

# **Perceived Sustainability Disruptions in High-Rise Construction in Malta**

Elisa Marie Gatt

A dissertation submitted in partial fulfilment of the requirements of the Master of Science in Insurance and Risk Management at the University of Malta

September 2023

## **Abstract**

As Malta grapples with land scarcity and increasing population density, the implementation of high-rise buildings emerges as a potential solution to optimise land usage. This thesis undertakes a comprehensive analysis to address the critical issues surrounding the adoption of high-rise buildings in Malta including the need for such buildings, potential sustainability disruptions, and the effective strategies which can be implemented to manage such disruptions. Following an increase in high-rise construction, concerns regarding the impact of such developments have surfaced. This study aims to address the gap of available research on risks and potential disruptions intrinsic to high-rise buildings, tailored to Malta's context, by employing a mixed method approach utilising both primary and secondary data. By using the PRISMA method, a systematic literature review explores existing studies to categorise the risks associated with high-rise construction. Primary data is gathered through interviews to delve into disruptions and risk management practices which are unique to the Maltese sector.

The interviews and literature review findings converge to identify the following subcategories of risk: fire, natural disasters, financial/economic, environmental, social, and health and safety risks. Remarkably, financial/economic risk emerges as the predominant concern across both data sources. The research reveals that while high-rise structures can be sustainable, achieving this goal warrants effective policies to designate appropriate sites and mandate sustainable principles. Significantly, the study uncovers a deficiency in local expertise required to ascertain truly sustainable high-rise buildings.

The research underscores the importance of proactive risk management, aligning high-rise benefits with potential adversities to the environment and community. Moreover, it attempts to identify risks and expertise gaps whilst providing a foundation for policymakers, urban planners, and construction professionals to foster tailored sustainable practices for Malta. This contribution aids towards a more informed approach to high-rise construction, which is conducive to vertical expansion aligning with long-term sustainability.

**Keywords: Risk Management, High-Rise Buildings, Sustainability, Malta**

## **Acknowledgements**

I would like to express my sincere gratitude to my supervisor, Professor Simon Grima, whose consistent guidance and invaluable insights have played a crucial role in shaping the direction of this thesis.

I extend my heartfelt acknowledgements to Ms. Sharon Seychell for her exceptional guidance, as well as to the dedicated lecturers of the faculty who have generously shared their profound knowledge throughout my Masters.

Furthermore, I am deeply thankful to all the individuals who demonstrated an interest in my study and collaborated with me to complete this research. Special recognition is due to the team at GA projects, whose unwavering support has been constant every step of the way.

Last but not least, my deepest thanks go to my family and close friends, especially my parents, whose endless support and encouragement have provided the solid foundation for my academic achievements.

# Table of Contents

<b>Abstract .....</b>	<b>ii</b>
<b>Acknowledgements .....</b>	<b>iii</b>
<b>List of Figures .....</b>	<b>viii</b>
<b>List of Abbreviations.....</b>	<b>ix</b>
<b>List of Appendices.....</b>	<b>x</b>
<b>Chapter 1: Introduction .....</b>	<b>1</b>
<b>1.1 Overview .....</b>	<b>2</b>
<b>1.2 Motivation.....</b>	<b>4</b>
<b>1.3 Statement of the Problem.....</b>	<b>5</b>
<b>1.4 Aim of the Study .....</b>	<b>6</b>
1.4.1 Research Questions.....	6
<b>1.5 Originality of the Study .....</b>	<b>7</b>
<b>1.6 Dissertation Outline .....</b>	<b>8</b>
<b>Chapter 2: Literature Review .....</b>	<b>9</b>
<b>2.0 Chapter Overview .....</b>	<b>10</b>
<b>2.1 Key definitions.....</b>	<b>11</b>
2.1.1 Definition of Risk.....	11
2.1.2 Definition of Risk Management .....	11
2.1.3 FAR Policy Definition of a High-Rise Building .....	11
<b>2.2 Part 1: The High-Rise Construction Industry in Malta .....</b>	<b>12</b>
2.2.1 Introduction .....	12

2.2.2	Definitions .....	13
2.2.3	The FAR Policy .....	15
2.2.4	The Case for High-Rise Buildings in Malta .....	18
2.2.5	The Case Against High-Rise Buildings in Malta .....	19
2.2.6	Risks Associated with High-Rise Buildings in Malta .....	20
2.2.7	Conclusion.....	20
<b>2.3</b>	<b>Part 2: High-rise Construction and Sustainability.....</b>	<b>21</b>
2.3.1	Sustainability .....	21
2.3.2	Sustainable Development .....	23
2.3.3	Greenwashing .....	27
2.3.3	Conclusion.....	27
<b>2.4</b>	<b>Part 3: Risk Management in the High-Rise Construction Industry: A Systematic Review with Meta-Analysis (Guided by the PRISMA Statement Standards) .....</b>	<b>28</b>
2.4.1	Introduction .....	28
2.4.3	Results.....	29
2.4.4:	Presentation of Results via Risk Heat Map .....	42
<b>2.5</b>	<b>Conclusion .....</b>	<b>44</b>
	<b>Chapter 3: Methodology.....</b>	<b>45</b>
<b>3.0</b>	<b>Introduction.....</b>	<b>46</b>
3.0.1	Research Questions .....	46
<b>3.1</b>	<b>Research Strategy and Study Design .....</b>	<b>47</b>
3.1.1	Secondary Data .....	48
3.1.2	Primary Data .....	48
<b>3.3</b>	<b>Sampling Strategy .....</b>	<b>49</b>
3.3.1	Sampling Strategy: Systematic Literature Review.....	49
3.3.2	Sampling strategy: Interviews.....	51

<b>3.4</b>	<b>Data Collection and Analysis .....</b>	<b>53</b>
3.4.1	Collection and Analysis of Secondary Data: Systematic Literature Review .....	53
3.4.2	Collection and Analysis of Primary Data: Interviews.....	54
<b>3.5</b>	<b>Reliability and Validity .....</b>	<b>55</b>
3.5.1	Reliability and Validity: Systematic Literature Review .....	55
3.5.2	Reliability and Validity: Interviews.....	55
<b>3.6</b>	<b>Limitations of the Study .....</b>	<b>56</b>
3.6.1	Limitations of the Study: Systematic Literature Review .....	56
3.6.2	Limitations of the Study: Interviews .....	56
<b>3.7</b>	<b>Ethical Issues and Confidentiality .....</b>	<b>58</b>
<b>3.8</b>	<b>Conclusion .....</b>	<b>58</b>
<b>Chapter 4: Analysis and Results .....</b>		<b>59</b>
<b>4.0</b>	<b>Introduction.....</b>	<b>60</b>
<b>4.1</b>	<b>Identified Themes .....</b>	<b>61</b>
4.2.1	Theme 1 – Policy: Defining of a High-Rise Building.....	62
4.2.2	Theme 2 – Zoning: Balancing Height with Context .....	63
4.2.3	Theme 3 - Interplay of Perspectives on High-Rise Buildings in Malta.....	66
4.2.4	Theme 4 - Drivers and Considerations for High-Rise Development.....	68
4.2.5	Theme 5: Operational Frameworks and Expertise.....	70
4.2.6	Theme 6: Challenges of High-Rise Development in Malta .....	71
4.2.7	Theme 7 - Risks of High-Rise Development in Malta .....	74
4.2	Closure of Findings.....	83
<b>Chapter 5: Discussion, Conclusions and Recommendations .....</b>		<b>84</b>
<b>5.1</b>	<b>Introduction.....</b>	<b>85</b>
<b>5.2</b>	<b>Salient Findings.....</b>	<b>85</b>

5.2.1	Is There a Genuine Need for High-Rise Buildings in Malta? .....	86
5.2.2	What are the Potential Sustainability Disruptions Arising from High-Rise Construction in Malta? 87	
5.2.3	How Can the Identified Risks Stemming from these Sustainability Disruptions be Effectively Managed? .....	88
<b>5.3</b>	<b>Significance of the Study .....</b>	<b>89</b>
<b>5.4</b>	<b>Recommendations for Further Research .....</b>	<b>90</b>
<b>5.5</b>	<b>Limitations of the Study .....</b>	<b>91</b>
<b>5.6</b>	<b>Conclusion .....</b>	<b>92</b>
	<b><i>References.....</i></b>	<b>93</b>
	<b><i>Bibliography.....</i></b>	<b>94</b>
	<b><i>Appendices.....</i></b>	<b>104</b>
	<b>Appendix 1 – Interview Information Letter.....</b>	<b>105</b>
	<b>Appendix 2 – Interview Consent Form.....</b>	<b>107</b>
	<b>Appendix 3 – Interview Schedule .....</b>	<b>109</b>

## List of Figures

Figure 1.1 - Dissertation Outline .....	8
Figure 2.1 - A Perspective on the Subjectivity of the Term 'Tall Building'.....	13
Figure 2.2 - Map Showing the Designated Locations and Committed Sites.....	15
Figure 2.3 - Themes Identified from the Systematic Literature Review.....	29
Figure 2.4 - Risk Heat Map of Identified Risks .....	42
Figure 3.1 - Process Used to Reach Objective.....	47
Figure 3.2 - PRISMA Flow Diagram.....	50
Figure 3.3 - Participant Demographics .....	52
Figure 4.1 - Word Frequency Chart .....	60
Figure 4.1 - Codes by Percentage Cover .....	61
Figure 4.3 - Mind Map Showing Identified Risks .....	74



## List of Abbreviations

<b>Acronym</b>	<b>Meaning</b>
CTBUH	Council of Tall Buildings and Urban Habitat
EEWS	Earthquake Early Monitoring Systems
FAR	Floor Area Ratio
GDP	Gross Domestic Product
ISO	International Organisation for Standardisation
MEPA	Malta Environment and Planning Authority
OHSA	Occupational Health and Safety Authority
PA	Planning Authority
PA System	Public Address System
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
RSMS	Real Time Strong Motion Monitoring System

## List of Appendices

Appendix 1 - Interview Information Letter .....	105
Appendix 2 - Interview Consent Form .....	107
Appendix 3 - Interview Schedule .....	109

# **Chapter 1: Introduction**

## 1.1 Overview

Construction activities are often viewed as an indicator of change within a society (Architects' Council of Europe, 2014). Throughout history, mankind has always perceived tall structures as a symbol of great wealth, power, and prestige. Castles were used by royals; pyramids were used for the resting place of pharaohs and cathedrals were used as places of worship. Tall buildings started to make their mark on skylines in the 19th century in the United States and have since spread to all continents. However, in this modern context, they serve various purposes, such as business centres and places of residence.

In Europe, the case for high-rise buildings is different from that of the United States. This is because objects of historical value, including buildings, are considered symbols of European culture. Thus, there was a fear that high-rise structures might negatively impact the image of these European cities. However, with the passing of time, some European cities have found it necessary to integrate old and new buildings, and in so doing, they recognised that high-rise structures can symbolize economic growth and also offer a way to use land as profitably as possible (Hollister, 2014; Denk, 2007).

In Malta, the Floor Area Ratio (FAR) policy document was first submitted by MEPA in 1990 and has been periodically reviewed, with the latest version submitted in 2014, to serve as a plan for controlling building heights (Ali, 2008). The policy has piqued an interest in the high-rise construction industry in Malta, by providing the requirements for a building to be considered as tall, and outlining areas in Malta which are considered adequate for tall structures.

Since the first high-rise building, Portomaso Tower, was erected in the year 2000, Malta's skyline has been rapidly changing. However, the development of more high-rise buildings has proven to be controversial, with a local newspaper survey in 2023 showing that 53.7% of respondents opposed high-rise developments altogether and 26.7% advocated restricting them to specific areas (Calleja, 2023). Several factors may explain this opposition. Firstly, the public is concerned about the perceived lack of planning in the local construction industry, which has resulted in numerous incidents and overdevelopment in some areas. High-rise buildings impose higher risks compared to smaller

construction projects, and thus, it is understandable that the lack of standards in smaller projects causes concern for the safety of high-rise projects. Additionally, the country has only been developing high-rise buildings for the past 20 years, which may cause fears that there is a lack of knowledge of the risks they may impose, and, additionally, there is insufficient local expertise to effectively manage such risks. The increasing number of approvals, including ones outside the approved sites outlined in the FAR policy, further exacerbates the problem, adversely impacting the reputation of government authorities responsible for approving such sites. Additionally, many view high-rise buildings as eyesores that spoil Malta's historic cityscape, threatening the island's heritage and culture. Despite these challenges, some argue that high-rise buildings are necessary to meet the increasing demand for housing and commercial space driven by population growth, while also providing a solution to the issue of housing affordability in densely populated areas by increasing the housing supply.

Regardless of whether high-rise buildings are the answer to Malta's housing and commercial space requirements, it is crucial to have effective risk management in place. This will help identify potential opportunities, minimize risks for stakeholders, and ensure public safety, ultimately enhancing productivity. By implementing effective risk management practices, stakeholders and the public can have greater confidence in the construction of high-rise buildings and their ability to contribute positively to Malta's development.

## 1.2 Motivation

The motivation behind this thesis was sparked by the author's observation of public opposition to high-rise buildings in Malta (Calleja, 2023). The need for such a study was further made apparent to the author when she attended a local conference where many insurance industry representatives were present, and, during which, an insurance company representative expressed concern that insurance companies were expected to insure high-rise buildings despite a lack of understanding of the risks they face (Anonymous, 2022). This worry, evidenced by the Malta Insurance Association, has been present in the insurance industry for at least a decade, prompting the request for a report on the risks of high-rise buildings in 2009 from a local architecture firm. Unfortunately, this report is not publicly available and appears to only consider possible hazards. Therefore, through this study, the author aims to address this gap in knowledge and provide a more comprehensive understanding of the risks and opportunities associated with high-rise buildings in Malta not only in a way that benefits stakeholders, but also the public at large. The author believes that by addressing this issue, she can provide insight into the potential benefits of high-rise buildings, as well as ways to mitigate the risks associated with them.

### **1.3 Statement of the Problem**

In densely populated states facing problems of land scarcity, building vertically may be a viable solution as it helps maximise the use of available land while potentially reducing urban sprawl in surrounding areas. However, in Malta, high rise buildings have only been developed in the past two decades, which sparks fear that there is not enough local expertise and understanding regarding the effect of these buildings. Furthermore, no studies are available which highlight the risks and sustainability disruptions pertinent to high-rise buildings and the techniques which can be used to manage them. Regardless of this, there has been an increase in high-rise building applications in the past few years.

Recent incidents within the industry in addition to seemingly unplanned changes to the Maltese cityscape, highlight the need for effective risk management measures in order to balance the benefits of high-rise construction with the potential risks and sustainability impacts on the surrounding environment and community. However, to address the lack of risk management systems for high-rise buildings in Malta, a study is needed to identify and analyse the risks related to the high-rise construction industry, as well as the management techniques which can be used to address these risks.

## **1.4 Aim of the Study**

Throughout this study, the author aims to identify the risks of high-rise buildings in Malta in order to provide a comprehensive multidisciplinary approach that considers risks from various fields. The author also aims to gain an understanding of sustainability disruptions caused by such developments in order to identify the tools and techniques which can be used to manage them.

The author notes that there is currently no literature available on this topic, not only within the context of Malta but also for any small state. The study aims to bridge this gap in knowledge. Thus, with this study, the author hopes to contribute to the field, by presenting new knowledge. By doing so, the author hopes to aid policymakers, stakeholders and ultimately, the public, not only locally, but also other small countries or regions facing similar challenges.

### **1.4.1 Research Questions**

In order to achieve the aims presented above, through this research, the author seeks to answer the two following research questions:

1. Is there a genuine need for high-rise buildings in Malta?
2. What are the potential sustainability disruptions arising from high-rise construction in Malta?
3. How can the identified risks stemming from these sustainability disruptions be effectively managed?



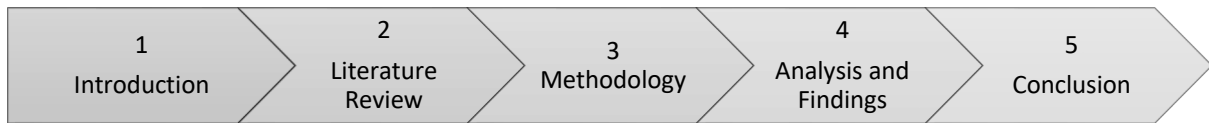
## 1.5 Originality of the Study

Within the context of Malta, studies regarding the risks associated with high-rise buildings are very limited, both in the cases of risk identification and risk management. In 2018, Grech la Rosa (2018) highlighted the fact that stakeholders identified the need for proper risk assessments to be put in place when it comes to high-rise buildings, particularly when it comes to fire risk, however no further research has been conducted with regards to this topic thus yet.

In this unpublished thesis, the author provides an identification of the main risks and sustainability disruptions associated with high-rise buildings in Malta and a further investigation relating to the recognition of methods through which the identified disruptions can be managed, which, as previously stated, has not been researched thus far within the context of the Maltese Islands or any other small states.

Moreover, it is worth noting that many of the existing studies on the topic of high-rise building risks tend to only examine one specific type of risk rather than offering a comprehensive review of all potential risks. Consequently, there are relatively few reports available that stakeholders can use to gain a thorough understanding of the topic. This lack of background information can hinder efforts to effectively manage risks associated with high-rise buildings in Malta.

## 1.6 Dissertation Outline



*Figure 1.1 - Dissertation Outline*

*[Compiled by Author]*

This thesis is split into five chapters as follows: Introduction, Literature Review, Methodology, Analysis and Findings and finally, the Conclusion.

Firstly, the introduction chapter provides the reader with a brief background on the topic. This chapter includes a motivation section, whereby the author identifies the main drivers that led the author to take on this topic, followed by the statement of the problem section which identifies the objectives of the study, and then the research questions are then introduced. Finally, the author discusses the originality of the study by comparing the topic being discussed with the existing studies available. The second chapter contains the literature review, providing the reader both with key definitions related to the study, and a background on the high-rise construction industry in Malta and sustainability in building practices. This chapter also presents a systematic literature review of risk management of high-rise buildings.

