Urban Disaster Risk: Evaluating Disaster Risk Reduction integration with Urban Planning curriculums at South African Universities

T Koen

orcid.org/0000-0003-1807-8933

Dissertation accepted in fulfilment of the requirements for the degree *Environmental Sciences with Disaster Risk Science* at the North-West University

Supervisor:	Prof C Coetzee
Co-Supervisor:	Dr K Puren
Co-Supervisor:	Dr L Kruger

Graduation May 2023

28953924

ACKNOWLEDGEMENT

"*Always work enthusiastically for the Lord, for you know that nothing you do for the Lord is ever useless*" 1 Corinthians 15:58

All honour and glory to God. By His grace, I was able to go on this amazing journey

To my supervisor and co-supervisors and the North-West University

I am so thankful to Prof Christo Coetzee for his guidance, patience, and constant encouragement. I contribute much of the success of this study to him. Thank you to Dr Leandri Kruger for her constant support and calmness during every aspect of this study. To Dr Karen Puren who helped me so much in understanding the perspectives of her discipline. I am humbled and grateful for the opportunity and financial support that enabled me to conduct and complete the study.

To my family and my friends

To my parents, Amoré and Jaco Koen who were always there to answer when I called. Your love and kind words kept me going and I am so grateful to you both. Thank you for believing in me from the start and for allowing me to find my passion and to pursue it. You two are an inspiration and I hope to always make you proud. To my little sister Chiney, thank you for making me laugh every time I fell on hard times and for being my constant cheerleader. Thank you to Tannie Janine and Ouma for always praying and thinking of me.

Sherise, Nicole, Carri, Stefan, Wilhelm and Stephan for making the last two years memorable and always checking up on me. Especially Carri who has been with me since day one, thank you for always lending me an ear and your advice.

To my fiancé Durandt

You have been my pillar and my rock. You have been so supportive, and I cannot begin to tell you how grateful I am. Thank you for dancing with me when I felt overwhelmed, for holding me when I was tired, and for loving me every step of the way. I love you so much.

"*Do not conform to the pattern of this world, but be transformed by the renewing of your mind. Then you will be able to test and approve what God's will is – His good, pleasing and perfect will*." Romans 12:02

ABSTRACT

The number of recorded disasters has been shifting from predominantly rural areas to urban areas. Consequently, the increase in complexity, frequency and even severity of disasters in such urban areas are a growing concern. By integrating disaster risk reduction (DRR) with urban planning (UP), it is anticipated that nations can increase the overall level of disaster resilience of their urban areas. This is echoed by the Sendai Framework for Disaster Risk Reduction (SFDRR), which encourages DRR integration in UP to increase urban disaster resilience. A potential starting point for such integration is at a university level where training and education in DRR can be mainstreamed into key fields such as urban planning and architecture. Although this type of curriculum integration is crucial to facilitate the development of urban planning students who are more aware of disaster risk, it is often difficult to estimate how far Urban Planning Departments in South African Universities have gone to ensure the integration of DRR into their existing curriculums. This dissertation will explore the current status quo, identify obstacles, and identify potential solutions towards greater integration of DRR into UP curriculums at South African Universities. As a point of departure, comprehensive literature reviews were conducted focusing on creating a basic understanding of the urban disaster risk profile of South Africa. Furthermore, the theoretical underpinnings of DRR integration with UP and the international and national frameworks in favour of DRR integration with UP were evaluated, and finally the role of Higher Education Institutions (HEIs) in integrating DRR in Urban and Regional Planning (URP) curriculums were reviewed. This was followed by an empirical study that utilised an exploratory mixed methods research design in order to gain insights into the integration of DRR into existing URP curricula. Primary data was collected in the form of electronic surveys that were sent out to lecturers of 11 South African Universities that offer courses in URP. Frequency and descriptive analysis were used so examine the data collected. It was established that only a few South African universities have integrated concepts related to DRR in their existing URP modules. Additionally, it appears that when DRR is integrated into curriculums it is only offered at a post-graduate course level. This means that many planning students will exit university at undergraduate level without ever having been exposed to DRR concepts. Another, distressing indicator seems to point to the fact that most university lecturers in UP have a limited level of awareness on the topic of DRR integration and DRR integration policies. A plethora of obstacles were also found, including a lack of understanding of the field, lack of academic resources, lack of finances, complexity of the subject matter, and problematic notions such as not seeing value in integrating DRR with Urban Planning. These obstacles were found to hinder the integration of DRR in curricula at South African universities. The study recommends that HEIs review their URP curriculums to include

