level educational background.

Table 03: Profiles of Respondents

Description	Property 01 (P1)	Property 02 (P2)	Property 03 (P3)	Property 04 (P4)	Property 05 (P5)	Property 06 (P6)	Property 07 (P7)
Respondent	R1	R2	R3	R4	R5	R6	R7
Age between	30 – 40	30 – 40	20 – 30	40- 50	40 – 50	50 – 60	30 – 40
Gender	Female	Female	Female	Male	Male	Male	Male
Education background	Bachelor's degree	Masters' degree	Bachelor's degree	Bachelor's degree	Bachelor's degree	Bachelor's degree	Master's degree
Occupation	Facility and Admin Manager	Charted Valuation Surveyor	Property Manager	Facility and Admin Manager	Chief Operating Officer	Property Manager	General Manager
Experience	3 years	10 years	7 years	16 years	15 years	35 years	15 years
Working organization	Homeland Holding	Individual Practitioner	JLL Lanka Ltd.	Homeland Holding	International Construction Consortium	Reality Management Services Organization	CBL Group

Source: Interviewed Data (2023)

4.2. Availability and Operating Process of Performance Services

As the initial step, the researchers examined the availability of selected key services in the properties. The selected key services were air conditioning, passenger lifts, gas system, on-site restaurants/ canteens, multi-purpose halls and cleaning & waste disposal. The components of process, organization, location, information, suppliers and management systems in the Andrew Campbell's Operating Model (2017) were used to analysis the availability and the nature of each service. Table 04 explains the operating process of each selected service. Abbreviations used are air conditioning (AC), passenger lifts (PL), gas system (GS), on-site restaurants/ canteens (RC), conference halls (CH) and cleaning & waste disposal (CW). The components of process, organization, location, information, suppliers and management systems.

Table 04: Operating Process of the Selected Performance Services

	AC	PL	GS	RC	CH	CW
1. Process						
All units have been installed separate air-conditioners.	(P1, P3, P4)	-	-	-	-	-
Management Corporation repairs units of system and a fee is charged from unit owners.	(P5)	-	-	-	-	-
Centralized systems are used.	(P5)	-	(P1, P2, P3, P4, P5, P6, P7)	-	-	-
One year warranty period from company from installation date.	(P1, P4)	(P1, P4)	-	-	-	-
Monthly, bi-annual and annual repairs and maintenance are essential.	(P1, P2, P3, P4, P5, P6, P7)	(P2, P3, P5, P6, P7)	(P1, P2, P3, P4, P5, P6, P7)	-	(P1, P2, P3, P4, P5, P6, P7)	-
A fixed system is used.	(P2, P6, P7)	-	-	-	-	-
Canteen is rented annually through tenders.	-	-	-	(P2, P3, P5)		
Need to make prior reservations.	-	-	-	-	(P1, P2, P3, P4, P5, P6, P7)	-
Cleaning and garbage collection are done daily and weekly while cleaning of pipelines is done once a month.	-	-	-	-	-	(P1, P2, P3, P4, P5, P6, P7)
2. Organization						
The Management Corporation is fully responsible for the common areas' repairs and maintenance of systems.	(P1, P2, P3, P4, P5, P6, P7)	(P1, P2, P3, P4, P5, P6, P7)	(P1, P2, P3, P4, P5, P6, P7)	-	(P1, P2, P3, P4, P5, P6, P7)	-
The unit owners are fully	(P1, P2,	-	(P1, P2,	-	-	(P1, P2,