Chapter 3 outlines the methodology. This chapter discusses the methodological methods used in the thesis, and reasons for adopting such methods. Furthermore, the author also discusses methods used in the collection of data for analysis, and the reliability and validity of such methods.

Consequently, the author highlights any limitations with regards to data collection resulting from the methodological methods used.

Chapter 4 presents an analysis of the data collected, and highlights any findings identified in the analysis.

The final chapter is the conclusion chapter. This chapter consists of an exhibition of findings and provides the reader with the answers to the research questions.

## **Chapter 2: Literature Review**

## **2.0 Chapter Overview**

In this chapter, the author aims to provide a background on the subject being evaluated in this thesis by reviewing various resources available on the topic. The literature review is divided into three sections. The scope of the first section is to introduce the reader to the high-rise construction industry in Malta. The second section outlines the relationship between high-rise buildings and sustainability. Finally, the third and last section will provide a systematic review of the literature available relating to the risk-management of high-rise buildings by making use of the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analysis) statement.

## **2.1 Key definitions**

### **2.1.1 Definition of Risk**

Risk is defined by the International Organisation for Standardisation (2009) under ISO 31000 as the “*effect of uncertainty on objectives*”.

Risk combines the exposure of an event occurring with the consequences of such an event (Purdy, 2010). The ISO 31000 Standard (2009) postulates that the consequence of risk can be both positive (resulting in opportunities) and negative (resulting in threats).

### **2.1.2 Definition of Risk Management**

Risk management is defined by the ISO31000 Standard (2009) as “*coordinated activities to direct and control an organization with regard to risk*”.

Risk management is, hence, a method of managing risks to reduce the likelihood and impact of the negative event occurring and thus increasing the likelihood of the positive event occurring (Purdy, 2010).

### **2.1.3 FAR Policy Definition of a High-Rise Building**

In Malta, a high-rise building is any building which is higher than 10 floors (not considering additional levels which are below ground level, such as basement and semi-basement) but above street level (MEPA, 2014).

## **2.2 Part 1: The High-Rise Construction Industry in Malta**

### **2.2.1 Introduction**

Construction is very prominent in the Maltese market. As an industry, it directly contributes to about 4.2% of the country's GDP. Furthermore, the construction industry also provides an indirect economic contribution as it gives rise to other industries such as quarrying, tiling, plastering, fixture of doors and windows, plumbing and electricity etc (Briguglio, 2021). In addition to the direct and indirect effects that construction has on the island's GDP, it also creates an income multiplier effect, where a segment of the profits earned are spent again and are thus redistributed into the economy (Briguglio, 2015). However, while the construction industry is important for a country's economy, it is also the industry which causes the largest amount of workplace fatalities, having been the cause of 90% of the workplace fatalities which occurred from 2019 to 2021 (OHSA, 2022). The industry has also been under public scrutiny because of the social and environmental costs it impose on the environment (Klesper, 2022).

In recent years, we have seen an increase in proposals for high-rise buildings on the island, particularly after the establishment of the Planning Authority's FAR Policy, which was named in the MEPA Structure Plan in 1990 to provide a tool used to control building heights (Ali, 2008). Since its emergence, it has been reviewed periodically to adapt to the changes in the industry, with its latest version being published in 2014. This increase in high-rise building proposals may also be a result of a growth in innovation in the industry, which allowed for better structural processes (Mercieca, 2020).

## 2.2.2 Definitions

### 2.2.2.1 Definition of High-Rise Buildings

The term high-rise building is defined by Collins dictionary (2014) as a “modern building which is very tall and has many levels or floors”.

However, words such as ‘tall’ and ‘many’ can present as subjective, and relative to the country one is discussing. There is no universal definition as to what the specifications are for a building to be considered high-rise. Different countries provide us with their independent standards as to what they consider as a high-rise building. This will generally depend on the average height of the existing buildings in that country (Ali, 2008).

The Council of Tall Buildings and Urban Habitat (CTBUH) state that height is relative to context. A 14-story building may not be considered as tall in a city with many high-rise buildings, such as New York, however, the same building in Malta would be higher than the norm, and so may be considered as high-rise (CTBUH, n.d.).

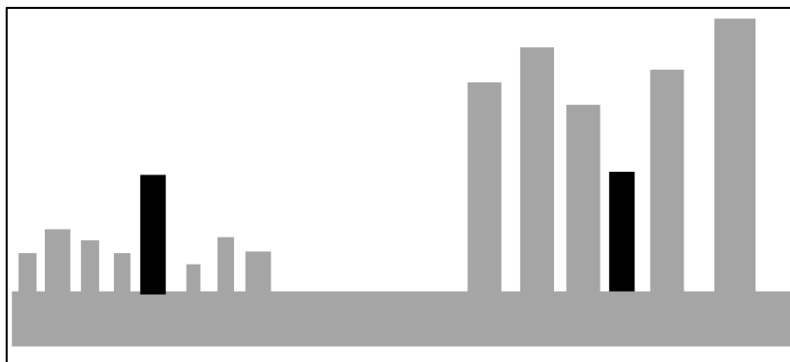


Figure 2.1 - A Perspective on the Subjectivity of the Term 'Tall Building'

[Compiled by Author, Adapted from (CTBUH, n.d.)]

The CTBUH believe that the proper way to define a tall building is not by how tall it is when measured, but if its tallness impacts the project in the building and design phases, day-to-day operation, or urban impact (Ali, 2008). This is illustrated in figure 1.

#### **2.2.2.2 Definition of High-Rise Buildings in Malta**

As previously mentioned, the FAR policy states that “a building is considered tall if it is higher than 10 floors” (not considering additional levels which are below ground level, but above street level, such as basement and semi-basement) (MEPA, 2014). However, in this policy, it was noted that a definition is given on the term ‘tall buildings’, but the document itself also makes use of the term ‘high-rise’ without providing a clear distinction regarding the difference between the two terms.

When taking this definition into account, one may note that it contradicts the definition provided by the CTBUH, as MEPA defines a tall building by the way it is measured.



### 2.2.3 The FAR Policy

The FAR policy also includes location criteria for applications, thus specifying a list of appropriate locations in Malta where one can apply for a high-rise building permit. These locations were determined using various criteria, including land conservation, transport, and urban design effects. Once these criteria were evaluated, locations identified as appropriate for tall buildings were Marsa Park and Gzira employment node (principally for workplace use), the Qawra peninsula and the Paceville and Tinge peninsula (primarily for tourism/leisure use) (MEPA, 2014).

While five out of the ten locations from the list provided in the 2014 FAR policy were not in the list of locations that were deemed appropriate for tall buildings, the sites were considered fit for purpose by MEPA as they fit other criteria. Figure 2 illustrates a map of Malta with the areas considered suitable for high-rise buildings and the committed areas marked.

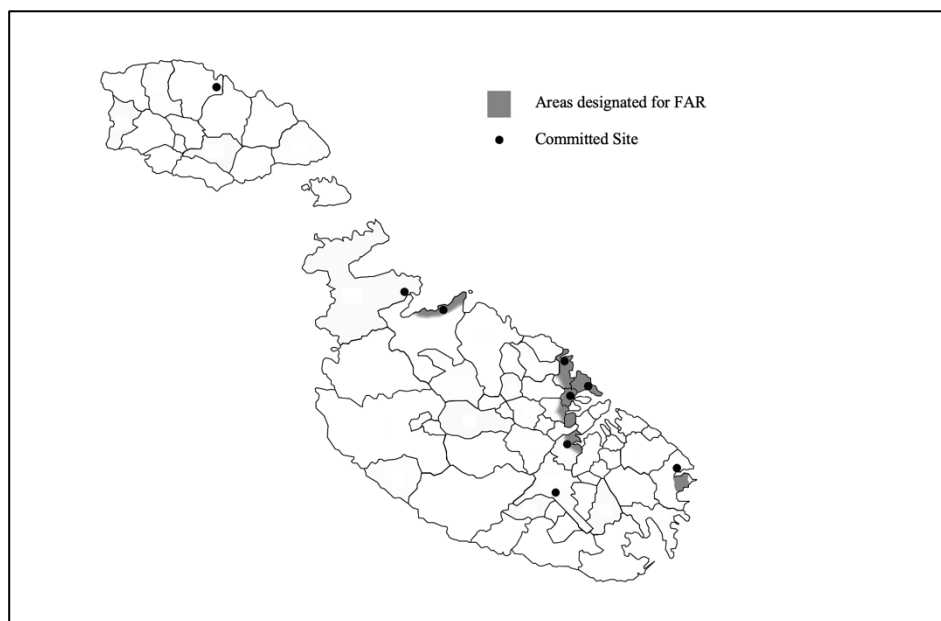


Figure 2.2 - Map Showing the Designated Locations and Committed Sites

[Compiled by Author, Adapted from (MEPA, 2014)]

To provide a better understanding of high-rise buildings in Malta, the author will delve deeper into two specific locations: Paola, where the A3 buildings are located, and Paceville St. Julian's, which includes the Portomaso Tower, Pender Place, and Mercury Tower.

### **2.2.3.1 A3 Towers**

The A3 towers, located in the commercial center of Paola and overlooking the Addolorata cemetery, are three high-rise residential buildings ranging from 10 to 16 floors. These towers were the first of their kind on the island but fall outside the development zone highlighted in FAR. However, MEPA's document does state that the site of the three towers through Albert Town and the Marsa Shipbuilding did provide potential for high-rise buildings (MEPA, 2014).

Originally, the plot of land was not intended for high-rise residential buildings. However, MEPA officers encouraged the developers to employ the FAR policy despite significant opposition from local residents and environmental groups. Once the plans were developed and a Traffic Impact Statement was carried out, the developers applied for permission, which took three years to obtain (Ali, 2008).

The project faced negative public response, with locals feeling that it was out of place in this location and is now considered an "eyesore". Today, the A3 towers are deemed as a symbol of bad planning (Ali, 2008).

### **2.2.3.2 Portomaso Tower, Pender Place and Mercury Tower**

The Portomaso tower is a high-rise building in St. Julian's which is mainly used for office space. Furthermore, Pender place is a mixed-use high-rise building which is used for office use, commercial use, as well as residential use. These buildings are in close vicinity to one another and so both contribute to providing a cluster of dominant features on the skyline (Ali, 2008). While the Planning Authority (PA) states that this will create an opportunity for an iconic destination skyline and an improved image of a business, Dr. Ali states that the two Pender place towers may seem as bulky and short next to the tall Portomaso Tower (Ali, 2008) (MEPA, 2014).

Mercury Tower, a 33-story mixed-use tower, is a more recent addition to the Maltese skyline and was not included in Dr. Ali's study. The tower consists of residences, a hotel, and various public facilities (CTBUH, n.d.). While some people view the tower as a modern hub that preserves the historic value of the Mercury House, others disagree. Furthermore, the fact that this was one of the last projects that Zaha Hadid worked on before she passed away, further adds to the potential historic value of the project (Mercury, n.d.).

A social impact survey conducted during the tower's construction found that only 9% of residents agreed with the project. Interviews conducted during the survey revealed that many respondents harboured a great deal of mistrust and bitterness towards the local construction and building industry. They believed that the project would have negative consequences for the environment, exacerbate traffic and parking congestion in the area, and harm the area's skyline. In contrast, businesses in the area had a positive outlook on the project and believed that it had the potential to boost investment and employment in the area (Formosa & Brown, 2016).

## 2.2.4 The Case for High-Rise Buildings in Malta

Dr. Ali (2008) argues that these buildings may provide Malta with a better image of a progressive nation, and thus will help the country in being a more significant part of the global community. The PA also recognizes this in the Paceville Development Framework by stating that tall buildings give location a clearer and more memorable image by creating a statement (Planning Authority, 2016).

Additionally, building vertically may be used as a tool for mitigating the issues with property scarcity and high property prices, which are escalating due to rising pressures from Malta's rising population density. These structures might also be utilized to relieve pressure on the nation's issue with the pervasive use of automobiles, which would consequently benefit the environment (Ali, 2008).

Ali also argues that, while the economic justification of high-rises in Malta has not been addressed, such structures can still be used to revive neighbourhoods while attracting international investors and confronting globalisation concerns. MEPA also mentions this in the FAR Policy, noting that if these tall buildings are well-designed, they can attract international investment. They do, however warn, that if the structures are poorly constructed, they might degrade local character, causing problems with commercial development.

### **2.2.5 The Case Against High-Rise Buildings in Malta**

In his impressions and observation, Ali also states that commercial and residential high-rises may not be justifiable from an economic point of view as at the time the study was conducted, most of the demand for such buildings was driven from developers. Thus, there are uncertainties regarding the economic implications of high-rise buildings in Malta which need to be assessed.

Furthermore, while high-rise buildings may give the impression that a country is more progressive, if the areas are made of low-rise sites, high-rises may look alien, which gives rise to opposition from the public. We have already seen this opposition from the Maltese public because of their tendency to be protective of the country's heritage, which is understandable, considering the historic character that is found in certain villages in Malta (Ali, 2008).

### **2.2.6 Risks Associated with High-Rise Buildings in Malta**

Grech La Rosa conducted a study in 2018 in which they interviewed several local stakeholders, including architects, developers, members of the government and economists to understand their perception of local tall buildings. When asked if policies should require risk assessments when it comes to large scale projects, all participants agreed that a level of risk assessment is necessary with particular prominence given to fire risks (Grech La Rosa, 2018).

Fire safety provides a greater issue when it comes to high-rise buildings in comparison to other buildings for two reasons. Firstly, due to the higher vertical distances, it imposes an extra difficulty for fire escape and secondly, fire-fighting strategies also become increasingly difficult. Furthermore, due to the complex nature of certain high-rise building designs, different types of tall buildings may require different strategies. To ensure proper fire safety systems in place, consultations with the Malta Police Fire Brigade take place (Muscat, 2009). In the local context, apart from evaluating fire safety, the literature addresses the identification and management of risks associated with the construction of high-rise buildings.

### **2.2.7 Conclusion**

While it is evident that construction has a large impact on the economy of the Maltese islands, the need for high-rise buildings is not clearly justified. However, the need for proper planning and policies in place is justified. We have seen cases of high-rise buildings which are located in development zones considered suitable for tall buildings result in successful projects, such as the Portomaso and Pender Place buildings. However, we have seen other cases which were not as successful, such as the A3 towers, which are considered as a “symbol for bad planning” (Ali, 2008). Overall, high-rise construction in Malta has both economic benefits and environmental concerns, and it is essential to ensure safety measures and environmental sustainability in its implementation.

## **2.3 Part 2: High-rise Construction and Sustainability**

### **2.3.1 Sustainability**

Sustainability refers to our ability to achieve our goals while maintaining and improving the well-being of other individuals, and the planet.

Locally, one of the industries which is often under scrutiny for contributing to unsustainability is the construction industry. However, in order to address this issue, it is crucial to understand the fundamental pillars of sustainability.

#### **2.3.1.1 The Three Pillars of Sustainability**

A common way of defining the term sustainability involves three equal and interconnecting pillars:

- Social
- Economic
- Environmental

While the tripartite description of sustainability as three interconnected pillars is not the only way to define sustainability, it is a widely used framework. In fact, the pillars of sustainability were explicitly incorporated into the formulation of the United Nations Sustainable Development Goals (Purvis, et al., 2019).

### 2.3.1.2 Ecological Approach to Resources

Another sustainable concept is an ecological approach to resources. In literature, a common approach to resource management is the “Rs principle” which can be found in varying forms and with a differing number of R’s, and the most common being “reduce, reuse, recycle”.

In the context of construction and architecture, the 5R principle is a suitable version of this principle. It includes the following steps, listed in the order of most sustainable to least sustainable:

- Refuse
- Reduce
- Repair
- Reuse
- Recycle

The most sustainable approach is to refuse, meaning not to build anything new and make use of the existing buildings available. This is because a building will have no impact if it is never built. Reduce, on the other hand, does have some environmental impact as a building is being built; however, in this case, needs are evaluated, and the minimal option is chosen to reduce environmental impact as much as possible. Repair refers to the refurbishing of buildings that already exist to make them better suited to serve their function. Reuse, on the other hand, refers to reconstructing old buildings to allow them to serve a new function that is now required of them. Finally, recycle, the least sustainable option, is the process of recycling materials from an old building to use in the construction of new buildings (Eklová, 2020).



### **2.3.1.3 Sustainability in Buildings**

Sustainability is ultimately the culmination of the three pillars. However, merging these pillars is not an easy task, particularly in the construction industry. There is a disagreement in literature regarding whether these pillars can reinforce each other or if trade-offs are necessary to achieve sustainability. According to Eklova (2020), a building cannot excel in all pillars simultaneously and must strike a balance between economic, environmental, and social criteria. In construction, these criteria may mutually reinforce each other at times, but at other times may require trade-offs. Therefore, careful consideration must be given during the planning stages to ensure that a balance is achieved among the three pillars.

### **2.3.2 Sustainable Development**

The Brundtland Commission is often credited with popularising the term sustainable development, as the Brundtland Report was the first report to introduce this term into international policy discourse (Johnston, et al., 2007). The report defined sustainable development as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs”.

### **2.3.2.1 Maximizing Sustainable Development with High-Rise Buildings**

One of the most evident contributions of high-rise buildings to sustainability is the providing of a solution to the lack of residential space, caused by population growth, that cities face. This, in turn, contributes to the environmental pillar of sustainability as high-rise buildings can help address the issue of land scarcity in cities (Al-Kodmany, 2022).

In addition to the benefits relating to land scarcity, another environmental benefit is that high-rise buildings in cities concentrate people and services in one city, which, when keeping factors such as population and income constant, results in lower greenhouse gas emissions (Glaeser & Kahn, 2010).