DRR in both undergraduate and post-graduate courses, as well as invest in broadening the knowledge and understanding of DRR among UP lecturers.

Key terms: Disaster risk reduction (DRR); Urban Planning (UP); Urban and Regional Planning (URP); integration; curriculum, Higher Education Institute (HEI).

LIST OF ABBRIVATIONS AND ACCRONYMS

CBD	Central business district
DMA	Disaster Management Act No. 57 of 2002
DRA	Disaster Risk Assessment
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
EIA	Environmental Impact Assessment
EM-DAT	Emergency Event Database
EU	European Union
GIS	Geographic Information System
HEI	Higher Educational Institution
HFA	Hyogo Framework for Action 2005-2015
IFRCRCS	International Federation of the Red Cross and Red Crescent Societies
IUDF	Integrated Urban Development Framework
KPA	Key performance areas
LDC	Least Developed Countries
MDMC	Municipal Disaster Management Centre
NDMC	National Disaster Management Centre
NDMF	National disaster management Framework
NGO	Non-Governmental Organisation
NQF	National Qualifications Framework
NUA	New Urban Agenda
OECD	Organisation for Economic Co-operation and Development
PDMC	Provincial Disaster Management Centre
PFA	Priorities for Action
SQ	Survey Question
SACPLAN	South African Council for Planners

SDF	Spatial Development Framework
SDG	Sustainable Development Goals
SFDRR	Sendai Framework for Disaster Risk Reduction 2015-2030
SPLUMA	Spatial Planning and Land use Management Act 16 of 2013
UNCTAD	United Nations Conference on Trade and Development
UNDRR	United Nations Office for Disaster Risk Reduction
UNEP	United Nations Environment Programme
UP	Urban Planning
URP	Urban and Regional Planning