responsible for repairs and maintenance inside their units.	P3, P4, P5, P6, P7)		P3, P4, P5, P6, P7)			P3, P4, P5, P6, P7)
Operated by outside tenants & repairs and maintenance are done by Management Corporation.	-	-	-	(P2, P3, P5)	-	(P1, P2, P3, P4, P5, P6, P7)
Cleaning company & management team is responsible for cleaning all common area.	-	-	-	-	-	-
3. Location						
All the repairs and maintenance are done in-house.	(P1, P2, P3, P4, P5, P6, P7)	(P1, P2, P3, P4, P5, P6, P7)	(P1, P2, P3, P4, P5, P6, P7)	(P2, P3, P5)	(P2, P3, P5)	(P1, P2, P3, P4, P5, P6, P7)
If there is a major issue, the machines are a removed and repaired and fixed again.	(P1, P2, P3, P4, P5, P6, P7)	(P1, P2, P3, P4, P5, P6, P7)	-	-	-	-
4. Information						
All the repairs and maintenance are identified manually.	(P1, P4)	(P1, P4)	(P1, P4)	-	(P1, P4)	-
Systems are used maintain maintenance schedule and to identify repairs and maintenance requirements.	(P2, P6, P7)	(P2, P6, P7)	(P2, P6, P7)	(P2, P3, P5)	(P2, P6, P7)	-
Engineers maintain asset management plan and CCTV camera to identify repairs and maintenance.	(P5)	(P5)	(P5)	-	(P5)	(P5)
5. Suppliers						
Services are provided by facility management agent.	(P1, P2, P3, P4, P5, P6, P7)	(P1, P2, P3, P4, P5, P6, P7)	(P1, P2, P3, P4, P5, P6, P7)	-	-	-
Cleaning services are outsourced and garbage is collected by local authority.	-	-	-	-	-	(P1, P2, P3, P4, P5, P6, P7)
6. Management system						
Funds were allocated by budget for all repairs and maintenance.	(P1, P2, P3, P4, P5, P6, P7)	(P1, P2, P3, P4, P5, P6, P7)	(P1, P2, P3, P4, P5, P6, P7)	-	-	-
Management fee is being increased by two rupees per sqft monthly.	(P5)	(P5)	(P5)	-	-	-
Fully managed by the Management Corporation.	-	-	-	-	(P1, P2, P3 P4, P5, P6, P7)	-

Note: air conditioning (AC), passenger lifts (PL), gas system (GS), on-site restaurants/ canteens (ORC), conference halls (CH) and cleaning & waste disposal (CWD).

Source: Interviewed Data (2023)

5. Impact of Economic Crisis on Performance Services

The researchers next examined the impact of economic crisis on the performances of high-rise residential buildings. The key indicators of economic crisis evident in Sri Lanka during the past year were used for the analysis. Those were power outages, fuel shortages, gas shortages, import restrictions and increases in price levels (Koutrolikou, 2015; Silva, 2022)..

Tables 5, 6 and 7 show the impact of each indicator on the performance of the selected services and the number of impacts as mentioned by the respondents are included as a total count. The total impact of each table has been calculated by taking column-wise summations.

Table 05: Impact of Power Cuts and Fuel Shortages on Performance Services

	Power Outage						Fuel Shortage					
	AC	**PL**	**GS**	**RC**	**CH**	**CW**	**AC**	**PL**	**GS**	**RC**	**CH**	**CW**
1. Process												
System Installation	7	7	7	3	7	1	6	7	6	3	7	1
Repairs and maintenance	4	4	1	-	3	2	2	-	-	-	-	7
Inability to provide service	6	6	4	3	3	2	2	-	-	2	2	4
Delay of service providing	7	7	4	3	3	2	7	-	-	2	7	7
2. Organization												
Employee availability issues	7	7	7	7	7	7	7	7	7	7	7	7
3. Location												
Scarcity of required materials in stores	2	-	--	-	2	3	2	-	-	-	-	3
4. Information												
Not functioning of CCTV	-	5	-	5	5	-	-	-	-	-	-	-
5. Suppliers												
Delay of material/ service providers	7	7	7	7	2	7	6	5	7	7	7	7
6. Management system												
Management delays	7	7	7	7	7	7	7	7	7	7	7	7
Cost/ fees Increases	7	7	7	7	7	7	7	7	7	7	7	7
Total Impact on each service	**54**	**57**	**44**	**42**	**46**	**38**	**46**	**33**	**34**	**35**	**44**	**50**
Total impact due to each economic crisis consequence	**281**						**242**					