Another significant benefit of high-rise buildings is their ability to combat rising land prices which thus, contributes to the economic and social pillars of sustainability by ensuring affordable housing for citizens (Korotich, 2016). Some authors argue that this is a secondary factor of the contribution of high-rise buildings to the economy and society, stating that high-rise buildings become a symbol of the city which communicates that it is progressive and prestigious to potential investors (Fender, 2015).

Furthermore, another factor contributing to the economic sustainability of high-rise buildings is the fact that high-rise buildings are more profitable as more square meters can be built on smaller land areas, which generates higher profits (Eichner, et al., 2018).

### **2.3.2.2 High-Rise Buildings as a Barrier to Sustainable Development**

As was previously discussed, high-rise buildings have the potential to contribute to sustainable development; however, they can also pose as a barrier towards achieving sustainable development.

Firstly, with respect to the environmental pillar, as well as the economic pillar, while high-rise buildings help with land scarcity, they still contribute to the depletion of other resources, due to the great amount of energy and other resources which are required to build them. Furthermore, these buildings also generate greater amounts of waste at building stages throughout their lifecycle, from the initial building stage to when they are demolished (Ahmada, et al., 2016).

Moreover, studies also suggest that high-rise buildings may have a negative impact on various social factors on individuals who reside in them. However, one should note that there is varying literature around this topic. Gifford (2006) states that while there may be increased rates of violence and crime in these areas, this relationship also depends on the socio-economic factors of the area that the building is located in, in other words, higher-crime rates are only observed in high-rise buildings if they are located in areas with lower socioeconomic status. This could explain why there are disagreements between the different literature on the topic.

### **2.3.2.2 Summary of Relationship Between High-Rise Buildings and Sustainable Development**

Although high-rise buildings provide solutions which can contribute positively towards the three pillars of sustainability, they also present factors which may impede sustainable practices, and thus pose uncertainty as to whether or not, they can be a sustainable building practice. This creates a challenging task of finding a balance whereby high-rise buildings are developed in a way that does not cause harm.

For this harm to be reduced, whilst being cognizant to the environmental and economic pillars, it is argued that buildings must be created in a way that integrate minimum energy and resource consumption during all phases of the building, from when the building is being erected, while the building is in use, up to demolition. Furthermore, in order to enhance the social pillar, the structure should be integrated within society in a way that it provides additional facilities for the community, such as recreational spaces and outside areas (Eichner, et al., 2018).

Unarguably, architects haven been making use of sustainable building designs for a long time, employing passive systems. One should also note however, that in recent years, engineering and scientific methods have been developed in order to incorporate sustainability into the design of high-rise buildings. This shows promise for integrating sustainability and possibly achieving a balance between the benefits and drawbacks of such buildings (Elbajheit, 2012).

### **2.3.3 Greenwashing**

Greenwashing occurs when companies mislead customers about the sustainable practices of a company in general, or the environmental impact of a product or service (Delmas & Cuerel Burbano, 2011).

Al-Kodmany (2022) states that greenwashing is prevalent in the high-rise building industry. Industries tend to say that using new technologies is the solution to making high-rise buildings sustainable, however, making and acquiring this technology is not always sustainable (Mouzon, 2010). For example, Low-E Glass is used in order to make buildings more energy efficient and is thus depicted as a method to make buildings more sustainable, however, this product has wider transportation and environmental implications as it is usually imported from China. Thus, the energy efficiency benefits may be outweighed by the environmental costs of shipping (Al-Kodmany, 2022).

### **2.3.3 Conclusion**

In conclusion, sustainable development is an aspect that the high-rise construction industry should consider. The general understanding of the public is that tall buildings are less sustainable compared to shorter buildings as they use more resources. However, the height of tall buildings can be used to integrate more sustainable building practices (Ahmada, et al., 2016).

High-rise buildings contribute to sustainable development by providing solutions to the lack of residential space, combating rising land prices, and concentrating people and services in one city, which result in lower greenhouse gas emissions. However, high-rise buildings can also pose as a barrier towards achieving sustainable development, particularly in terms of the environment and the economy, which require stakeholders to evaluate these benefits and limitations carefully.

## **2.4 Part 3: Risk Management in the High-Rise Construction Industry: A Systematic Review with Meta-Analysis (Guided by the PRISMA Statement Standards)**

### **2.4.1 Introduction**

On account of how densely populated the island is, land resource has started to become very scarce in Malta, thus resulting in increased demand for housing and rise in the cost of land. Building vertically could be used as a tool to mitigate this risk. However, high-rise buildings bring their own risks to the table and, due to their large-scale nature, risks are significantly increased when compared to low-rise and mid-rise construction projects. These risks can only be minimized when their causes are identified. Thus, to reap the benefits that high-rise buildings can offer without increasing risks substantially, risks need to be identified at the earliest of stages of the project, so that they could be properly mitigated and the probability of them occurring is reduced.

The purpose of this systematic review is to understand risks which have been identified relating to high-rise buildings, and their relevant mitigation techniques in order to serve as a basis for this thesis, which aims to understand risk management for high-rise buildings within the Maltese context. There currently are no studies relating to risk management of high-rise buildings in Malta. Therefore, in this review, the author will be considering literature emerging from various countries.

## 2.4.3 Results

### 2.4.3.1 Introduction

The themes identified from the systematic literature review are shown in the below table:

<b>Theme</b>	<b>Reference</b>
<b>Financial/ Economic Risks</b>	(Perera, et al., 2020), (Raghib, et al., 2021)
<b>Environmental Risks</b>	(Ali & Armstrong, 2008), (Lotfabadi, 2014)
<b>Fire Risks</b>	(Fang, et al., 2012), (Li, et al., 2019), (Sun & Luo, 2014), (Tan & Moinuddin, 2019) (Weissman, et al., 2013)
<b>Social Risks</b>	(Dwijendra, et al., 2021), (Gifford, 2007)
<b>Natural Disaster Risks</b>	(Kim & Lee, 2018), (Kubo, et al., 2011), (Roy, et al., 2021)
<b>Health and Safety Risks</b>	<b>For construction workers</b> (Goh, et al., 2016), (Li, et al., 2018), (Manzoor, et al., 2021), (Putra, et al., 2021)  <b>For residents</b> (Guo, et al., 2022), (Sha, et al., 2021), (Verhaeghe, et al., 2016)
<b>Other / General Risk Assessments</b>	(Gavit, et al., 2019), (Janani & Balkis, 2020), (Katebi & Teymourfar, 2017), (Kim, et al., 2019)

*Figure 2.3 - Themes Identified from the Systematic Literature Review*

*[Compiled by Author]*

### **2.4.3.2 Financial/ Economic Risks**

The two most important risks present in the construction industry are financial and economic risks (Choudhry & Iqbal, 2013). This is partially because of the role that construction plays in the development of a country. We can see this in Malta, when looking at the economic impact that the construction industry has on the country. These risks are even greater when it comes to the high-rise industry, thus highlighting the need for the proper management of these risks in this industry.

In addition to external factors which can affect cost deviations, such as political instability and natural disasters, these risks can also be a result of internal factors which result in cost deviations, as these cost deviations can negatively affect project's cash flow and impede their profitability (Xenidis & Angelides, 2005). In their study based in Egypt in 2021, Raghieb et al. identified the causes and effects of cost deviations in high-rise buildings. The causes were then ranked according to their cost influence whilst, the responsible parties for mitigating such risks were also identified on the influence that these factors have on costs.

These responsible parties are split into owners, consultants, contractors, and miscellaneous. The factor which was ranked the highest in this study overall was inflation, while the factor which ranked second was unexpected fluctuations in material prices, while currency exchange rate changes ranked third. These factors were all grouped with the miscellaneous related causes factors (Raghieb, et al., 2021). While the currency exchange rate factor might not be as applicable to Malta, which uses the euro as its currency in comparison to Egypt, which has its own Egyptian pound, we have already experienced inflation and changes in material prices affecting many construction projects on the island, particularly this past year due to the ongoing Russia-Ukraine War. In an interview held by the Malta Independent, the President of the Malta Developers Association, Mr. Cassar, stated that the cost of steel in Malta had risen by around 30%, and was still increasing, with importers unable to guarantee prices by more than a couple of weeks in advance. In this interview he also stated that there was also a great impact on shipping costs during the Covid-19 crisis. Furthermore, both events resulted in logistical issues, due to delays in shipping. Because of all these factors, Cassar stated that the cost of construction projects on



average has risen by almost 30% since the beginning of the Covid-19 pandemic (Schembri Orland, 2022).

While the three most prominent factors were not the responsibility of the stakeholders of the project, there were still many factors which were identified as falling under the responsibility of the owner, consultants, and contractors.

In relation to the previously mentioned causes, the highest ranked contractor related cause is the inaccurate assessment of market conditions during the planning stages of the project. If these market conditions were assessed properly at initial stages, the previously mentioned risks could be potentially minimised. Furthermore, the most prominent factor relating to owners is scope creep, thus resulting in changes in orders. Scope creep is when the scope of a project is mismanaged, thus resulting in changes in the project of the scope, thereby breaking the initial boundaries of the project (Ajmal, et al., 2022). The most prominent consultant related cause on the other hand, is the inadequate description of the specifications of the project after its procurement (Raghib, et al., 2021). Following the identification of the highest ranked financial/economic risks in a high-rise construction project, one can further appreciate how the aforementioned risks, particularly those which are the responsibility of the owner, contractor and consultant of the project could be mitigated to certain extents if they are identified at the initial stage of the project.

### **2.4.3.3 Environmental Risks**

High-rise buildings consume very large amounts of energy (Ali & Armstrong, 2008). However, their height also provides them great potential when it comes to the use of sustainable energy sources (Lotfabadi, 2014). Population growth has not only been the cause of land scarcity as previously discussed in this chapter, but it also results in an increasing need for energy, which contributes to the increased global environmental concerns. Thus, the opportunity for high-rise buildings to be self-sustainable must be utilized. The advantageous height-of high-rise buildings when it comes to turning climate into energy, could be used as a source of power for the building, allowing it to be “zero energy”, or even creating surplus energy which can be used to power other parts of the city in which it is located (Ali & Armstrong, 2008). Therefore, high-rise buildings have the potential not only to be used as a solution for the increased demand of housing but can also potentially address the environmental concerns that result from an increasing population. This highlights the increasing need for stakeholders to start implementing the use of sustainable energy into the design of high-rise buildings.

Other than the environmental benefits that come with sustainable buildings, financial benefits are also present. While increased costs may be incurred at building stages to make a high-rise building sustainable, these costs will be offset by lower operational costs (Ali & Armstrong, 2006).

Tall buildings which lack the use of sustainable building design already present their own environmental advantages. Firstly, building vertically occupies less land, which has its own environmental benefits. Furthermore, potential saving on material and lower building costs is also present due to economies of scale (Lotfabadi, 2014). However, there are further possible environmental advantages which may be utilized.

The opportunity for buildings to be sustainable is not only present in the design of the building, but also during the construction phases and maintenance practices, such as using sustainable building materials (Ali & Armstrong, 2008). Indeed, multiple sustainable practices can be adopted to accomplish this.

Firstly, we have passive solar gain. Because of the vertical nature of high-rise buildings, they can be used to free up an area which can be used for public amenity sites. Furthermore, their design, and the materials used to build the façade and windows can be used to create paths of sun and ventilation which can positively impact these sites (Ali & Armstrong, 2008).

Consequently, façade technology such as daylighting can be implemented in the design of the building to optimize the building design so that there is an increase in internal light, reducing the need of artificial lighting. Shading devices are another example of façade technology which can also be used to decrease the need for cooling systems as they reduce the indoor temperature of the building (Lotfabadi, 2014; Ali & Armstrong, 2008).

The harvesting of renewable energy is also an important strategy. Solar power can not only be used in passive manners, such as using daylighting as previously discussed, but also through active manners such as, the collection of solar power through photovoltaic panels. Wind energy can also be collected due to the advantageous height of tall buildings, as wind speed increases considerably with height. Furthermore, high-rise buildings can be designed in a manner to funnel wind so that it could be collected without negatively impacting the building's structure (Ali & Armstrong, 2008).

The materials used in the building design can also contribute to the sustainability of the building. Firstly, materials can be used to regulate the temperature of the building and thus reduce the amount of energy needed for heating and cooling, whilst sustainable materials such as recycled steel can be used to also implement more sustainable building practices (Ali & Armstrong, 2008).

#### 2.4.3.4 Fire Risks

Fire risk management is critical because it protects not only people's property but also their lives. When it comes to high-rise buildings, it becomes even more important because of the concentrated population found within them, as many lives could be protected if proper fire risk mitigation systems are implemented.

Li et al. (2019) split the fire protection ability of a high-rise building into three different stages. “*The firefighting ability of the building*”, “*the safe evacuation ability of the building*”, and “*the safety management level of the building*” (Li, et al., 2019, p.6338). However, they do not mention systems which can be implemented to avoid a fire from starting in the first place.

Some types of fires can be completely avoided by employing certain mechanisms at the early design stages of the building. For example, electrical fires can be avoided by installing current-limiting fire protection devices to prevent fires caused by electrical overflow (Sun & Luo, 2014). However, Sun and Lou also give importance to *the safety management level of the building*, by stating that since some amounts of fire risk are imposed by individuals, it is impossible to completely eradicate the possibility of fire hazards occurring.

In their study of human and organizational risks linked to fire risk in high-rise buildings. Tan and Moinuddin (2019) continue to expand further on the effect of human risk, not only as a cause of fires, but also as a cause of insufficient fire evacuation behavior, which increases the risk of fire-related fatalities. They do however state that adequate training could reduce this risk. In the case of some buildings, particularly newly constructed buildings, elevators may be used in fire situations. However, old fire safety codes may cause individuals to believe that elevators cannot be used in all fire cases, increasing the time it takes to escape the building and thus increasing fatalities (Tan & Moinuddin, 2019). Contrarily, if appropriate training is provided, these fatalities could potentially be avoided.

In relation to *the safe evacuation of the building*, Li et al. (2019) state that having adequate systems in place to ensure that people escape the building quickly is important, but once again stress the fact that there can still be adverse effects which are caused by the behavior of the escapees. The design of the building's stairwell can also affect the evacuation process. The stairwell of the building can be considered as the most important emergency access, and its design can have a significant effect on the time it will take for individuals to evacuate the building, not only because of space, since the stairwell has to be used by several floors, and also firefighters, but also bearing in mind, the effect that the design has on visibility due to smoke (Fang, et al., 2012).

*The firefighting ability of the building* is also of utmost importance. This refers to the equipment in the building which may aid in putting out the fire. Various systems can be included. For instance, fire alarm systems can be used to detect the fire and inform people that a fire has started while emergency lights and signs, and PA systems can be used to help individuals when evacuating the building. Moreover, sprinkler systems, fire suppression systems and gas extinguishers can be used to automatically extinguish the fire. Hydrant systems and fire extinguishers on the other hand, can be used by people and fire fighters to further aid in putting out the fire. Finally, smoke extraction systems, and fire shutters can help to stop the fire from spreading (Sun & Luo, 2014). These systems, however, will only be effective if maintenance is carried out when supposed to, this once again shows the effect of human errors on the fire protection ability of buildings (Tan & Moinuddin, 2019).

In a disaster planning study for a plane crash into a high-rise building, Weissman et al. (2013) stress the importance for health care systems to have disaster plans in place in the case of mass burn casualty events. They also postulate that hospitals need to have the adequate resources in place if a fire incident or terrorist event occurs in a densely populated building such as a high-rise building (Weissman, et al., 2013).

#### **2.4.3.7 Social Risks**

Studies have shown that high-rise buildings can possibly have adverse effects on the people living in them. In particular, high-rises can have an unpleasant outcome on one's health, happiness, productivity, and social connections (Dwijendra, et al., 2021).

High-rise buildings can first evoke social issues for their residents because of the element of fear that comes with them. Gilford (2007) identified six fears which people feel in relation to high-rise buildings. The first fear is falling, in particular the fear that themselves, or someone close to them will fall or jump out of the high-rise building. Different studies have presented opposing arguments regarding the contribution of high-rise buildings to suicide. On one hand, the substitution hypothesis states that if an individual wants to commit suicide, they will find a way, regardless of whether or not they have possible means to do so (Daigle, 2005). On the other side, the availability hypothesis argues that suicides that otherwise would not have been committed are brought on by high-rise structures (Clarke & Lester, 2013). The second fear is the fear of fire, specifically the fear of being trapped in the building if a fire breaks out; however, as previously discussed, this risk can be reduced. Thirdly, residents are concerned about the impact of an earthquake on a high-rise building. The fourth fear was evoked following the 9-11 era, this is the fear of an attack on the building. Moreover, high-rise buildings also cause a fear of crime amongst its residents, due to the large amounts of people that one is sharing their common space with. Furthermore, due to the fact that one is sharing their common space with large amounts of people, the final fear reported, is the fear of illness. Communicable illnesses spread quicker in high-rise buildings because of the number of occupants (Gifford, 2007).

Numerous studies have also found that high-rise buildings have a negative impact on the children who live in them. Studies have reported developmental issues in children raised on higher floors, such as slower development of independence skills such as dressing (Oda, et al., 1989). High-rise buildings also have an effect on children's play, which also effects their mental development. In particular, children who live in high-rises are kept indoors more often which may slow down the development of their motor skills (Gifford, 2007). Studies have also identified that children who live in high-rise buildings present more behavioural problems, however Gifford states that these results could have been due to

the fact that high-rise buildings are more often found in areas of a lower socioeconomic status in certain countries. He also states however that these issues could be present due to restrictions which are a result from living in a high-rise building.

The type of dwelling which one resides in may also have an effect on the social relations that one has. Studies show that, high-rise residents have poorer social relationships, both amongst themselves and with outsiders. People who live in high-rise buildings meet more people on a daily basis, but they have fewer friends. Less friendships may lead to social withdrawal, which may result in a loss of community (Gifford, 2007).

#### **2.4.3.5 Natural Disaster Risks**

In a study conducted 20 years ago, architect Denis Camilleri stated that Malta needs to increase its mitigation with regards to buildings and the country could not afford to just wait for a natural disaster to happen (Camilleri, 2003). However, in 2020, through an interview with Prof. Marc Bonello, Times of Malta identified that newer buildings in Malta, especially, high-rise buildings, have started to incorporate the reduction of systemic risk in their designs (Times of Malta, 2022).