TABLE OF CONTENTS

ACKNOWLEDGEMENT ..... **I**

ABSTRACT ..... **II**

LIST OF ABBRIVATIONS AND ACCRONYMS ..... **IV**

CHAPTER 1 INTRODUCTION **1**

1.1 Background **1**

1.2 Problem statement **1**

1.3 Research aim, questions and objectives **3**

1.3.1 Research questions 3

1.3.2 Research objectives 4

1.4 Research design and methodology **4**

1.4.1 Research design 5

1.4.2 Literature review 6

1.4.3 Research sample 6

1.4.4 Data collection 8

1.4.4.1 Survey layout 9

1.4.5 Data analysis 9

1.4.6 Reliability and validity 10

1.5 Ethical consideration **11**

1.6 Challenges and limitations **11**

1.7 Structure and outline of the dissertation **12**

CHAPTER 2 THE SOUTH AFRICAN RISK PROFILE AND THE NEED TO INTEGRATE DISASTER RISK REDUCTION WITH URBAN PLANNING 15

2.1 Introduction..... 15

2.2 Urban disasters: the international and South African context 15

2.2.1 International..... 16

2.2.1.1 Heavy rainfalls and heatwaves 16

2.2.1.2 Flooding and unplanned urbanisation 17

2.2.1.3 Wildfires and infrastructure 17

2.2.1.4 Lacking DRR and the long-term effects in urban environments..... 17

2.2.2 South Africa..... 18

2.2.2.1 Droughts..... 18

2.2.2.2 Floods..... 19

2.2.2.3 Sinkholes..... 19

2.2.2.4 Wildfires..... 20

2.2.2.5 Informal urban settlement fires..... 21

2.2.2.6 Overall risk profile of South Africa..... 21

2.3 Socio-economic drivers of urban disaster sin South Africa..... 26

2.3.1 Developmental context of South Africa 27

2.3.2 Informal settlements and overcrowding..... 27

2.3.3 Poverty 29

2.3.4 Uncontrolled urbanisation 29

2.4 Climate change and the future of South Africa's risk profile 30

2.4.1 Climate change and its impacts on economic sectors: The case of the South African tourism sectors 31

2.5 Urban planning defined 32

2.6 Towards the integration of urban planning and disaster risk reduction 34

2.6.1 Benefits of DRR and UP integration 39

2.6.2 Role of UP techniques and design in DRR 40

2.6.3 Factors impending the integration between DRR and UP 40

2.7 Conclusion 42

CHAPTER 3 POLICIES THAT GUIDE THE INTEGRATION BETWEEN DISASTER RISK REDUCTION AND URBAN PLANNING 44

3.1 Introduction 44

3.2 International disaster risk frameworks that advocate for the integration between DRR and UP 44

3.2.1 Yokohama Strategy and Plan of Action for a Safer World 45

3.2.2 Hyogo Framework for Action 2005-2015 47

3.2.3 Sendai Framework for Disaster Risk Reduction 51

3.2.4 Integration between DRR and UP in other global development policies 54

3.3 South African National policies governing DRR 55

3.3.1 Disaster Management Act No. 57 of 2002 56

3.3.2 National disaster management Framework (NDMF) 57

3.3.3 The Integrated Urban Development Framework (IUDF) 60

3.4 Conclusion 62

CHAPTER 4 THE ROLE OF UNIVERSITES IN THE INTEGRATION OF DRR AND UP 64

4.1 Introduction 64

4.2 Teaching and learning 64

4.2.1 Theoretical aspects of teaching DRR 65

4.2.1.1 Teaching and learning UP 66

4.2.2 Curriculum development 67

4.2.2.1 Practical leaning 68

4.2.3 Role of teaching and learning in DRR and UP integration 69

4.2.4 DRR Integration at undergraduate and postgraduate levels: Global examples 71

4.3 Research 71

4.3.1 Theorical aspects of research 72

4.3.2 Role of research in DRR and UP integration 72

4.4 Community outreach programmes 73

4.4.1 Community outreach programmes in theory 74

4.4.2 Community outreach programmes in theory 74

4.4.3 Student and community outreach programmes 75

4.5 Consultation 76

4.5.1 Consultation with universities 76

4.5.2 DRR and UP integration and the role of university consultation 77

4.6 Conclusion 78

CHAPTER 5 RESULTS AND DATA ANYLISIS 81

5.1 Introduction 81

5.2 Demographic (SQ1) 81

5.2.1 Highest qualification (SQ1.1) 81

5.2.2 Years of experience as a lecturer (SQ1.2) 82

5.2.3 HEIs that participated in the study (SQ1.3) 83

5.2.4 Fields of speciality (SQ1.4) 84

5.3 Field of teaching and disaster risk (SQ2) 84

5.3.1 UP modules teaching (currently and previously) (SQ2.1) 85

5.3.2 Is DRR included in curriculums? (SQ2.2) 86

5.3.3 The percentage of DRR inclusion in undergraduate and postgraduate modules (SQ2.3) 87

5.3.4 Reasons for including DRR in modules previously taught (SQ2.4) 89

5.3.5 DRR related topics that have been included in modules (SQ2.5) 91