Source: Interviewed Data (2023)

Overall, the above statistics show that majority of properties have been affected by the power outages and fuel shortages. Process, organisation, suppliers and management systems are the highly affected components of the process. As the total impact statistics show, passenger lifts are mainly affected due to power outages and cleaning and waste disposal have been affected severely due to fuel shortages. Further, when compared with fuel shortages, all the services have been highly affected by power outages.

Table 06: Impact of Gas Shortages and Import Restrictions on Performance Services

	Gas Shortage						Import Restriction					
	AC	**PL**	**GS**	**RC**	**CH**	**CW**	**AC**	**PL**	**GS**	**RC**	**CH**	**CW**
1. Process												
System Installation	-	-	-	-	-	-	2	4	5	1	1	4
Repairs and maintenance	-	-	7	5	-	-	7	7	7		7	7
Delay of service providing	6	-	5	2	-	-	4	6	2	3	1	7
2. Organization												
Employee availability issues	3	1	4	1	3	2	-	-	-	-	-	-
3. Location												
Scarcity of required materials in stores	-	-	7	-	-	-	7	7	7	7	7	5
4. Information												
CCTV not functioning	-	-	6	5	-	-	3	7	3	7	2	7
5. Suppliers												
Delay of service providers	-	-	7	2	-	-	7	7	7	7	2	7
6. Management system												
Management delays	-	-	7	6	-	-	4	5	5	5	4	7
Cost/ fees Increases	-	-	7	7	-	-	7	7	7	7	7	7
Total Impact on each service	**9**	**1**	**43**	**23**	**3**	**2**	**32**	**39**	**31**	**36**	**23**	**40**
Total impact due to each economic crisis consequence	**81**						**201**					

Source: Interviewed Data (2023)

As an overall observation made based on above statistics, majority of properties have been affected by gas shortage and import restrictions while the impact of import restrictions is much higher than gas shortage. As the total impact statistics show, gas systems are mainly affected due to gas shortage and passenger lifts & cleaning and waste disposal have been affected severely due to import restrictions.

Table 07: Impact of Increase in Service Charges on Performance Services

	Increases in price levels					
	AC	**PL**	**GS**	**RC**	**CH**	**CW**
1. Process						
System Installation	-	-	-	-	-	-
Repairs and maintenance	7	7	7	7	7	7
Delay of service providing	-	-	-	-	-	-
2. Organization						
Employee availability issues	-	-	-	-	-	-
3. Location						
Scarcity of required materials in stores	-	-	-	-	-	-

4. Information							
Not functioning	-	-	-	-	-	-	
5. Suppliers							
Delay of service providers	-	-	-	-	-	-	
6. Management system							
Management delays	-	-	-	-	-	-	
Cost/ fees Increases	7	7	7	7	7	7	
Total Impact on each service	**14**	**14**	**14**	**14**	**14**	**14**	
Total impact due to each economic crisis consequence	**84**						

Source: Interviewed Data (2023)

As above statistics reveal, increases in price levels highly affected all selected condominiums. Further, managing budgets have also become challenging with constantly increasing prices. All the properties have been affected in the areas of management fees and cost of maintenance and repairs.

Table 8 shows the total impact of economic crisis on performances. It has been compiled using the summations of impacts of tables 5, 6 and 7. Further, based on the total number of responses, the crisis indicators were ranked to identify the most impactful consequence of economic crisis.