Earthquakes are a critical aspect to consider while planning for high-rise buildings with regards to natural disasters. This is because, while the likelihood of an earthquake occurring is low, its impact can be very substantial as it will spread to the surrounding environment.

While the likelihood of an earthquake cannot be reduced, its impact can be reduced by incorporating mitigation systems in the design of the building. In their study, Roy et al. (2021) discuss the functionality of base-isolation devices, which are a popular mitigation technique used to reduce the effect that an earthquake may have on high-rise buildings. They also see the effect that this system may have, not only on earthquake forces, but also against prolonged duration wind forces. They state that while these systems are very effective when it comes to low-rise and mid-rise buildings, their functionality is inversely proportional to the height of a building, thus, the higher a building is, the less effective these systems will be. Nonetheless, these systems can still be considered advantageous to other systems since they do not cause damage to other components of the building. However, while base isolation systems are effective in the reduction of the effects of earthquakes on a building, they have the opposite effect when it comes to long duration winds. Thus, in the case of winds, fixed based buildings are considered to be more effective. Roy et al. (2021) state that high-rise buildings frequently consider earthquakes in their designs, but the effect of wind load is not always considered. This results in buildings being more vulnerable to wind loads. Thus, they recommend that both hazards should be considered in the design of a building (Roy, et al., 2021).



While most studies discuss risk mitigation during the design of the building, Kubo et al. (2011) discuss the application of real time strong motion monitoring systems (RSMS) and earthquake early warning systems (EEWS). The RSMS identifies any vibrations which are occurring at each floor of the building and can thus be used to identify any structural damage which is occurring in real time. Furthermore, the EEWS system is used to predict short term, and long-term ground motions. If these systems are used in a high-rise building and integrated into an emergency response system that alerts people in the building that they need to evacuate, it has the potential to reduce the number of deaths that may occur if a severe earthquake strikes the building. However, for this system to function properly, the following points need to be taken into consideration. Firstly, earthquakes at times may result in power outages, which may affect these systems, and hence, for this to be avoided an uninterruptable power supply system must be used in order to ensure that both systems and the emergency response system will still work if the power in the building goes out (Kubo, et al., 2011). A further point which needs to be considered is one which was mentioned previously with regards to fire risk. This relates to the effect of human risks during evacuation, which may result in an increase in fatalities due to insufficient evacuation behaviour. However, as previously stated, this risk can be mitigated through appropriate training measures (Tan & Moinuddin, 2019).

#### **2.4.3.6 Health and Safety Risks**

High-rise building health and safety can be discussed at two different stages of the building for two different types of stakeholders. The first relates to the health and safety of construction workers during the project's building stages, while the second is concerned with the health and safety of building residents following the completion of the building.

The fact as to whether high-rise buildings are bad for the health of their residents has been a topic of debate for a very long time. Some researchers believe that the high density of residents created in a high-rise building is unhealthy (Gehl, 2010). However, Verhaeghe and his colleagues discovered that studies claiming that high-rise buildings were bad for residents' health did not consider the socioeconomic segregation between high-rise and low-rise buildings. When this factor was considered, it was discovered that there is no difference in self-rated health between residents of high-rise buildings and those of low-rise buildings when socioeconomic demographics are considered (Verhaeghe, et al., 2016). The lack of consideration of socioeconomic factors was also previously discussed in relation to studies which consider the social effects of high-rise buildings (Gifford, 2007).

However, one health related aspect which is identified in many studies is the fact that transmittable diseases spread quicker in high-rise buildings. This has been seen in cases such as the SARS outbreak which occurred in 2003, and with the recent Covid-19 pandemic. In both cases we have seen a quicker spread of these diseases in high-rise buildings due to their high population densities. Ventilation is an important aspect with regards to the airborne transmission of diseases. Sha et al. (2021), in fact, recommend the use of a mechanical ventilation system to increase the ventilation in the building, and thus reduce the risk of transmission. However, they also state that this method does consume high amounts of energy and will thus result in high energy costs (Sha, et al., 2021). On the other hand, Guo et al. (2022) propose a solution which does not result in increase of energy costs. This is by increasing the height of vent pipes to increase ventilation. However, while this method does not consume more energy, it may affect the structural stability of the building (Guo, et al., 2022).

In addition to residents, the site's construction workers are yet another group of stakeholders whose health and safety is put at risk due to high-rise construction projects. Construction accounts for 20% of workplace incidents in Europe. In Malta, however, this figure rises to 90% (OHSA, 2022). High-rise buildings, by nature, will have more workers on site, and there is more room for faults when considering the complexity of the project due to its large nature and need for deep foundations. Thus, it is critical that any potential flaws which may cause a workplace incident, are identified in order to ensure the safety of the workers on site. Workers are not the only individuals who stand to lose if there is an accident on site, the company is also at risk, both directly with respect to costs and fines, and indirectly due to the effect on their reputation (Putra, et al., 2021).

Incidents on high-rise construction sites can take many different forms. Goh et al. (2016) and Li et al. (2018) state that, due to increased height and deeper foundations, a potential hazard of falling objects is identified (Goh, et al., 2016; Li, et al., 2018). In addition, Rubio-Romero et al. (2013) discuss the increased risk of scaffolding complications due to the increased height (Rubio-Romero, et al., 2013). However, Putra et al. (2021) find that unexpected events (such as falling objects) and technical aspects (such as scaffolding installation) are ranked second and third when it comes to the factors that are most likely to cause occupational safety hazards on the construction site. The aspect ranked first was in fact, Human Resources (Putra, et al., 2021). It should be noted, however, that all three studies emphasise the importance of adequate training and site safety management as a risk-mitigation strategy.

Proper site safety management will significantly reduce the possibility of hazardous activities. Goh et al. (2016) recommend the implementation of a system which rewards good behaviour and punishes bad behaviour with regards to sub-contractors, suppliers and also employees relating to safety. Furthermore, the use of photographic and drone technology can be used in order to monitor the project and ensure that safety rules are being adhered to (Manzoor, et al., 2021).

## 2.4.4: Presentation of Results via Risk Heat Map

In this section, a risk heat map is presented, which has been developed by the author to showcase the risks identified from the systematic literature review. The map illustrates the likelihood of each risk materializing and the potential impact it could have.

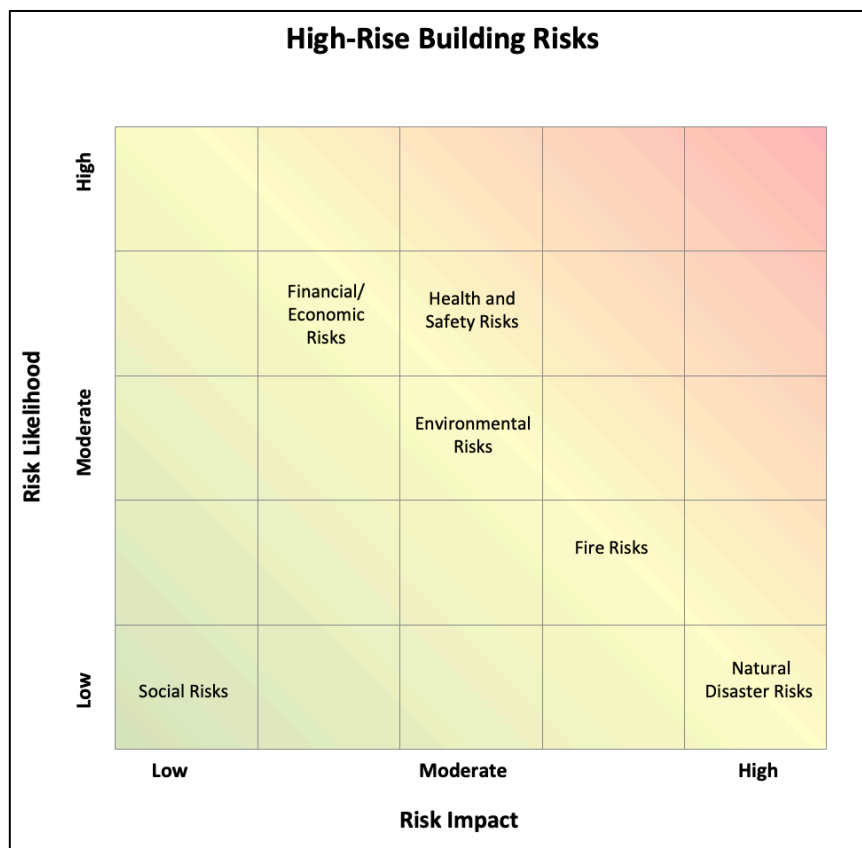


Figure 2.4 - Risk Heat Map of Identified Risks

[Compiled by Author]

Starting off the discussion with the risk with the lowest impact and likelihood, we have **social risks**. The probability of social risks occurring was deemed low, based on research that suggests the impact of high-rise buildings on social risks is contingent on the surrounding area's socioeconomic factors. Additionally, social risks were considered to have a low impact due to conflicting findings in the literature regarding the relationship between high-rise buildings and social risks. Studies that did indicate a negative impact also noted the potential influence of external factors.

**Financial and economic risks** were identified as having a moderate to high likelihood and a low to moderate impact. This likelihood is attributed to the susceptibility of the construction industry to factors such as inflation, which has been observed in recent times. However, the impact of these cost deviations seems to predominantly affect private stakeholders rather than the economy at large. Proper planning by stakeholders can help mitigate the impact of such risks.

**Fire risks** were determined to have a low to moderate likelihood of occurring and a moderate to high impact. This assessment is based on the safety measures in place that make it unlikely for a fire to spread throughout the entire building. However, in the rare event that a fire does spread, the large scale of high-rise buildings can result in significant impact on the surrounding areas. Additionally, the high number of people who may be affected can put a strain on local healthcare systems.

**Health and safety risks** were determined to have a moderate to high likelihood and a moderate impact. The probability of these risks is attributed to a recent trend of cost-cutting in the construction industry, which has resulted in increasing incidents. However, it is essential to acknowledge that better standards and advancing technology can be utilized to improve health and safety in high-rise buildings. The impact of these risks is considered moderate, as they primarily adversely affect employees and stakeholders, and rarely impact the general public.

**Natural disaster risks** were identified as having a high impact, as their effects can be significant and detrimental if they occur. However, these risks also have a low probability of occurring.

High-rise buildings have an **environmental risk** with a moderate likelihood and impact due to their energy consumption. However, sustainable building design and practices can mitigate these risks and provide environmental and financial benefits, including occupying less land, potential savings on materials and building costs, and the use of renewable energy sources.

## **2.5 Conclusion**

In conclusion, this chapter has successfully accomplished its objective of establishing a foundation for the subject being discussed in this thesis. By drawing from a variety of resources, this literature review was able to acquaint the reader with the dynamic landscape of the high-rise construction industry in Malta, discuss the interplay between high-rise building and sustainability, and finally, through the use of the PRISMA statement as a guide, the author was able to introduce risk management into the subject by outlining the categories of risk that exist within the vertical urban context.

## **Chapter 3: Methodology**

## **3.0 Introduction**

In this chapter, the author explains the methodology employed in this dissertation to achieve the objectives set in Chapter 1. To collect the data used to answer the research questions, the author employed a mixed method approach compounding both secondary documentary data as well as primary data obtained through interviews conducted by the author. This chapter provides a detailed overview of the research tools used to collect the data, as well as the methods used to analyse and interpret it. Furthermore, this chapter also details the steps taken to ensure the validity and reliability of the research and concludes by addressing the limitations and ethical considerations of this study.

### **3.0.1 Research Questions**

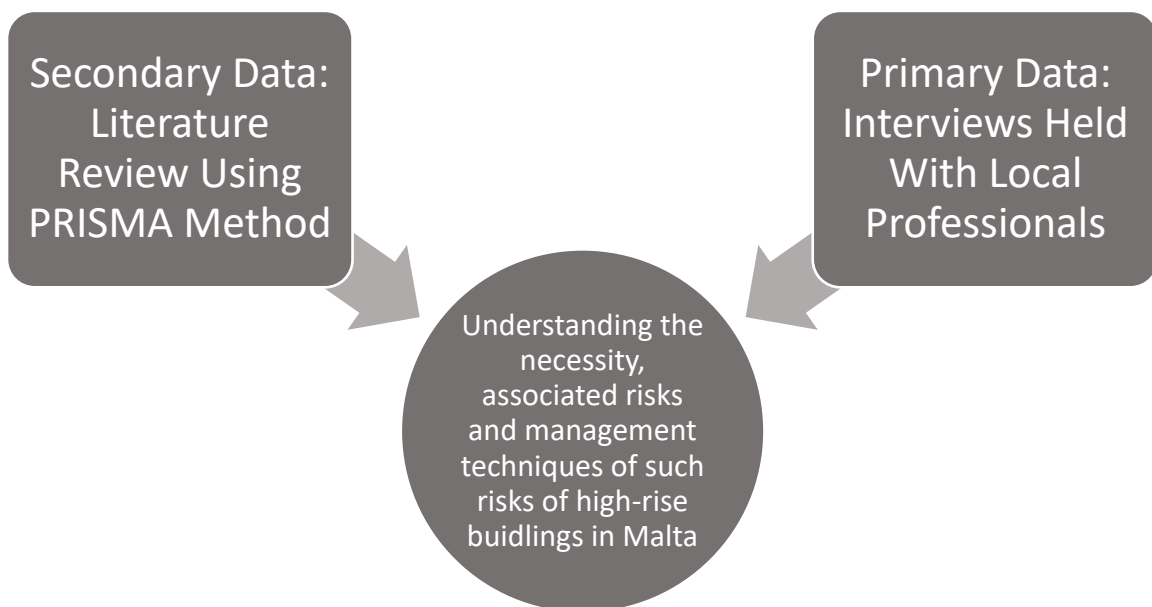
The following are the research questions outlined in Chapter 1, which the author seeks to answer through this research:

1. Is there a genuine need for high-rise buildings in Malta?
2. What are the potential sustainability disruptions arising from high-rise construction in Malta?
3. How can the identified risks stemming from these sustainability disruptions be effectively managed?



### 3.1 Research Strategy and Study Design

The gap in literature available for the local scenario led to the adoption of a mixed-method approach. Secondary data was used to understand risk management of high-rise buildings based on studies which were conducted abroad, while primary data was collected to gain a deeper understanding of the risk management practices in the high-rise building industry within the local sector. Thus, this research strategy aims at providing a comprehensive understanding of the risk management practices in the high-rise building industry in Malta in comparison to those used abroad.



*Figure 3.1 - Process Used to Reach Objective*

*[Compiled by Author]*

### **3.1.1 Secondary Data**

To identify and discuss the key risk themes pertaining to high-rise buildings, written material secondary data will be collected using a systematic literature review. This will be conducted using the PRISMA method, in order to allow the author to ensure that the literature review is conducted in a consistent and transparent way so as to try to diminish bias in the process (Page, et al., 2021). Once the literature review is completed, a risk heat map featuring the risks identified will be created based on the information collected in the literature.

### **3.1.2 Primary Data**

Primary data was collected by the author through structured interviews. Appendix 3 lists the questions asked during the interviews with all participants. Structured interviews allow the author to conduct the same interview with each interviewee, allowing consistency between the different interviews thus reducing bias or inconsistency in the data collected (Saunders, et al., 2007). The purpose of these interviews is to gain a greater understanding of the topic with respect to the local scenario.

### **3.3 Sampling Strategy**

#### **3.3.1 Sampling Strategy: Systematic Literature Review**

This literature review was conducted using the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) search strategy. This statement is used to identify and synthesise all studies which would be relevant to the topic (Page, et al., 2021).

A comprehensive literature search was conducted using the databases ResearchGate, and HyDi, the online library of the University of Malta. These databases were chosen because of their accessibility to the author, and their reputability. A comprehensive literature search was conducted in November 2022, covering literature from 2007 to 2022 (the past 15 years). There was also a language restriction as only publications in English were considered.

The keywords used were: "Risk Management" AND "High-rise". These keywords were applied to the previously mentioned databases and the resulting search lists were uploaded onto the RefWorks software. Using this software, the author was able to use the duplicates finder tool to identify the close matches. Duplicates were removed through a combination of the duplicate finder function on the RefWorks software as well as manual sorting by the author to remove additional duplicates which were not identified by the software.

Following the removal of the duplicates, the author screened the abstracts of the studies, and removed the studies which were not aligned with the aims of this literature review. Additionally, there were studies, which, despite displaying an English abstract, were not in English. As a result, these were still identified by the databases, although a filter was applied to only include studies conducted in English. The author, consequently, manually removed these studies during the screening process. After the initial screening, the author screened the full text to determine which of the articles would be included in this literature review.

The PRISMA flow diagram below (Figure 3.2) presents the process by which the studies were filtered to identify the final set of articles (n = 25) which were used in the systematic review.