5.4 Current knowledge (SQ3) 93

5.4.1 Lecturers' current knowledge on DRR (SQ3.1) 93

5.4.2 DRR relevance to UP (SQ3.2) 94

5.4.3 Awareness level of national and international policies in promoting integration of DRR an UP (SQ3.3) 97

5.5 Curriculums (SQ4) 99

5.5.1 Experience level in integrating DRR and UP in curriculums (SQ4.1) 99

5.5.2 The need for DRR integration into existing UP curriculums (SQ4.2) 101

5.5.3 Benefits of the integration of DRR with UP curriculums? (SQ4.3) 104

5.5.4 Most appropriate academic year for DRR integration into the curriculums (SQ4.4) 105

5.5.5 Number of modules that included DRR elements (SQ4.5) 106

5.5.6 Theoretical modules vs Practical modules (SQ4.6) 109

5.5.7 Best suited modules for DRR integration (SQ4.7) 109

5.5.8 Practical DRR learning (SQ4.8) 110

5.5.9 Sub-component vs Stand-alone module (SQ4.9) 111

5.6 Challenges of integrating DRR with UP (SQ5) 113

5.6.1 DRR integration aiding students' professional development (SQ5.1) 113

5.6.2 Level of integration at HEIs in South Africa (SQ5.2) 115

5.6.3 Room to increase integration in curriculums (SQ5.3) 116

5.6.4 Challenges faced with integrating DRR (SQ5.4) 117

5.6.5 Approaches to increase integration on curriculum level (SQ5.5) 119

5.7 Additional comments 120

5.8 Discussion 121

5.9 Conclusion 125

CHAPTER 6 CONCLUSIONS AND RECOMMENDATIONS 126

6.1 Introduction 126

6.2 Key insight relating to formulated research objectives 126

6.2.1 Research Objective 1: To investigate the increasing impact of disasters on urban areas. Globally and within the South African context 127

6.2.2 Research Objective 2: To establish the theoretical underpinnings for the integration between UP and DRR 128

6.2.3 Research Objective 3: To investigate the Integrational and National DRR policy prescription for the integration of DRR and UP 130

6.2.4 Research Objective 4: To evaluate the current levels of integration of DRR with UP in URP Departments and curriculums within HEIs in South Africa 131

6.2.5 Research Objective 5: To identify integration gaps and best practice cases of integration of DRR in UP within URP curriculums in South African Universities 133

6.2.6 Research Objective 6: To make recommendations for furthering the integration of DRR and UP within URP curriculums in South African Universities 134

6.3 Conclusions 135

BIBLIOGRAPHY 137

ANNEXURES A: QUESTIONNAIRE 168

ANNEXURES B: ETHICS APPROVAL LETTER 179

LIST OF TABLES

Table 1-1: **SACPLAN accredited planning schools and qualifications (SACPLAN, 2022).** 7

Table 2-1: **Disaster history of South Africa since 2015 (adapted from EM-DAT, 2021).**..... 22

Table 2-2: **Policy frameworks highlighting the DRR and UP integration (Amin & Hasim, 2014).**..... 36

Table 3-1: **The HFA: Emphasis on training and integration between UP and DRR (adapted from the UNISDR, 2005).**..... 49

Table 3-2: **A line-up of SFDRR PFAs relevant to this research study (adapted from the UNISDR, 2015b).**..... 52

Table 5-1: **The number and percentage of DRR in undergraduate and postgraduate modules at various HEI's.** 88

Table 5-2: **National and international frameworks and policies that encourage DRR and UP integration.**..... 98

Table 5-3: **URP modules that include DRR at the various universities.**..... 107

LIST OF FIGURES

Figure 2-1: A map of sinkholes located in the Gauteng Province (Heath & Constantinou, 2015). 20

Figure 5-1: The highest qualification of the respondents (SQ1.1). 82

Figure 5-2: Years of lecturing at HEIs (SQ1.2). 83

Figure 5-3: Representation of university respondents (SQ1.3). 84

Figure 5-4: The previous and current number of URP modules taught by respondents (SQ2.1). 85

Figure 5-5: The current level of knowledge of the concepts of DRR amongst lecturers (SQ3.1). 94

Figure 5-6: Lecturers' opinion on the relevance of DRR in UP modules (SQ3.2). 95

Figure 5-7: Lecturers' awareness level in terms of DRR and UP integration policies and frameworks (SQ3.3). 97

Figure 5-8: Overall experience of DRR and UP integration in curriculums (SQ4.1)..... 100

Figure 5-9: Lecturers opinion on the integration on DRR in UP curriculums (SQ4.2). ... 102

Figure 5-10: Lecturers' opinion on when DRR should be implemented in URP curriculums (SQ4.4). 106