Table 08: Total Impact of Economic Crisis on Performance Services

Impact of economic crisis	AC	PL	GS	RC	CH	CW	Total Impact	Rank
Power outages	54	57	44	42	46	38	**281**	**1**
Fuel shortages	46	33	34	35	44	50	**242**	**2**
Import restrictions	32	39	31	36	23	40	**201**	**3**
Increases in price levels	14	14	14	14	14	14	**84**	**4**
Gas shortages	9	1	43	23	3	2	**81**	**5**

Source: Interviewed Data (2023)

According to the study, the most challenging impact category of an economic crisis on the sustainability of performance systems of condominium property was power outage following with fuel shortage and import restrictions. Comparatively, the impact of increases in price levels and gas shortages on performances of high-rise residential buildings was minimum in all properties. This proves the argument of Yeung (2022) that economic crises can generate multiple impacts on sustainability of performances.

5.1. Actions taken to Mitigate the Impacts of Economic Crisis on Performance Services

The researchers were able to identify common actions and strategies taken to mitigate the impacts of economic crisis on their performances and those are

summarised in Table 9.

Table 09: Actions taken to Mitigate Impacts of Economic Crisis on Performance Services

Impact of economic crisis	Mitigation Action
Power outages	Using generators. Restricting usage of AC, PL, RC, CH during power outages. Limit operating elevators.
Fuel shortages	Limit operating hours of elevators according to a pre-notified schedule Waste disposal was done. In-house accommodations were provided for staff to avoid travelling issues to maintain a healthy level of in-house employment.
Import restrictions	Parts were directly imported from another country. Local substitutes were used.
Increases in price levels	Increased monthly service charges. A contingency fund was established and utilised.
Gas shortages	Gas line operated according to a pre notified schedule during power outage Half of the cylinders were reserved and half of the cylinders were used

Source: Interviewed Data (2023)

6. Conclusion

The economic crisis has had a major influence on economic growth and development, and it is particularly evident in the housing sector. With the growing urban population in recent years, high-rise residential buildings have become a way to meet the increasing demand for housing. In order to sustain these properties and keep them at a standard level, the performance of these buildings needs to be maintained. Therefore, this study examined the impact of economic crisis on the sustainability of performances in high-rise residential buildings in Colombo urban area. Data was collected from the representatives of management corporations of seven high-rise residential properties located in Colombo and analysed using descriptive analysis, content analysis methods and Campbell's Operating Model Canvas.

The results showed that all the selected buildings were equipped with the required services for expected performances, however, due to power outages, fuel shortages, gas shortages, import restrictions and increases in price levels, various services were affected at different levels. The study findings further revealed that the most challenging impact category of an economic crisis on the sustainability of performance systems of condominium

property was power outage following with fuel shortage and import restrictions. In addition, the researchers were able to highlight many strategies and actions taken to mitigate the impact of economic crisis on performances of high-rise residential buildings. Due to adopting qualitative methods, there can be limitations in generalising the study findings. Further, the study focused only the Colombo urban area and high-rise apartments only. Moreover, this study explored the impact of only power outages, fuel shortages, import restrictions, increases in price levels and gas shortages. The future studies can do an in-depth analysis on the impact of economic crisis for other components in condominiums and also dive deep into the mitigation actions can also be recommended. The authors expect that these findings would be useful for different parties including developers, management corporations, occupants, researchers, etc. to ensure sustainability of performance systems in high-rise residential buildings.

Acknowledgement

Centre for Real Estate Studies (CRES), Department of Estate Management and Valuation, University of Sri Jayewardenepura, Sri Lanka..

Disclosure statement

No potential conflict of interest was reported by the authors.

ORCID

Wickremasinghe, H. T.
https://orcid.org/0000-0003-0591-3477

Dushmila, D.
https://orcid.org/0009-0002-9871-6797

References

Al Jazeera News. (2022). Death sentence': Doctors in Sri Lanka decry medicine shortage. Available at: https://www.aljazeera.com/news/2022/5/23/death-sentence-doctors-in-sri-lanka-decry-medicine-shortage

Ariff, N. R. M. & Davies, H. (2009). Sustainable living environment for urban low-income households in Malaysia: key factors for maintenance. CIBW107 2009: Proceedings of the 2009 International Symposium on Construction in Developing Economies : Commonalities among diversities.