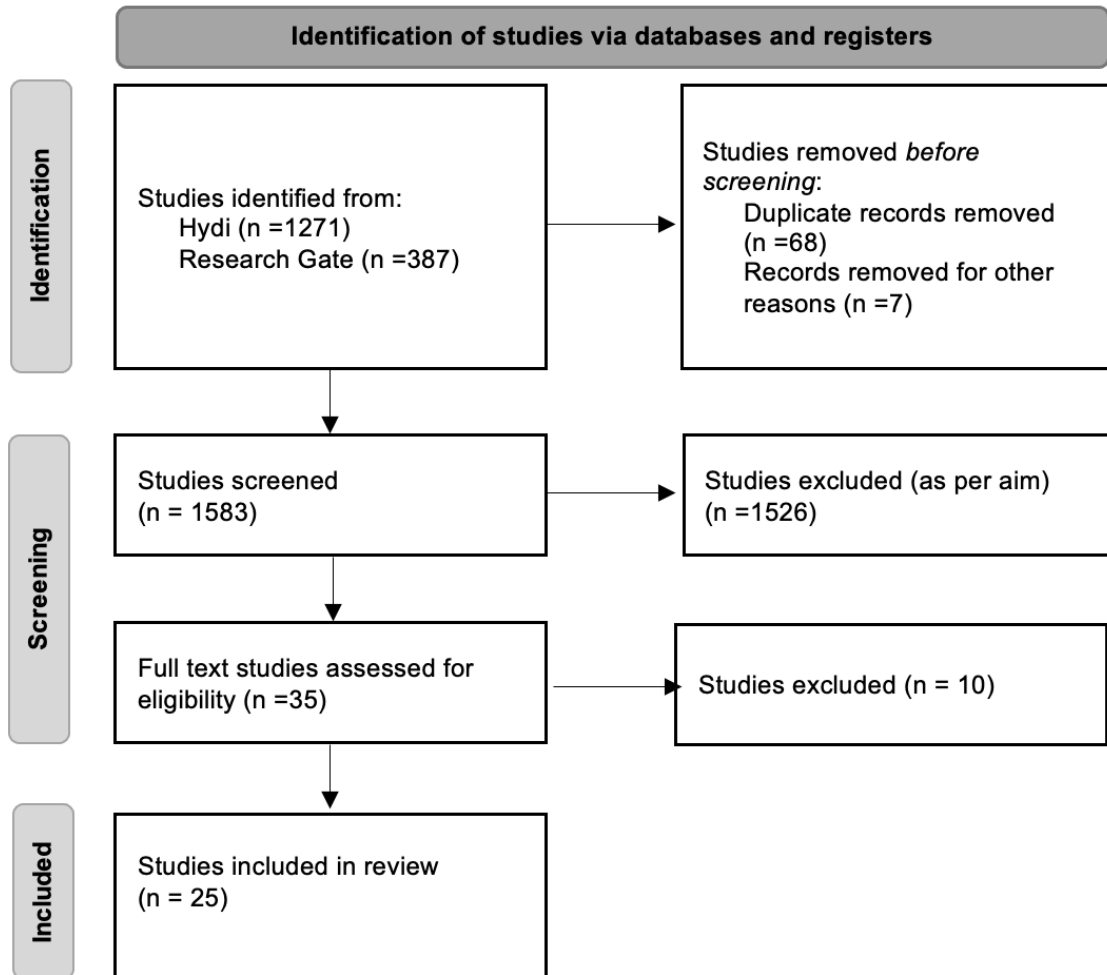


Figure 3.2 - PRISMA Flow Diagram

[Compiled by Author [Source: (Page, et al., 2021)]]

### **3.3.2 Sampling strategy: Interviews**

The author made use of a purposive sampling method in the case of the structured interviews which were held with local industry professionals. Purposive sampling is a non-probability sampling technique that allowed the author to select individuals that would best enable her to reach her objectives, which in this case, was to answer her research questions (Saunders, et al., 2007).

The interviews targeted industry professionals such as architects, engineers, contractors and sustainability experts since they are most knowledgeable of the risks which are presented by high-rise buildings. Appendix 1 shows the information letter sent to potential interviewees. A total number of ten individuals accepted to be interviewed. Interviews were conducted until the saturation level was reached. Saturation refers to the point where the data, in this case the responses of the interviews, start to lean towards repetition instead of offering new directions (Charmaz, 2005). Saturation was reached when there was an evolution in the thematic analysis whereby codes transformed from different viewpoints to recurrent themes as each code identified in the thematic analysis process had been voiced by 3 or more interviewees, and no new themes emerged.

### 3.3.2.1 Participant demographics

The interviews were carried out with a diverse group of ten individuals, each recognized as an expert in their respective field. The sample included two sustainability experts, two engineers, one contractor, and five architects. All participants possessed substantial experience locally and spanned a range of ages.

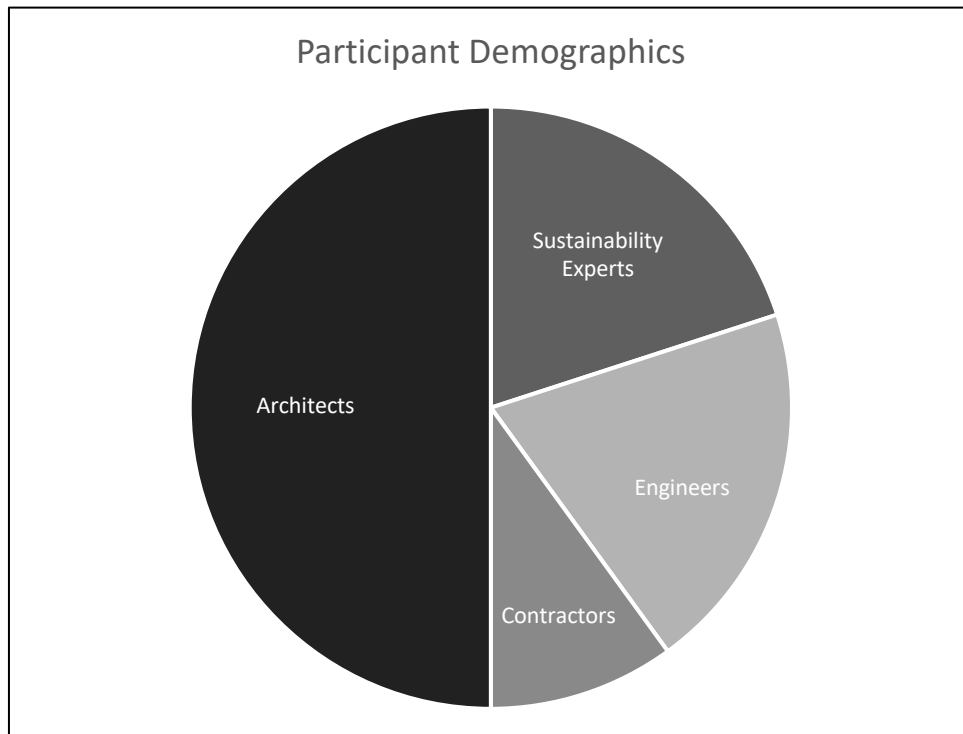


Figure 3.3 - Participant Demographics

[Source: Compiled by Author]

## **3.4 Data Collection and Analysis**

This section discusses and elucidates the methods used to accumulate and analyse the data, for both the systematic literature review and the interviews conducted in this study.

### **3.4.1 Collection and Analysis of Secondary Data: Systematic Literature**

#### **Review**

The objective of the systematic review was to examine existing studies that discuss the risks associated with high-rise buildings and corresponding mitigation strategies, in order to establish a foundation for this thesis. Since no studies were available on risk management for high-rise buildings in Malta, the author explored relevant literature from various countries in this review. By doing so, the author was able to identify the main risks associated with high-rise buildings from a foreign perspective, categorize them, and discuss the main mitigation techniques available. Once the final set of studies was identified, they were grouped according to their common themes.

### **3.4.2 Collection and Analysis of Primary Data: Interviews**

For these interviews, various participants who are stakeholders in the construction industry were recruited.

If consent was given by the interviewees, interviews were recorded so they could be transcribed before analysis could take place. Appendix 2 shows the consent form which was sent to the interviewees before the interview was conducted. Thematic analysis was used in order to analyse and interpret the data as it allowed the author to identify themes within the data, thereby allowing her to answer the research questions of this study.

The author used thematic analysis suggested by Braun and Clarke (2006) to analyse the data obtained from the interviews. To ensure a structured approach to the thematic analysis, the author employed the 6-phase technique developed by Braun and Clarke (2006). The author also enhanced the technique by making use of the NVivo software in order to code and analyse the interview transcripts.

In the first phase of the technique, the author familiarized herself with the data by transcribing it herself and re-reading this data to identify emergent additional themes. This approach enabled her to gain a comprehensive understanding of the data as she was already familiar with it from being the interviewer. In the second phase, the author coded the data by organizing it into different groups known as 'codes', making use of the coding tool offered by NVivo. In the third phase, the author searched for themes by collating the codes identified in phase 2 and utilized NVivo by conducting searches and creating charts and diagrams based on the dataset, which allowed her to conduct a comprehensive analysis of the data. Once the initial themes were identified, in phase 4, the author reviewed them in order to generate a thematic map of the data. This allowed her to break down any themes that may not have been relevant and to ensure that all important themes were captured. In phase 5, the author defined and named the identified themes. In the final phase, phase 6, the author produced the report from the final set of themes (Braun & Clarke, 2006). Overall, this structured approach to thematic analysis allowed the author to systematically analyse the data and identify key themes that were relevant to the research objective.



## **3.5 Reliability and Validity**

### **3.5.1 Reliability and Validity: Systematic Literature Review**

Brown (2006) identified reliability and validity as two key determinants of the success of a systematic literature review. Reliability relates to the reproducibility of the study. Thus, for a study to be considered as reliable, it should be prepared in a transparent way so that the study could be replicated by others. In order to achieve this transparency, the author made use of the PRISMA statement which allowed her to document how the studies were chosen and limit subjectivity and bias (Page, et al., 2021). Furthermore, validity refers to the degree to which the review process was conducted appropriately (Brown, 2006). Once again, the use of the PRISMA method allowed the author to ensure validity, as it is a reputable and standardised way for conducting systematic literature reviews.

### **3.5.2 Reliability and Validity: Interviews**

In order to limit potential bias, the author made use of structured interviews. Structured interviews allowed the author to conduct the same interview, with the same context with each stakeholder, to reduce the margin of error. Moreover, to further reduce the margin of error, interviews were recorded (if consent was given by the interviewees) and transcribed before analysis took place.

## **3.6 Limitations of the Study**

### **3.6.1 Limitations of the Study: Systematic Literature Review**

Systematic reviews can be subject to selection bias when the author is selecting the studies to be utilised for the literature review (Owens, 2021). Selection bias occurs when there is a systematic difference between the studies included and excluded in the review, which may lead to an unrepresentative sample. In order to reduce this bias, the author conducted a comprehensive search by considering two different databases, as well as establishing and documenting eligibility criteria prior to conducting the review, aiming to ensure a representative sample.

### **3.6.2 Limitations of the Study: Interviews**

In general, interviews as a data collection technique have their own limitations. With respect to the interviewees, Hammersley and Gomm (2008) suggest that interviewees will only disclose what they are willing to share about their perceptions, which may be different from their real-life perceptions. In order to address this possible limitation, the author has maintained the confidentiality of the interviewees throughout the study, in order to create a comfortable environment for them to express their genuine opinions.

On the other hand, interviews also present limitations associated with the interviewer. Brown (2001) states that interviews have a greater potential for subconscious bias. To mitigate this potential bias, the author followed a list of structured questions, in the same order for each interviewee to maintain consistency throughout all the interviews.

Brown (2001) also states that interviews have a greater potential for inconsistencies, and in order to reduce these inconsistencies, the author recorded the interviews (when consent was given by the interviewees) and transcribed these recordings carefully before analysis could take place.

Limitations were also present due to the open-ended nature of the research questions. Creswell (2007) states that coding for open-ended interviewing may be difficult to conduct. In order to reduce difficulty in coding, the author has kept interview questions clear and concise. Furthermore, in order to ensure that the coding process runs smoothly, the author has made use of the 6-phase theoretical analysis technique developed by Braun and Clarke (2006). Since purposive sampling is based on the judgment of the author, it is highly prone to researcher bias (Sharma, 2017). In order to address this bias and thus address potential limitations, the author contacted professionals from different age groups, genders and industry domains in order to gather a representative sample.

The interview sample encompassed a diverse group of experts, comprising of engineers, architects, sustainability experts and a contractor. However, it is essential to acknowledge the limitations that stem from the composition of this sample. Despite efforts to present a balanced representation, the majority of interviews were conducted with architects, and only one contractor agreed to participate. This discrepancy might influence the overall perspective presented in the findings, as the insights from the contractor could be limited in comparison to those of the architects. Nevertheless, it is worth noting that the participating architects spanned various age groups, ensuring a broader range of experiences and perspectives. Furthermore, the sample demonstrated a mix of male and female respondents. While the sample's limitations should be considered, the diverse nature of the architects interviewed contribute positively to the overall validity and reliability of the study's findings.

### **3.7 Ethical Issues and Confidentiality**

Throughout the process of collecting data, the author did not encounter any ethical issues. Regarding the interviews, the author took great care to ensure that the anonymity and confidentiality of the participants were preserved, and no attempt was made to deceive them. Respondents had the right to terminate the session at any point if they wished to do so.

The data collection process was conducted with complete transparency, and all information collected was solely used for the purpose of the dissertation, with the utmost respect for ethical guidelines.

### **3.8 Conclusion**

This chapter defined the methodologies used in order to answer the research questions identified in Chapter 1. Explanations were given as to how data was collected and analysed. This chapter also highlighted any strengths, limitations and ethical considerations which were taken into consideration in this study.

## **Chapter 4: Analysis and Results**



## 4.1 Identified Themes

Using NVivo, the author was able to conduct a comprehensive analysis of the interviewee responses which led to the formulation of 15 main codes. Notably, the interviewee’s responses echoed the risks identified in the systematic literature review. Among these identified risks, financial/economic risks emerged as the most salient as it was mentioned by the majority of the interviewees. This critical risk was also identified by the author as being the highest risk through the risk heat map created based on the systemic literature review. Furthermore, the discussions held by the interviewees predominantly focused on the adverse facets associated with high-rise buildings. However, the interviewees also addressed areas where such buildings possess the potential to yield positive effects with the help of risk assessments, specialized expertise, and well-defined policies.

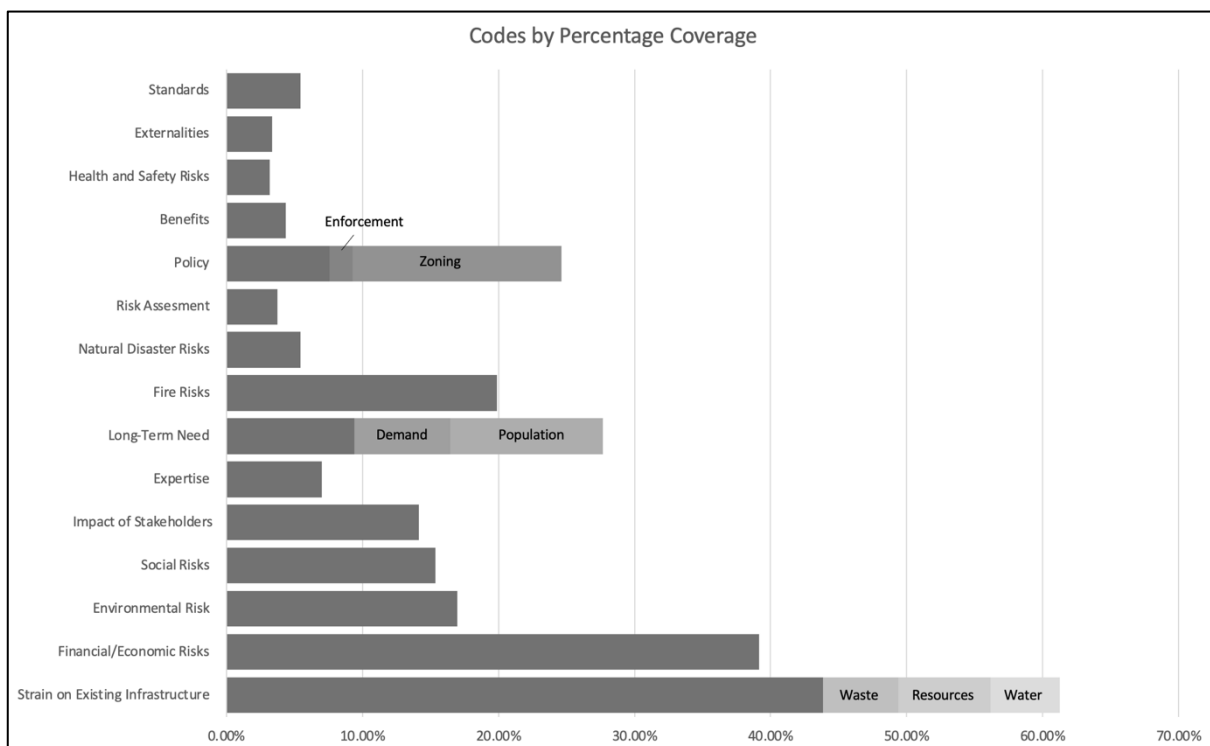


Figure 4.1 - Codes by Percentage Cover

[Source: Compiled by Author Using NVivo]

#### **4.2.1 Theme 1 – Policy: Defining of a High-Rise Building**

The definition of high-rise buildings emerged as a theme in the interviews as three of the interviewees, all of which were architects, raised the subject of defining such buildings. Two of the interviewees referred to the definition presented by the local FAR policy, which, as previously discussed, outlines certain criteria for classifying tall buildings, as well as determining the zones where such buildings can be located. While one of the interviewees simply referred to the policy, another stated that the policy itself can lead to risks due to its ambiguity and its challenges in determining permissible height, design, form, and materiality for high-rise structures. The policy's lack of clarity can lead to inconsistencies in planning and development decisions, potentially resulting in sporadic and out-of-context high-rise development, emanating into overshadowing development, inconsistent skyline aesthetics, and insufficient public spaces. The third interviewee however, characterised these buildings by their height and density in comparison to the buildings which surround them, which is in line with the definition set out by the CTBUH, as discussed in Chapter 2 of this dissertation.

Interestingly, all these individuals who mentioned the definition of high-rise buildings in their interviews, as well as others, advocated for a more organised and comprehensive policy framework for regulating and defining high-rise development. They also propose borrowing expertise from beyond the local context and enforcing the policy effectively. Their emphasis on balancing height with context, aligns with the idea that a structured policy framework can help integrate high-rise buildings harmoniously into the urban landscape.