Figure 5-11: Number of modules that include elements of DRR (SQ4.5). 107

Figure 5-12: Theory-based modules vs practice-based modules (SQ4.6). 109

Figure 5-13: DRR as a subcomponent or a standalone module (SQ4.9). 112

Figure 5-14: Lecturers' opinion of whether DRR integration will aid students in future professions (SQ5.1). 114

Figure 5-15: Level of DRR integration in URP curriculums (SQ5.2). 116

Figure 5-16: A representation of the various challenges faced when integrating DRR in URP curriculums (SQ5.4). 118

CHAPTER 1 INTRODUCTION

1.1 Background

As the world's population continues to grow, the level of urbanisation also increases and leads to the build-up of urban infrastructure and concentration of populations in densely populated urban areas (Feofilovs & Romagnoli, 2020). These urban areas are more prone to the mutually reinforcing problems of climate change and rapid urbanisation, which results in a rise in urban risk and vulnerability (Quesada-Román *et al.*, 2020; Oe & Yamaoka, 2021). This is concerning, since the majority of human activities – including economic, social, and political activities – occur in urban areas (Pereira *et al.*, 2022). In effect, urban disasters disrupt the functioning of these activities and the overall functioning of society. In the context of ever-increasing urban disaster risk, it is becoming increasingly important to strengthen structural and non-structural disaster-risk reduction interventions that contribute to building urban disaster resilience (Feofilovs & Romagnoli, 2020). One of the most fundamental non-structural urban disaster resilience measures that can be initiated by any country is integrating disaster risk reduction (DRR) theories, concepts, and methodologies into Urban Planning (UP) curriculums in higher education institutions (HEIs) (March & Leon, 2013; Bosher *et al.*, 2013). However, very few HEIs have recognised the link between DRR and UP, and subsequently, the integration between the two fields has suffered, especially in developing countries (March, 2011; March & Leon, 2013).

South Africa is one such developing country where the current extent of integration between DRR and UP in curriculums at HEIs is not fully understood. Consequently, there is a research gap this study will begin to explore. As a point of departure for this study, Chapter 1 provides an outline for the study by firstly elucidating the problem statement that informs the study. This is followed by a discussion on the research aim and questions formulated to guide the research, and, finally, the research methodology and design that informed the data collection process is also elaborated on.

1.2 Problem statement

With rapid urbanisation and the change in climate, the number of recorded disasters is shifting from predominantly rural to urban areas (Etinay *et al*. 2018; León & March, 2017; Rivera & Wamsler, 2014). The effects of disasters are experienced more keenly in urban areas, especially among poorer communities (Wamsler, 2004). The increase in complexity, frequency and even severity of disasters in urban areas are a growing concern (Chmutina *et al.*, 2014). As cities continue to grow, so does the exposure to risk and hazards (March & León, 2013). Disasters have

shown how vulnerable built environments are once they are affected, and bring into question the resilience of current land-use planning as well as that of man-made structures, especially in urbanised areas (Chmutina *et al.*, 2014). Wamsler (2006) has identified the mainstreaming of risk reduction with urban planning as a key challenge in urban development. Without the proper monitoring and governance of urban development, large urban populations are exposed to risks, hazards, and disasters (Amin & Hashim, 2014). Wamsler (2004) stated that urban growth is rarely executed with the perspective of reducing disaster risk. This reality is also being observed in South Africa, where urban disasters have been increasing in the last decade. Prominent urban disaster events in the last decade include the flash floods in Alexandra during November 2016 that affected more than 100 households forcing residents to relocate (Danielak, 2020, Danielak, 2022). In 2019 the large floods in Durban lead to 51 fatalities and washed bridges, roads and over 200 homes (Olanrewaju & Reddy, 2022). Cape Town experienced severe droughts from 2015-2018 where dam levels dropped to 20% in 2017 (Cole *et al.*, 2021).