BBC News. (2023). Sri Lanka: Why is the country in an economic crisis?. Available at: https://www.bbc.com/news/world-61028138

Campbell, A. (2017). Andrew Campbell's Operating Model. Available at:

https://lionessmagazine.com/will-this-replace-the-business-model-canvas/

Central Bank of Sri Lanka (2022). Consumer Price Inflation. Available at: https://www.cbsl.gov.lk/en/measures-of-consumer-price-inflation

CNN News. (2022). As Sri Lanka runs out of fuel, doctors and bankers protest 'impossible situation. Available at: https://edition.cnn.com/2022/06/29/asia/sri-lanka-fuel-shortage-impossible-situation-intl-hnk/index.html

Condominium Management Authority. (2023). Retrieved from https://www.condominium.lk/en/condominium-plan.html.

Ellis, H. (2022). They could not save their baby': the human cost of Sri Lanka's fuel crisis. The Guardian. Available at: https://www.theguardian.com/world/2022/may/24/they-could-not-save-their-baby-the-human-cost-of-sri-lanka-fuel-crisis

Hettiarachchi, H. (2015). An Evaluation of the Macro Economic Policies Following by Sri Lanka in the Last Two Decades.

Horner, R. M., El-Haram, M. A. & Munns, A. (1997) Building Maintenance Strategy: A New Management Approach. *International Journal of Quality in Maintenance*, 3, 273-280.

International Monetary Fund (2013). Financial Crises Explanations, Types, and Implications. IMF Working Paper. Available at: https://www.imf.org/en/Publications/WP/Issues/2016/12/31/Financial-Crises-Explanations-Types-and-Implications-40283

Jayesinghe, C. (2022). Sri Lanka will continue to experience more power cuts.

Koutrolikou, P. P. (2015). Governmentalities of Urban Crises in Inner-city Athens, Greece. *Antipode*, 48(1), 172–192.

Mitrea, E. C., Mühlböck, M., & Warmuth, J. (2020). Extreme Pessimists? Expected Socioeconomic Downward Mobility and the Political Attitudes of Young Adults. *Political Behavior.*

Nduhuura, P., Garschagen, M. & Zerga, A. (2021). Impacts of Electricity Outages in Urban Households in Developing Countries: A Case of Accra, Ghana. *Energies*. 14(12).

Prathapasinghe, D., Perera, R. & Ariyawansa, R. G. (2018). Evolution of Condominium Market in Sri Lanka: A Review and Predict. 2nd International Conference on Real Estate Management and Valuation.

Sia, M. K., Yew, V. W. C., Lim, Z. Y. & Dongqing, Y. (2018). Facilities and maintenance services for sustainable high-rise living, *Facilities*, 36(7/8), pp.330-348.

Silva, C. D. (2022). Government revises import curbs selectively.

Sisodia, M. (2022). Crisis-Hit Sri Lanka Now has a Cooking Gas Supply Problem. NDTV News. Available at: https://www.ndtv.com/world-

news/sri-lanka-economic-crisis-crisis-hit-sri-lanka-now-has-a-cooking-gas-supply-problem-2891617

Sri Lanka Sustainable Energy Authority (2017). Sri Lanka Energy Balance 2017: An Analysis of Energy Sector Performance. Available at: https://www.energy.gov.lk/images/energy-balance/energy-balance-2017.pdf

Swinnen, J. F. M. & Herck, K. V. (2009). The impact of the global economic and financial crisis on food security and the agricultural sector of Eastern Europe and Central Asia. Available at: https://www.ilo.org/wcmsp5/groups/public/---europe/---ro-geneva/documents/meetingdocument/wcms_367022.pdf

Yan, C. (2015), “Condos in the suburb: what are the drivers behind the decision to move into suburban condominiums”, Unpublished degree thesis, University of Waterloo.