## **4.2.2 Theme 2 – Zoning: Balancing Height with Context**

Overall, the interviews suggest that zoning is an important tool for managing potential risks associated with high-rise buildings and ensuring that they are constructed in appropriate areas. Many interviewees were not opposed to high-rise buildings provided there was adequate zoning for such structures.

### **4.2.2.1 Theme 2a - Uncertainty and Risks of Inadequate Zoning Policies**

As discussed in the previous theme, the FAR policy tends to lack clear guidance as while the document identifies adequate zones for high-rise buildings, in the past, contractors have been permitted to build high-rise developments outside of such zones. Additionally, the policy contains equivocal language that allows government decisions to override planning authority decisions. This ambivalence allows for diverse interpretation thus creating uncertainty and arbitrariness in high-rise development. Multiple interviewees discussed the perceived risk of abuse of this system within the current policy framework. This risk arises due to the lack of clear regulations, which could lead to haphazard and contextually inappropriate high-rise development.

#### **4.2.2.2 Theme 2b - Zoning for Compatibility**

Not only did interviewees state that the zoning polices should be effective, but that they should also be constructed in a way to ensure compatibility between high-rise buildings and their surroundings. One interviewee compared this concept to placing a pig farm in a residential area, to highlight obvious mismatches in function and impact. Concerns were raised about overshadowing, inadequate buffering, abrupt changes in the skyline and deviating from the traditional building style of the area. Many interviewees advocated for maintaining consistent heights within streetscapes to avoid chaotic and unsightly variations. This uniformity is believed to enhance visual harmony and create a more pleasing and organized urban environment. Similarly, the interviewees suggested that certain areas may be designated for high-rises while others are unsuitable, not only due to aesthetic impacts, but also due to factors such as wind patterns, shading effects, and urban space coverage.

#### **4.2.2.3 Theme 2c - Sustainable Urban Integration and Community Wellbeing**

The importance of safeguarding cultural and heritage values from the potential impact of high-rise development was a prominent theme elicited from the interviews. Multiple interviewees also suggested that the use of high-rises may allow us to retain green and unbuilt areas with the idea that concentrating high-rises in specific zones could potentially prevent further encroachment into natural landscapes and outside development zones, which otherwise would have to be developed due to the rising population.

Many interviewees also mentioned the public unease of such buildings. An adequate zoning policy would prevent sudden surprises, thereby reducing public apprehension and concerns about future developments. One interviewee suggested that zoning could not only alleviate these fears but ensure that decisions do not entirely rest on architects' capabilities to foresee every consequence.

Interviewees also highlighted the need for an integrated approach when designing high-rises. The design process should involve a detailed study of the neighboring urban fabric to ensure that new high-rises contribute positively to the existing environment. Additionally, experts mentioned the possibility of elevating the ground floor of a building to introduce mixed-use public spaces to balance the potential loss of public openness due to the large footprint of the building.

### **4.2.3 Theme 3 - Interplay of Perspectives on High-Rise Buildings in Malta**

When analyzing the interviews, it became evident that while the perspectives of different experts vary, there are overarching themes on the discourse of high-rise buildings in Malta. In the complex landscape of high-rise development, the attitudes of different stakeholders, regulatory dynamics and public perceptions are intertwined. This theme underscores the need for holistic approaches to address these issues.

#### **4.2.3.1 Theme 3a - Stakeholder Attitudes**

The interviews highlight the pivotal role of stakeholders, such as policymakers and authorities in managing high-rise buildings and their risks. While some interviewees suggest that risks can be managed if those leading are willing to commit, others indicated skepticism about whether leadership truly wants to invest in risk management. These perspectives show the complexity of aligning the interests of diverse stakeholders in order to implement effective strategies.

The concept of "cowboy contractors" emerges as a shared concern among interviewees. This reflects the perception that there are contractors who prioritize cost-cutting over proper construction practices hence potentially compromising structural integrity. These shared concerns emphasize the importance of not only stringent policies, but also quality control measures to ensure long-term safety. These factors point to a potential need for more concerted efforts to ensure coherence between risk management and cost considerations.

#### **4.2.3.2 Theme 3b - Perception of Regulatory Changes**

This sub-theme delves into the economic and social dynamics influencing high-rise development. It emphasizes the role of politics, lobbying, and personal connections in shaping legislation and building regulations. Both the interviews, as well as the systematic literature review seem to allude to the need for changes stemming from policymakers. Interviewees also brought up the fact that locally, personal connections within the regulatory landscape can potentially affect how policies are formulated and executed.

Different interviewees shed light on the impact of regulatory changes on high-rise development. One interviewee discussed the cyclical evolution of regulations, raising concerns about the continuous changes in legislation due to political shifts, which contribute to a climate of uncertainty in the construction sector. This highlights that while regulations need to change, there also needs to be a balance between the need for change and regulatory consistency to ensure stability for the industry.

#### **4.2.3.3 Theme 3c - Architectural Identity and Aesthetic Harmony**

Many interviewees brought up the potential visual impacts of high-rises on Malta's skyline and heritage. The shared concern over architectural dissonance highlights a common thread in public perception shaped by the perceived incongruity of high-rises within Malta's cultural context.

As previously stated, across the interviews conducted, there was a consensus for the need for adequate zoning regulations to ensure urban harmony and mitigate concerns about haphazard developments.

## **4.2.4 Theme 4 - Drivers and Considerations for High-Rise Development**

Malta's landscape has been experiencing a transformation in certain areas due to the emergence of high-rise buildings. While these vertical structures serve as symbols of contemporary urban progress, it is essential to delve deeper into the motivations driving this vertical expansion. By doing so, the author aims to unravel the functional and practical factors that contribute to the increase of high-rise buildings.

### **4.2.4.1 Theme 4a - Demand for High-Rise Buildings: Population Dynamics and Increasing Urbanization**

The question as to whether there is a demand for high-rise buildings was brought up in a few interviews. Presently, high-rise construction responds to demand for office spaces and premium residential units, as opposed to directly addressing the housing needs of the general populace. However, this does have an indirect effect as individuals looking for premium residences are replacing large villas which take up more space, and similarly, offices in high-rises may be freeing up space elsewhere. It was mentioned by another interviewee that this narrative is not particular to Malta. Experiences from Europe underline that high-rise buildings may not be sustainable in the long run due to shifting preferences which emphasises the link between demand and enduring sustainability of high-rise buildings. This relates both to the physical sustainability of the building, and to its viability in meeting the long-term needs of the population.

### **4.2.4.2 Theme 4b - Long-Term Objectives of High-Rise Buildings**

The debate surrounding the long-term objectives of high-rise buildings identifies a lack of consensus amongst the interviewees. While some discuss the potential benefits of urban sprawl and space utilisation, others show scepticism regarding the sustainability of this approach amidst population growth. This theme highlights the need for a more cohesive and forward-looking strategy that not only considers immediate gains, but also the future consequences of such buildings.

#### **4.2.4.3 Theme 4c - Property Market Dynamics**

Three interviewees brought up the property marketing in their discussion. The property market is an integral element that shapes the narrative of high-rise buildings as the valuation of such properties is directly impacted by the market at the time. One interviewee cautioned against solely relying on historical trends to predict the prospects of such buildings. This was further highlighted by another interviewee, who accentuated the potential consequences of market crashes and their impact on property values.

Affordability also emerged as a critical concern. One interviewee questioned the affordability of living spaces in high-rise developments, pointing to a broader issue of ensuring that real estate remains accessible to various segments of the population, rather than catering to high-end investors. This interviewee also brought up the role of government policies in shaping the property market, making a comparison to a practice in the UK where developers are required to include affordable housing in their large developments. This introduces the idea that intervention from policymakers can help mitigate a housing crisis and promote more equitable property development.

#### **4.2.4.4 Theme 4d - Sustainability and Future Prospects**

Sustainability was a recurring concern across interviewees, encompassing both environmental and economic dimensions. Some interviewees discussed the potential sustainability benefits of such buildings, mainly, efficient land use and reduced carbon footprints which can only transpire if such buildings are thoughtfully designed. Doubts however persisted regarding the long-term feasibility and viability of such a model.

## **4.2.5 Theme 5 - Operational Frameworks and Expertise**

The interviews shed light on some of the challenges associated with high-rise development in Malta. Interviewees highlighted the importance of well-defined policies, specialised expertise, and thorough risk assessments in order to ensure that there is a good foundation for effective decision making and risk management in this sector.

### **4.2.5.1 Theme 5a - Policy Frameworks and Regulatory Approaches**

As previously discussed, the interviews revealed a consistent concern regarding the inadequacy of the existing policy framework governing high-rise development in Malta in respect to zoning, risk management and particularly towards the socio-economic aspects of such buildings. Interviewees also highlight the need for effective implementation of frameworks already existent in relation to building practices.

### **4.2.5.2 Theme 5b - Expertise: International Insights and Local Capabilities**

The consensus among several interviewees is that high-rise development requires specialised expertise that Malta currently lacks. Many mentioned the need for foreign expertise due to the novelty of such buildings. Not only was it mentioned that foreign expertise may be needed during design stages, but also during the feasibility stage, as foreign experts can impact the financial aspects of the project by providing insight of the challenges in terms of cost implications.

### **4.2.4.3 Theme 5c - Risk Assessments and Mitigation**

A central concern raised by interviewees relates to the adequacy of risk assessments, not only when it comes to the technical aspects during building stages, but also when it comes to planning aspects. Reference was also made to geological studies and the role of advanced technologies which can be used in testing phases in order to reduce potential hazards.



## **4.2.6 Theme 6 - Challenges of High-Rise Development in Malta**

Many interviewees voiced their concerns related to high-rise development in Malta. Many of these concerns were interconnected, reflecting a need for comprehensive planning that not only considers the architectural aspects, but also impacts on infrastructure and resources. Sustainable and well-integrated design approaches are necessary to mitigate these challenges in order to ensure that high-rise development contributes positively to our local environment.

### **4.2.6.1 Theme 6a - Strain on Existing Infrastructure**

The interviewees consistently emphasised the strain on existing infrastructure caused by high-rise development. In general, the risk of inadequate infrastructure can pose risks to safety and functionality of areas which house such buildings.

#### *Theme 6ai - Strain on Existing Infrastructure: Congestion and Overcrowding*

Several interviewees expressed concerns about the strain caused by increased congestion and overcrowding resulting from high-rise developments. Multiple interviewees discussed the effect of such developments on traffic congestion. The possibility of these developments overloading local transportation infrastructure during building stages was discussed. Interestingly, one interviewee offered a counterpoint by suggesting that high-rise developments, when well-planned, could have a positive impact on infrastructure during the building phase. If one had to compare one high-rise development, with 10 individual developments in the same area, they would find that the clustering of the tower cranes and other construction activity for high-rises may have a concentrated, localised positive effect on infrastructure.

One interviewee also cautioned that such developments not only have such an adverse effect during building stages, but also after the project is completed as they may contribute to the issue of space constraints and thus worsen congestion.

*Theme 6aii - Strain on Existing Infrastructure: Capacity and Access*

Interviewees highlighted concerns about inadequate roads and parking facilities to support the large influx of people attracted by these high-rise developments. This can also have an effect on emergency facilities trying to make their way to such areas.

*Theme 6aiii - Strain on Existing Infrastructure: Community Interaction and Liveability*

One interviewee discussed the impacts of overcrowding, particularly, its negative social and economic impacts such as increased crime rates. Another interviewee further raised concerns about the impact of such buildings on people's health and well-being due to overshadowing and reduced sunlight.

*Theme 6aiv - Strain on Existing Infrastructure: Water*

Many responses highlighted a persistent concern about the strain on water infrastructure caused by development. Increased demand is perceived to increase challenges in maintaining an adequate water supply. The discussion further delves into the risks associated with high-rise building operation, such as water ingress that could inflict structural damage and subsequently amplify the pressure on water management systems. Furthermore, the notion of sustainability was also brought up when discussing water resource management, as interviewees underlined the significance of passive design in curbing water demand, utilizing natural resources like rainwater for non-potable uses.

*Theme 6av - Strain on Existing Infrastructure: Waste*

The strain on waste infrastructure was also brought up in a number of interviews. Across the interviews, a common thread emerges concerning the environmental repercussions of resource-intensive construction practices. While some pointed out the heightened resource consumption, and subsequent waste generation of such buildings, others (particularly the sustainability experts), underlined the need to move beyond surface level 'green' solutions, stating that we need to consider our demands and needs, before attempting to find a solution, in order to find a harmonious integration between existing infrastructure and new developments.

#### **4.2.6.2 Theme 6b - Limited Resources**

Interviewees pointed out that high-rise buildings tend to escalate resource consumption, such as concrete, steel and water. The fact that locally we have limited resources contributes to the sustainability challenges posed by high-rise development. Materials such as steel often need to be imported, which can undermine sustainability efforts. Furthermore, the high-grade concrete used in these developments requires sustainable energy for production, making it not only less sustainable, but concurrently adding to the energy demand and the strain on Malta's energy sources, mainly the interconnector. The point was made that increased demand from high-rises could necessitate the exploration of alternative energy sources, preferably renewable, to avoid reliance on fossil fuels.

#### **4.2.6.3 Theme 6c - Externalities and Pricing-in Impact**

One of the interviewees introduced the concept of pricing in externalities such as solar rights, community amenities, and importantly, water, drainage, and electricity systems. This perspective suggests that developers should account for the impact that their high-rise buildings have on surrounding communities and infrastructures, to help in managing the potential burden on resources.

#### 4.2.7 Theme 7 - Risks of High-Rise Development in Malta

Interestingly, all the sub-categories of risk which were identified in Chapter 2 of this thesis were brought up in the interviews. However, while some were described in a way which was consistent with the literature found, such as fire risk and the risk of natural disasters, other risks such as social risk, health and safety risk, and financial/economic risk were approached from a different perspective in the interviews when compared to the literature found. With respect to environmental risk, similar themes could be observed between those identified in the literature and those identified in the interviews, but there were also new themes introduced by the local experts. This could be attributed to the fact that when it comes to fire and natural disasters, there are more standards that stakeholders must adhere to, which are often universal across various parts of the world. On the other hand, the case is different for the other risks.

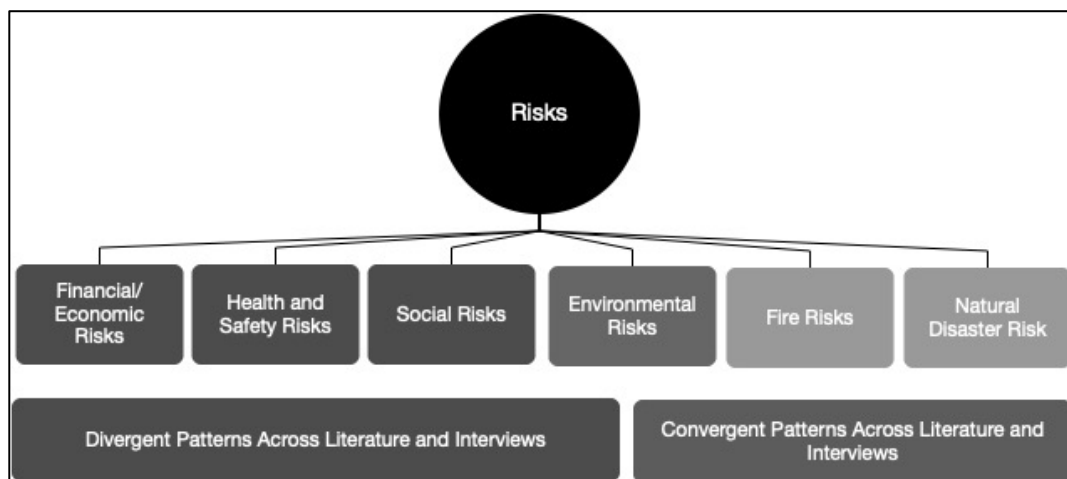


Figure 4.3 - Mind Map Showing Identified Risks

[Source: Compiled by author using NVivo]

#### **4.2.7.1 Theme 7a - Financial/ Economic Risks**

The interviewees shed light on various dimensions of financial and economic risks associated with high-rise development. This risk was in fact the most mentioned risk amongst the sample of interviewees, which shows that it is a common concern for various stakeholders of such developments.

##### *Theme 7ai - Feasibility and Risk Management*

The interviewees collectively emphasised the importance of feasibility studies and risk management in mitigating financial risks. Feasibility studies can be conducted by engaging experienced consultants in the early planning stages of a development, however one interviewee stated that such consultants may need to come from abroad which can entail additional costs for the project. Furthermore, while feasibility studies allow for a contingency plan to be developed, there is still inherent the unpredictability of future factors such as, population growth, economic contexts, and construction material costs. Moreover, the time that it takes to build such large developments further increases such risks. This identifies the dynamic environment and complexity of forecasting financial risks.

##### *Theme 7aii - Construction and Maintenance Costs*

One interviewee focused on financial risks that emerge during construction phases of the development, particularly the client's ability to sustain the project financially throughout constructing and ensure proper installations. This once again highlights the need for effective planning and project management.

##### *Theme 7aiii - Sustainability and Cost*

In their interviews the sustainability experts, alluded to the financial implications of sustainability. One expert stated that achieving a truly sustainable high-rise building, would lead to exorbitant costs per square meter, which could escalate property prices significantly. This underscores the trade-offs between sustainability and affordability in the context of high-rise development.

*Theme 7aiv - Property Value and Contractual Risks*

One interviewee identified an economic concern related to property values. Building a high-rise in front of existing properties could lead to a reduction in their value. This was highlighted by the interviewee referring to Portomaso as an example, where a contractual oversight regarding guaranteed sea-views, demonstrated the financial repercussions of unaddressed property value risks.

*Theme 7av - Financial Prudence amid Innovation*

While the perspectives of interviewees on financial risk varied, there was a common thread through the interviews, which was the necessity to strike a balance between financial prudence and urban development.

#### **4.2.7.2 Theme 7b - Social Risks**

While the number of studies in the literature review which mentioned social risks was limited, interestingly, many of the interviewees discussed social risks. The interviews revealed an interplay between macro-level factors of high-rise development such as urban planning, and micro-level factors such as individual attitudes and social interactions. This underscores the need for holistic urban planning that considers both architectural and social dimensions.