The Sendai Framework for Disaster Risk Reduction (SFDRR) pleads for the integration of DRR in UP under Sections 27(d), 30(f) and 47(d) of the Framework. Section 47(d) particularly emphasises the need to incorporate DRR measures within "*multilateral and bilateral development assistance programmes within and across all sectors, as appropriate, related to poverty reduction, sustainable development, natural resources management, the environment, urban development and adaptation to climate change*" (UNISDR, 2015b). By integrating DRR with UP, it is anticipated that nations can increase the overall levels of disaster resilience of their urban areas. Urban planners have a significant role to play in planning, modifying, and managing cities and regions (March & León, 2013). By eliminating unsafe infrastructure and land-use planning, disaster risk can be minimised, and societal disaster vulnerability significantly decreased (Sagar, 2017).

Even though the need for the integration of DRR and UP growing, there has been little progress in realising this goal (Bull-Kamanga *et al.*, 2003). Some research suggests the reasons for the current lack of integration is due to DRR being a low priority topic for urban planners, lack of finances to facilitate integration, and a poor sense of ownership from urban planners regarding to risk reduction (Wamsler, 2004). Another possible reason is the lack of interest and the general absence of DRR from the curricula of regional planners, architects, engineers, etc. (Sagar, 2017).In Sagar's (2017) study, he stated that, as a consequence, urban planners with specialised skills in DRR are extremely uncommon. The SFDRR states in Sections 24 (g and l) and 48(c) that, to really understand disaster risk, DRR training and education must be provided at a national and local level in both private and public sectors (UNISDR, 2015). In South Africa, disasters risk management concepts and principles are only included in a few primary and secondary school curriculums such as Social Science and Geography at Grade 7 and 12 levels (Rambau *et al.*,

2012). DRR as subject or integrated topic in existing curriculums in tertiary institutions in South Africa, is also rare. Only a handful of universities worldwide present entire degree programmes on DRR and whereas a few other related disciplines have integrated some level of DRR in their course work. In South Africa as well, there is still a lack of integration of DRR in course work in fields such as Urban and Regional planning that causes an impediment to sustainability of DRR training and education, and has severe implications for urban planning practice (Selby & Kagawa, 2012).

In light of the problem as stated in the preceding discussion, this study aimed to evaluate the current extent of integration of DRR concepts and theory in Urban and Regional Planning (URP) courses at South African Universities.

1.3 Research aim, questions and objectives

The overarching aim of this research was to evaluate the current levels of integration of disaster risk reduction (DRR) with urban planning (UP) at Urban and Regional Planning (URP) departments and curriculums within higher education institutions (HEIs) in South Africa. To achieve this aim, the following research questions and objectives were formulated to guide the study.

1.3.1 Research questions

This research study evaluated the level of integration by addressing the following research questions:

1. What are the various impacts that contribute to the increase of disasters in urban areas on a global scale and, locally, in South Africa?

2. What are the theoretical underpinnings motivating the integration between UP and DRR?

3. What are the international and national DRR policy prescription for the integration of DRR and UP?

4. What is the current level of integration of DRR with UP at URP Departments and curriculums within HEI in South Africa?

5. What are the various challenges, gaps, and best practice cases of integration of DRR in UP within URP curriculums in South African HEIs?

6. What can be done to further the integration of DRR and UP within URP curriculums in South African HEIs?

1.3.2 Research objectives

Six objectives were addressed to achieve the research aim and research questions. These research objectives helped to evaluate the overall level of DRR integration in curriculums at HEIs, specifically in the URP departments.

The research objectives of this study were as follows:

1. To investigate the increasing impact of disasters on urban areas, globally and within the South African context;

2. To establish the theoretical underpinnings for the integration between UP and DRR;

3. To investigate international and national DRR policy prescriptions for the integration of DRR and UP;

4. To evaluate the current levels of integration of DRR with UP at Urban and Regional Planning departments and curriculums in higher education institutions in South Africa;

5. To identify integration gaps and best practice cases of integration of DRR in UP within Urban and Regional Planning curriculums in South African HEIs; and

6. To make recommendations for furthering the integration of DRR and UP within Urban and Regional Planning curriculums in South African HEIs.