##### *Theme 7bi - Limited Access to Community Spaces and Isolation*

Limited access to green spaces and community amenities could have an adverse effect on the health and well-being of the residents. Isolation arises from a lack of opportunities for residents to interact. One of the interviewees identified an unintended consequence of high-rise developments, which is creating dead voids between buildings which can further hinder social interactions. These concerns highlight the role of community spaces in mitigating such risks. Community spaces can be integrated within the building itself by using a human-centric approach to architecture.

##### *Theme 7bii - Prejudice and Social Integration*

One interviewee introduced an additional layer of social risk – prejudice against foreigners. Many locals believe that overdevelopment in Malta is an effect of the population growth which is caused by foreigners migrating to Malta. However, there is also fear of economic collapse if these foreigners do choose to leave. This, together with concerns about cultural differences, raises questions about social integration and harmony.

##### *Theme 7biii - Architectural Impact on Liveability*

Potential adverse effects of high-rise development such as obstruction of sunlight could lead to overshadowing of lower buildings. This obstruction of sunlight could lead to negative implications for residents' health and well-being. This underscores the balance between architectural decisions and the well-being of the residents as well as residents of surrounding buildings.

#### **4.2.7.3 Theme 7c - Health and Safety Risks**

A small number of interviewees referred to health and safety when discussing risks of high-rise buildings, especially in comparison to the vast number of studies which were identified discussing these risks in the systematic literature review, and the recent events that have highlighted the importance of health and safety in construction in Malta. This discrepancy can stem from various factors, such as the prominence of other concerns, individual interviewee experience, or the framing of questions. However, it is unlikely that the framing of questions was the cause of this discrepancy since the questions were broad and open-ended.

The contrast between the emphasis stemming from health and safety risks in the literature and the interviewees suggests a need for further exploration. This gap also highlights the need for effective communication and management of health and safety concerns within the industry.

#### *Theme 7ci - Public Safety and Quality Assurance*

The interviewees who mentioned health and safety in their responses did so when providing a comprehensive overview of the risks associated with high-rise construction, highlighting that these risks are part of a larger spectrum of challenges. One interviewee did however discuss this risk in detail, expressing concern for both worker and public safety by stating that such risks are a potential consequence of compromised work quality due to rushed projects driven by financial motivations.

#### *Theme 7cii - Insurance and Contractor Accountability*

One interviewee introduced the role of insurance companies as a lens through which health and safety risks are viewed. The observation that insurance companies may be reluctant to insure contractors when developing such buildings underscores the industry's recognition of these risks. This viewpoint also raises questions about accountability of such risks, highlighting the importance of fostering responsible practices to ensure safety.



#### **4.2.7.4 Theme 7d - Natural Disaster Risks**

A number of interviewees, particularly the architects, made reference to natural disasters when discussing the potential risks of high-rise developments, highlighting the vulnerability of high-rise structures to seismic events and the challenges associated with mitigating these risks.

##### *Theme 7di - Design and Vulnerability to Movement*

The interviewees emphasised the critical role that the design of the building has in mitigating the risk of natural disasters. While some focused on the seismic resilience of such buildings, noting that they are typically engineered to withstand events often up to a magnitude of 7 or 8, one interviewee feared that there may be risks which exist not only due to seismic events, but also due to inadequate construction practices, thus denoting a concern for the quality and adherence to proper building codes. The interviewee also stated that this can be particularly concerning as Malta has a higher earthquake risk associated with the tectonic plate region it is found on.

##### *Theme 7dii - Balancing Safety and Cost*

The analysis of the interviews reveals an ongoing tension between prioritizing safety and managing costs. This tension is evident in the discussions about the complexities and expenses associated with seismic design and the potential shortcuts taken by contractors. The challenge lies in striking a balance between ensuring building resilience and making economically viable decisions during construction. The interplay between risks and cost has proven to be a persistent problem across many of the risks identified.

#### **4.2.7.5 Theme 7e - Fire Risks**

Due to the standardisation of fire safety codes, many fire safety measures which were identified in the systemic literature review were identified in the interviews. This shows the consistency and validity of the identified fire safety measures.

##### *Theme 7ei - Adherence to Building Codes and Standards*

The interviewees who gave great importance to fire risk were both engineers. Their engineering background brings a specialized understanding of the technical intricacies and practical considerations related to fire safety. Both interviewees underscored the importance of adhering to building codes and technical standards, particularly highlighting the locally adopted British Standard. This underlines the institutionalization of safety practices within the construction industry. In the aftermath of the Grenfell tower fire incident, building codes have been updated, leading to a heightened awareness of fire risks. This indicates that codes are dynamic and responsive to real-world events.

One of the interviewees made reference to particular standards such as, BS9999 and En12845 for guidance. It is also noteworthy that the interviewee also acknowledged the potential challenges when adhering to such standards, such as lack of access to fire engines and high ladders, as valid reasons for application refusal.

##### *Theme 7eii - Multifaced Fire Risk Management*

Interviewees offered a comprehensive perspective on fire risk in high-rise buildings, similar to the perspective provided from the systematic literature review. One interview discussed the crucial nature of fire escape strategies in high-rise buildings, advocating for careful consideration of fire escape aspects and highlights the necessity of comprehensive systems like sprinklers and smoke evacuation. This reiterates the increased importance of evacuation strategies in tall buildings due to challenges posed by height and accessibility.

### *Theme 7eiii - Financial Implications*

One interviewee introduced the dimension of cost in mitigating fire in tall buildings. The implementation of fire suppression systems was deemed necessary, but the expense associated with these measures was highlighted. This introduces an economic aspect to the discussion, pointing towards a potential trade-off between safety and financial feasibility.

#### **4.2.7.6 Theme 7f - Environmental Risks**

The theme of environmental risk was central to the discussions provided by the interviewees. While there was some consensus on the potential benefits of high-rise development, there was also a clear recognition of the associated risks and challenges related to environmental sustainability.

##### *Theme 7fi - Energy Efficiency and Green Spaces*

Some of the interviewees emphasised the importance of energy-efficient design and construction practices in high-rise development, suggesting that incorporating aspects such as solar panels, green roofs, and smart lighting systems can minimize the impact of such buildings on the environment. One interviewee pointed out however, that high-rise buildings can create shade on surrounding buildings which are dependent on solar panels, emphasizing that there should be thoughtful planning to ensure that renewable energy opportunities are not hindered by the design and disruption of high-rise structures.

Interviewees also highlighted that the efficient use of space and reduction of urban sprawl caused by high-rise development can also have positive effects on the environment. These factors align with the idea that high-rise buildings, when thoughtfully planned, can contribute positively to energy conservation and resource optimization.

##### *Theme 7fii - Embodied Carbon and Sustainability*

One interviewee brought up a significant environmental concern regarding the environmental sustainability of high-rise buildings, highlighting the use of materials like glass and steel in their construction, which contributes to a significant issue with embodied carbon, a measure used to calculate the carbon emissions associated with the production of materials. The interviewee's assertion that the manufacturing of steel involves substantial carbon emissions raises concerns about the environmental impact of high-rise construction, particularly in terms of contributing to global warming.

## **4.2 Closure of Findings**

The analysis carried out by the author demonstrates the connection between the risks identified in foreign studies, as identified within the systematic literature review, and their applicability to the context of Malta. However, in certain cases, the manifestation of some risks might differ, due to the influence of stakeholders and the construction sector within the Maltese context.

Furthermore, the interviews predominantly shed light on the adverse repercussions of high-rise development. However, the interviewees also recognised the positive impact towards sustainability that high-rise buildings can offer if they are contingent to changes in policy and building practices.

In the upcoming and final chapter of this study, the author will address the conclusion, encapsulating the findings and insights gathered in this study.

## **Chapter 5: Discussion, Conclusions and Recommendations**

## **5.1 Introduction**

In this chapter, the author presents the salient findings of this study by attempting to answer the research questions outlined in Chapter 1. This chapter will also discuss the limitations of this study and recommendations for future research.

## **5.2 Salient Findings**

The primary goal of this study was to answer the research questions outlined in Chapter 1. The author will thus revisit the research questions and answer each one by making use of the insights gained in the systematic literature review and thematic analysis of the interviews conducted.

The following are the research questions outlined in Chapter 1:

1. Is there a genuine need for high-rise buildings in Malta?
2. What are the potential sustainability disruptions arising from high-rise construction in Malta?
3. How can the identified risks stemming from these sustainability disruptions be effectively managed?

### **5.2.1 Is There a Genuine Need for High-Rise Buildings in Malta?**

The literature review identified that the need for high-rise buildings in Malta is a subject of debate. Some argue that such development can enhance Malta's image, attract international investment, and potentially alleviate issues like property scarcity and traffic congestion. However, others contend that economic justifications for high-rise buildings are uncertain, as demand may be driven by developers rather than local needs. The public also highlights concerns that such buildings disrupt local character and heritage.

The interviews identified that at present, the demand for such buildings revolves around premium residential units and office space, as opposed to addressing the housing needs of the average resident. While such spaces may free up space elsewhere, it is notable that their impact on mitigating overall land scarcity, might not be as substantial as initially anticipated. This evaluation along with the ambiguity of current policies cast doubt on the efficacy of high-rise constructions as a comprehensive solution to the pressing issue of land scarcity in the long-term.

Thus, currently, there is not a genuine need for high-rise developments. Nevertheless, in the future, if policies which embody a discerning evaluation of local requirements and sustainable prospects are created and implemented, it could potentially warrant a certain degree of need for such buildings within Malta's urban landscape to a certain extent.



## **5.2.2 What are the Potential Sustainability Disruptions Arising from High-Rise Construction in Malta?**

High-rise buildings may result in architectural dissonance, whereby such buildings do not align with the island's cultural and architectural context. This can lead to visual disharmony and concerns about the impact on heritage and aesthetics. This problem is greater when considering the ambiguity and lack of clarity in policies, which can lead to challenges in determining permissible height, design, form, and materiality for high-rise structures, resulting in inconsistencies in planning and development decisions. Furthermore, the lack of clear zoning regulations can lead to haphazard and contextually inappropriate high-rise developments, overshadowing, inconsistent skyline aesthetics, and insufficient public spaces.

High-rise buildings can also cause a strain on existing infrastructure causing congestion, overcrowding, and overloading of transportation, parking, water, and waste systems. Additionally, the construction of such developments can escalate resource consumption, potentially leading to increased demand for materials like concrete and steel, which may need to be imported, affecting sustainability efforts.

In addition to the above sustainability disruptions, a number of categories of risk were identified. These are financial/economic risk, fire risk, natural disaster risk, health and safety risk, environmental risk and social risk. These risks can all lead to sustainability disruptions if they materialize. Financial risk was deemed to be the highest risk also directly relates to one of the three pillars of sustainability.

### **5.2.3 How Can the Identified Risks Stemming from these Sustainability Disruptions be Effectively Managed?**

Risk assessments which are conducted at planning stages of the project can be used as a key tool to address the risks of such developments. Once risks are identified and assessed, effective risk mitigation strategies can be implemented. Due to the limited expertise on such buildings in Malta expertise from abroad may be beneficial, particularly during design, feasibility, and risk assessment stages, to ensure well-informed decision-making.

A well-defined comprehensive policy framework which provides clear guidelines for high-rise construction, including permissible height, design standards and zoning regulations must be established. This will help avoid ambiguity and inconsistencies in decision making. Moreover, implementing zoning policies that balance height with context can ensure compatibility between high-rise buildings and their surroundings.

Furthermore, long-term sustainability planning can help manage effectively these sustainability disruptions by considering long-term sustainability and viability of high-rise buildings such as, demand over time, and economic and environmental impacts. Post-construction monitoring may also be used in order to adjust policies and regulations based on the real-world performance of such developments.

Government policies may also be utilised in order to influence the property market and promote affordability. For instance, requiring developers to include affordable housing in high-rise developments can help ensure accessibility for various segments of the population.

Finally, in order to address the negative public perception of such developments, engaging with the public and stakeholders to address concerns may be beneficial. This can be achieved with transparent communication and by involving the community in decision-making processes.

### **5.3 Significance of the Study**

The number of studies which consider the various risks pertinent to high-rise buildings are limited. This is also applicable to Malta, where no studies are available which consider the risks and sustainability disruptions of high-rise buildings. This study fills this critical gap,

Furthermore, the findings of this study offer valuable insights to both practitioners and policymakers, guiding in the development of risk management strategies and sustainable construction practices tailored to Malta's unique context.

This study brings together an academic pursuit and practical significance. It aspires to play a small role in guiding thoughtful decision-making and push towards sustainable high-rise construction practices within the Maltese landscape.

## 5.4 Recommendations for Further Research

This study addresses the critical issues surrounding the adoption of high-rise buildings in Malta. Due to the limited amount of literature available on this topic with regards to the local context, a number of recommendations for further research were identified as the study was being conducted.

Firstly, an analysis of the awareness and preparedness of insurance companies regarding the risks associated with high-rise developments could offer insights into the industries' alignment with the mitigation strategies associated with such risks.

Additionally, further analysis on the financial/economic risks associated with such buildings could be a promising prospect. For example, the formulation of a comprehensive risk assessment framework for such risks could be valuable, given the fact, that this risk was the most prominent risk identified in this study. Furthermore, the absence of standardised protocols in this area highlights the need for such a study.

Finally, a comparative analysis of public perceptions concerning the risks associated with high-rise buildings, compared with those of experts, would enrich the understanding of the alignment or divergence between these viewpoints.

## 5.5 Limitations of the Study

Further to the limitations of the methodology which were identified in Chapter 3 of this thesis, the author was faced with other limitations.

The lack of local literature on high-rise construction risks in Malta necessitated a reliance on studies which were based abroad. While more comprehensive local data would have enriched the study's findings, the author made sure to conduct an extensive review of the studies available which was facilitated by the use of the PRISMA method.

Furthermore, due to the limited local expertise with reference to high-rise buildings on the island, not all of the interviewees had direct experience working with such buildings. However, within the sample, at least one interviewee from each profession had direct or indirect experience with such buildings in the past.

Current local news headlines pertaining to construction site incidents which were prominent at the time that interviews were being conducted, may have influenced interviewees responses. However, the open-ended nature of the questions encouraged the interviewees to provide detailed responses in their own words, rather than respond in a certain way based on the news coverage.

Due to the time frame and the many different subjects which were explored in the literature review and the thesis, conducting a pilot study which represents all stakeholders was not feasible. However, when creating the sample for the interviews the author attributed importance to choosing different experts in the field, all of which were in line with the purpose of this study.

## **5.6 Conclusion**

In conclusion, this thesis serves as a stepping-stone for understanding the complex interplay between high-rise construction, sustainability, and risk management in Malta. While limitations do exist, the significance of the study lies in its potential for contributing towards informed decision-making by both policymakers and industry stakeholders, in order to shape the trajectory of high-rise development for a more sustainable and resistant urban future.

## References

## Bibliography

Ahmada, T., Aibinua, A. & Jamaluddin Thaheemb, M., 2016. The effects of high-rise residential construction on sustainability of housing systems. *International High-Performance Built Environment Conference – A Sustainable Built Environment Conference*.

Ajmal, M. M., Khan, M., Gunasekaran, A. & Helo, P. T., 2022. Managing project scope creep in construction industry. *Engineering, construction, and architectural management*, 29(7), pp. 2786-2809.

Al-Kodmany, K., 2022. Sustainable High-Rise Buildings: Toward Resilient Built Environment. *Frontiers in sustainable Cities*, Volume 4.

Ali, M. & Armstrong, P., 2006. *Integration of Tall Building Systems. Building Integration Solutions. Proceedings of the 2006 Architectural Engineering National Conference*. Omaha NE, Architectural Engineering Institute.

Ali, M. & Armstrong, P., 2008. *Overview of Sustainable Design Factors in High-Rise Buildings*. Dubai, CTBUH 2008 8th World Congress.

Ali, M., 2008. *Urban Design Strategy Report on Tall Buildings in Malta*, Illinois: School of Architecture, University of Illinois at Urbana Champaign.

Anonymous, 2022. *International Conference on Applied Business and Economics 2022 18th Edition: A Hybrid Conference*. Malta, Malta Association of Risk Management and International Management Strategic Association.

Architects' Council of Europe, 2014. *Architecture and Quality of Life*. s.l: s.n.

Braun, V. & Clarke, V., 2006. Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), pp. 77-101.



Briguglio, L., 2015. *Times of Malta - Construction industry and GDP*. [Online]  
Available at: <https://timesofmalta.com/articles/view/Construction-industry-and-GDP.588608>  
[Accessed 23 October 2022].

Briguglio, L., 2021. *Malta Today - The unquantifiable cost of construction to our society*. [Online]  
Available at:  
[https://www.maltatoday.com.mt/news/interview/112596/the\\_unquantifiable\\_cost\\_of\\_con#.Y1VRty8RpGw](https://www.maltatoday.com.mt/news/interview/112596/the_unquantifiable_cost_of_con#.Y1VRty8RpGw)  
[Accessed 23 October 2022].

Brown, D. J., 2001. *Using Surveys in Language Programs.*, Cambridge: Cambridge University Press .

Brown, R., 2006. *Doing Your Dissertation in Business and Management: The Reality of Research and Writing*, s.l.: Sage Publications.

Calleja, M., 2023. *Majority against high-rise developments in the country*. [Online]  
Available at:  
[https://www.maltatoday.com.mt/news/national/121374/majority\\_against\\_highrise\\_developments\\_in\\_the\\_country\\_#.ZBMbYezMLm9](https://www.maltatoday.com.mt/news/national/121374/majority_against_highrise_developments_in_the_country_#.ZBMbYezMLm9)  
[Accessed 13 March 2023].

Camilleri, D. H., 2003. Malta's risk minimisation to earthquake, volcanic and tsunami damage. *Disaster Prevention and Management*, 12(1), pp. 37-47.

Charmaz, K., 2005. Grounded Theory in the 21st century; applications for advancing social justice studies. In: *The Sage Handbook of Qualitative Research*. s.l: Sage Publications Inc..

Choudhry, R. M. & Iqbal, K., 2013. Identification of risk management system in construction industry in Pakistan. *Journal of Management in Engineering*, 29(1), pp. 42-49.

Clarke, R. V. & Lester, D., 2013. *Suicide: Closing the Exits*. 1 ed. New York : s.n.

CTBUH, n.d. *CTBUH Height Criteria for Measuring & Defining Tall Buildings*. [Online]

Available at: [https://cloud.ctbuh.org/CTBUH\\_HeightCriteria.pdf](https://cloud.ctbuh.org/CTBUH_HeightCriteria.pdf)

[Accessed 23 October 2022].

CTBUH, n.d. *Mercury Towers Saint Julian's*. [Online]

Available at: <https://www.skyscrapercenter.com/building/mercury-towers/33735>

[Accessed 4 April 2023].

Daigle, M. S., 2005. Suicide prevention through means restriction: Assessing the risk of substitution: A critical review and synthesis. *Accident Analysis & Prevention*, 37(4), pp. 625-632.

Delmas, M. A. & Cuerel Burbano, V., 2011. The Drivers of Greenwashing. *California Management Review*, 54(1), pp. 64-87.

Denk, E., 2007. Die Ursprünge des Hochhausbaus. *Detail er. 2007*, Volume 9, pp. 935-940.

Dwijendra, N. K. A. et al., 2021. Modeling Social Impacts of High-Rise Residential Buildings During the Post-Occupancy Phase Using DEMATEL Method: A Case Study. *Buildings (Basel)*, 11(11), pp. 504-521.

Eichner, M., Zinaida Safarik, I., Tabunschikov, Y. & Murgul, V., 2018. Socioecological Aspects of High-rise Construction. *E3S Web of Conferences*, Volume 33, pp. 3065-3073.

Eklová, K., 2020. *Sustainability of Buildings: Environmental, Economic and Social Pillars*, Prague : Czech Technical University.

- Elbajheit, A. R., 2012. Why Tall Buildings? The Potential of Sustainable Technologies in Tall Buildings. *International Journal of High-Rise Buildings*, 1(2), pp. 117-123.
- Fang, Z.-M. et al., 2012. Experimental study on evacuation process in a stairwell of high-rise building. *Building and Environment*, 47(1), pp. 316-321.
- Fender, K., 2015. *Asia & Australasia: A Selection of Written Works on the World's Tall Building Forefront*. s.l., s.n., pp. 154-164.
- Formosa, M. & Brown, M., 2016. *Sociology of the Maltese Islands*, s.l.: University of Malta.
- Gavit, S. C., Makwana, A. H. & Pitroda, J., 2019. Risk Management in High-Rise Construction Projects: A Review. *JETIR*, 6(4), pp. 66-71.
- Gehl, J., 2010. *Cities for People*. 1 ed. London: Island Press.
- Gifford, R., 2007. The Consequences of Living in High-Rise Buildings. *Architectural Science Review*, 50(1), pp. 2-17.
- Glaeser, E. L. & Kahn, M. E., 2010. The greenness of cities: Carbon dioxide emissions and urban development. *Journal of Urban Economics*, 67(3), pp. 404-418.
- Goh, K. C. et al., 2016. Accidents Preventive Practice for High-Rise Construction. *MATEC Web of Conferences*, Volume 47.
- Grech La Rosa, A., 2018. *The Evolution of Tall Building Discourse in the Maltese Islands*.
- Guo, G. Z., Yu, Y., Kwok, K. & Zhang, Y., 2022. Air pollutant dispersion around high-rise buildings due to roof emissions. *Building and Environment*, 219(1), p. 109215.

- Hammersley, M. & Gomm, R., 2008. Assessing the radical critiques of interviews. *M. Hammersley, (Ed.), Questioning Qualitative Inquiry: Critical Essays*, pp. 89-100.
- Hollister, N., 2014. The History of European Skyscraper. *CTBUH Journal*, Volume 2, pp. 52-55.
- International Organization for Standardization, 2009. *ISO 31000:2018 - Risk Management Guidelines*. [Online]  
Available at: <https://www.iso.org/obp/ui/#iso:std:iso:31000:ed-2:v1:en>  
[Accessed 23 October 2021].
- Janani, S. & Balkis, A., 2020. A Study on Critical Risk Assesmeny and Safety Managemeny for a High Rise Building. *International Research Journal of Engineering and Technology*, 7(11), pp. 1636-1640.
- Johnston, P., Everard, M., Santollo, D. & Robert, K. H., 2007. Reclaiming the definition of sustainability. *Environmenzal Science and Pollution Research - International*, 14(1), pp. 60-66.
- Katebi , A. & Teymourfar, R., 2017. Identification, analysis and response to risk in high-rise building projects in Tehran's municipality of 22th district based on Vikor Technique. *International Journal of Civil Engineering and Technology* , 8(11), pp. 972-942.
- Kim, T.-Y. & Lee, K.-H., 2018. A Study on Risk Assessment and Analysis Method of Buildings for the Development of Korean Integrated Disaster Evaluation Simulator (K-IDES) in High-Rise Buildings. *Environmental Science and Sustainable Development*, 3(2), pp. 23-25.
- Kim, Y. et al., 2019. Case study of risk management for high-rise buildings using a control chart: schedule management of the busan M tower residential construction projects. *International Journal of Sustainable Building Technology and Urban Development*, 10(3), pp. 136-146.

Klesper, L., 2022. *Malta Business Weekly - The true contribution of the construction industry.*

[Online]

Available at: <https://maltabusinessweekly.com/the-true-contribution-of-the-construction-industry/19941/>

[Accessed 23 October 2022].

Korotich, A. V., 2016. Akademicheskij Vestnik. *UralNIiproektRAASN*, Volume 2, pp. 51-55.

Kubo, T. et al., 2011. Application of an earthquake early warning system and a real-time strong motion monitoring system in emergency response in a high-rise building. *Soil dynamics and earthquake engineering*, 31(2), pp. 231-239.

Li, W., Rocha, A., Guarda, T. & Lopes, I., 2019. Fire risk assessment and factor analysis of buildings based on multi-target decision and fuzzy mathematical model. *Journal of intelligent & fuzzy systems*, 27(5), pp. 6337-6348.

Li, Y., Ning, Y. & Chen, W. T., 2018. Critical Success Factors for Safety Management of High-Rise Building Construction Projects in China. *Advances in Civil Engineering*, Volume 2018.

Lotfabadi, P., 2014. High-rise buildings and environmental factors. *Renewable and Sustainable Energy Views*, 38(1), pp. 285-295.

Manzoor, B., Othman, I., Pomares, J. C. & Chong, H.-Y., 2021. A Research Framework of Mitigating Construction Accidents in High-Rise Building Projects via Integrating Building Information Modeling with Emerging Digital Technologies. *Applied Sciences*, 11(8359).

MEPA, 2014. *Floor-to-Area Ratio Policy*. [Online]

Available at: <https://cdn-others.timesofmalta.com/4457a3b2c93bd7e772245d04f59394331906785103.pdf>

[Accessed 26 October 2022].

Mercieca, M., 2020. *Comparative project management analysis of different structural systems for high-rise buildings*. [Online]

Available at: <https://www.um.edu.mt/library/oar/handle/123456789/76456>

[Accessed 23 October 2022].

Mercury, n.d. *Mercury*. [Online]

Available at: <https://www.mercury.com.mt/>

[Accessed 3 April 2023].

Mouzon, S., 2010. *The Original Green: Unlocking the Mystery of True Sustainability*. Los Angeles, CA: Guild Foundation Press.

Muscat, S., 2009. *A review of MEPA's tall building policy*. [Online]

Available at: <https://www.um.edu.mt/library/oar/handle/123456789/80281>

[Accessed 13 November 2022].

Oda, M., Taniguchi, K., Wen, M. L. & Higurashi, M., 1989. Effects of high-rise living on physical and mental development of children. *Journal of Human Ergology*, 18(1), pp. 231-235.

OHSA, 2022. *Fatalities at Work: 2019-2021*. [Online]

Available at: [https://nso.gov.mt/en/News\\_Releases/Documents/2022/10/News2022\\_182.pdf](https://nso.gov.mt/en/News_Releases/Documents/2022/10/News2022_182.pdf)

[Accessed 23 October 2022].

Owens, J. K., 2021. Systematic reviews: Brief overview of methods, limitations, and resources. *Nurse Author & Editor*, 31(3-4), pp. 50-72.

Page, M. J. et al., 2021. *the PRISMA 2020 statement: an updated guidelines for reporting systematic reviews*. [Online]

Available at: <https://prisma-statement.org/>

[Accessed 10 November 2022].

Perera, B., Samarakkody, A. L. & Nandasena, S. R., 2020. Managing financial and economic risks associated with high-rise apartment building construction in Sri Lanka. *Journal of financial management of property and construction*, 25(1), pp. 143-162.

Planning Authority, 2016. *Paceville - Malta's prime coastal location - Development Framework*.  
[Online]

Available at: <https://parlament.mt/media/90577/dok-19.pdf>

[Accessed 26 October 2022].

Purdy, G., 2010. ISO 31000:2009-Setting a New Standard for Risk Management. *Risk Analysis*, 30(6), pp. 881-886.

Purvis, B., Mao, Y. & Robinson, D., 2019. Three pillars of sustainability: in search of conceptual origins. *Sustainability Science*, 14(1), pp. 681-695.

Putra, A. B. et al., 2021. Analysis on risk management of occupational health and safety on ongoing building project. *IOP Conf. Series: Earth and Environmental Science*, Volume 794.

Raghib, A. T., Belayutham, S., Mohammad, M. Z. & Ibrahim, C. K. I. C., 2021. Causes, effects and potential measures of cost deviations in high-rise building projects in Egypt. *International Journal of Construction Management*, 30 December, 1(1), pp. 1-11.

Roy, T., Saito, T. & Matsagar, V., 2021. Multihazard framework for investigating high-rise base-isolated buildings under earthquakes and long-duration winds. *Earthquake engineering & structural dynamics*, 50(5), pp. 1334-1357.

Rubio-Romero, J. C., Rubio, M. & Garcia-Hernandez, C., 2013. Analysis of construction equipment safety in temporary work at height. *Journal of Construction Engineering and Management*, 139(1), pp. 9-14.

Saunders, M., Lewis, P. & Thornhill, A., 2007. *Research Methods for Business Students*. 4th Edition ed. s.l.:Prentice Hall.

Schembri Orland, K., 2022. *Malta Independent - Ukraine war, Covid push construction material prices up by 30%*. [Online]

Available at: <https://www.independent.com.mt/articles/2022-03-19/local-news/Ukraine-war-Covid-push-construction-material-prices-up-by-30-6736241603>

[Accessed 13 November 2022].

Sha, H., Zhang, X. & Qi, D., 2021. Optimal control of high-rise building mechanical ventilation system for achieving low risk of COVID-19 transmission and ventilative cooling. *Sustainable cities and society*, 74(1), pp. 103256-103256.

Sharma, G., 2017. Pros and cons of different sampling techniques. *International Journal of Applied Research*, 3(7), pp. 749-752.

Sun, X.-q. & Luo, M.-c., 2014. Fire Risk Assessment for Super High-rise Buildings. *Procedia Engineering*, 71(1), pp. 492-501.

Tan, S. & Moinuddin, K., 2019. Systematic review of human and organizational risks for probabilistic risk analysis in high-rise buildings. *Reliability engineering & system safety*, 188(1), pp. 233-250.

Times of Malta, 2022. *Are Maltese buildings earthquake-ready?* [Online]

Available at: <https://timesofmalta.com/articles/view/are-maltese-buildings-earthquake-ready.925630>

[Accessed 1 December 2022].

Verhaeghe, P.-P., Ceonen, A. & Van de Putte, A., 2016. Is Living in a High-Rise Building Bad for Your Self-Rated Health?. *Journal of Urban Health*, 93(5), pp. 884-898.



Weissman, O. et al., 2013. Examining disaster planning models for large scale burn incidents—A theoretical plane crash into a high rise building. *BURNS*, 39(8), pp. 1571-1576.

Xenidis, Y. & Angelides, D., 2005. The financial risks in build-operate-transfer projects. *Construction Management and Economics*, 23(4), pp. 431-441.

# Appendices

# Appendix 1 – Interview Information Letter

## Information Letter

[Date]

### **Information letter**

Dear Sir/Madam,

My name is Elisa Marie Gatt and I am a student at the University of Malta, presently reading for a Master of Science in Insurance and Risk Management. I am presently conducting a research study for my dissertation titled: Risk Management of High-Rise Buildings in Malta; this is being supervised by Prof. Simon Grima. This letter is an invitation to participate in this study. Below you will find information about the study and about what your involvement would entail, should you decide to take part.

The aim of my study is to explore the potential risks and benefits of high-rise buildings in Malta's urban landscape and identify ways to effectively manage these risks. This study aims to better understand the impacts of high-rise buildings on the environment, community, and economy, as well as their potential contributions to sustainability in the construction sector. Your participation in this study would help contribute to a better understanding of the risks associated with high-rise buildings in Malta. Any data collected from this research will be used solely for purposes of this study.

Should you choose to participate, you will be asked to participate in a one-to-one interview, held online via zoom. The survey and interview questions will explore your perceptions of high-rise buildings in Malta, their potential risks, and ways to effectively manage these risks.

Data collected will be anonymised, and no identifying information will be shared. Only the author will have access to the data.

Participation in this study is entirely voluntary; in other words, you are free to accept or refuse to participate, without needing to give a reason. You are also free to withdraw from the study at any time, without needing to provide any explanation and without any negative repercussions for you. Should you choose to withdraw, any data collected from your interview will be erased as long as this is technically possible (for example, before it is anonymised or published), unless erasure of data would render impossible or seriously impair achievement of the research objectives, in which case it shall be retained in an anonymised form.

If you choose to participate, please note that there are no direct benefits to you. Your participation does not entail any known or anticipated risks.

Please note also that, as a participant, you have the right under the General Data Protection Regulation (GDPR) and national legislation to access, rectify and where applicable ask for the data concerning you to be erased. All data collected will be erased in an anonymised form completion of the study and following publication of results.

A copy of this information sheet is being provided for you to keep and for future reference.

Thank you for your time and consideration. Should you have any questions or concerns, please do not hesitate to contact me by e-mail [elisa.gatt.19@um.edu.mt](mailto:elisa.gatt.19@um.edu.mt); you can also contact my supervisor over the phone: +356 2340 3368 or via email: [simon.grima@um.edu.mt](mailto:simon.grima@um.edu.mt).

Sincerely,

Elisa Marie Gatt

[Elisa.gatt.19@um.edu.mt](mailto:Elisa.gatt.19@um.edu.mt)

Prof. Simon Grima

[Simon.grima@um.edu.mt](mailto:Simon.grima@um.edu.mt)

218 Humanities B (FEMA)

## Appendix 2 – Interview Consent Form

### Participants` Consent Form

#### **Risk Management of High-Rise Buildings in Malta**

I, the undersigned, give my consent to take part in the study conducted by Elisa Marie Gatt. This consent form specifies the terms of my participation in this research study.

1. I have been given written and/or verbal information about the purpose of the study; I have had the opportunity to ask questions and any questions that I had were answered fully and to my satisfaction.
2. I also understand that I am free to accept to participate, or to refuse or stop participation at any time without giving any reason and without any penalty. Should I choose to participate, I may choose to decline to answer any questions asked. In the event that I choose to withdraw from the study, any data collected from me will be erased as long as this is technically possible (for example, before it is anonymised or published), unless erasure of data would render impossible or seriously impair achievement of the research objectives, in which case it shall be retained in an anonymised form.
3. I understand that I have been invited to participate in an interview in which the researcher will ask open-ended questions to *explore* the risks which industry professionals believe are pertinent to high-rise buildings in Malta, as well as techniques which can be used to manage these risks. I am aware that the interview will take approximately 30 minutes. I understand that the interview is to be conducted in a place and at a time that is convenient for me.
4. I understand that my participation *does not entail any known or anticipated risks*.
5. I understand that *there are no direct benefits to me from participating in this study*. I also understand that this research may benefit others by: providing the industry with a list of risk which effect the high-rise building industry and the methods which can be used to manage such risks
6. I understand that, under the General Data Protection Regulation (GDPR) and national legislation, I have the right to access, rectify, and where applicable, ask for the data concerning me to be erased.
7. I understand that all data collected will be *erased in an anonymised form completion of the study and following publication of results*.
8. I have been provided with a copy of the information letter and understand that I will also be given a copy of this consent form.
9. I am aware that, by marking the first-tick box below, I am giving my consent for this interview to be audio recorded and converted to text as it has been recorded (transcribed).

**MARK ONLY IF AND AS APPLICABLE**

- I agree to this interview being audio recorded.
- I do not agree to this interview being audio recorded.

10. I have read and understood the above statements and agree to participate in this study.
11. I am aware that extracts from my interview may be reproduced in these outputs, either in anonymous form, or using a pseudonym [a made-up name or code – e.g. respondent A].
12. I am aware that the interview will be held online; the researcher will use Zoom and will activate the *Require Encryption for 3rd party endpoints SIP/H-323* function. The researcher will *only audio record* the session.

Name of participant: \_\_\_\_\_

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Elisa Marie Gatt

Prof. Simon Grima

Elisa.gatt.19@um.edu.mt

Simon.grima@um.edu.mt

218 Humanities B (FEMA)

## **Appendix 3 – Interview Schedule**

### Interview Questions

#### **Question 1**

What potential risks do high-rise buildings pose to Malta?

#### **Question 2**

Do you think these risks can be managed ? If so, what measures do you think can be taken to effectively manage these risks?

#### **Question 3**

From a sustainability standpoint, how do you see high-rise buildings contributing to the construction sector in Malta, and what are some potential advantages or disadvantages to this approach?