1.4 Research design and methodology

Creswell and Creswell (2018) define research methodology as a set of formal procedures that provide guidelines for the collection, analysis and interpretation of data when conducting a research study. This section provides the framework for how data was obtained for this study to provide possible answers to the research questions mentioned above. Specifically, issues of overarching research design, sampling method, data collection tools, data analysis, reliability and validity, and ethical considerations are elaborated on. As a point of departure, the overall research design utilised in the study is discussed first.

1.4.1 Research design

A researcher needs to choose a specific research design that will aid in achieving the aims of their research. This study included aspects of both qualitative and quantitative research approaches, consequently known as a mixed-methods research design. Mixed-method research consists of the systemic integration of both qualitative and quantitative data to combine different perspectives and to neutralise the shortcomings of both approaches used in isolation (Creswell & Creswell, 2018). Quantitative data was analysed and provided important information for drawing conclusions and decision-making (Sharma, 2019). This data is usually structured and represented through descriptive statistics. Qualitative data, on the other hand, consists of 'empirical materials' data that are based on personal experience, interviews, observation, etc. (Aspers & Corte, 2019). Qualitative data provides insight into quality, underlying factors, and reasoning (Kothari, 2004). Thus this data collection method will also consist of open and closed ended question as part of taking on a mixed method research design.

This study followed an exploratory mixed-methods research design that uses the results of quantitative research to develop or inform the results of the qualitative research (Creswell & Plano Clark, 2006). Exploratory research studies do not use a problem or a hypothesis that already exists but find the problem or hypothesis within the current study (Kothari, 2004). This approach was appropriate since it led to the discovery of new ideas and insights in regard to the integration of DRR into existing Urban and Regional Planning (URP) curricula. This research study aimed to evaluate the current level of DRR integration with UP at URP departments and curriculums in HEIs. These results were then used to make recommendations for further integration and study. Thus, the quantitative data collected were used to illustrate the level of integration as indicated by the respondents to give an overall picture. However, 'cold hard facts' are still not enough, especially when the reason behind these numbers is unclear. Creswell and Creswell (2018) describe how one database (qualitative data) could build on another database (quantitative data). In other words, the quantitative data is explained by the qualitative data, and, in turn, the qualitative data is verified and validated by the quantitative data (Creswell & Creswell, 2018). This is where the qualitative data was so invaluable, as it indicated deeper reasons for the current level of integration as reflected in the numbers. Exploratory studies also provide the necessary data that could be used for future comparative research (Dillion *et al*., 2020). By analysing the qualitive data with the quantitative data, the research could provide recommendations of value supported by evidence.

1.4.2 Literature review

A literature review was conducted before the researcher started with the data collection process. Empirical literature is defined as the investigation of previous research studies that are similar to the proposed study (Kothari, 2004). The literature review addresses the research questions by creating a knowledge foundation of the study by integrating the perspectives and findings from other empirical findings (Snyder, 2019). This research study consists of three literature review chapters and each chapter was guided by the first three research objectives previously stated. Chapter 2 addresses the current urban disaster risk profile of South Africa and the theory behind integrating DRR and UP. By conducting a desktop study, this chapter looked at the EM-DAT (Emergency Event Database) disaster record of South Africa and the work of various South African studies on disasters in urban areas to establish the risk profile. The theoretical underpinnings were established by the work of key authors including Christine Wamsler, Alan March, Jorge Leon, Mark Pelling, Intan Amin, Halimaton Hashim, Ksnenia Chmutina, Tamar Ganor and Lee Bosher. Chapter 3 discusses the various policies and frameworks that support the integration of DRR and UP. This chapter primarily consulted the official international and national policy documents identified in section 1.7, with additional research studies that reflect on these policies and their implementation. Chapter 4 studies the role of HEIs in the integration of DRR in URP curriculums. This included the written work of Yung-Fang Chen, Arinola Adefila, Menaha Thayaparan, Rajib Shaw and Anwarul Abedin. The literature discussed in this chapter was identified by means of reliable search engines and resources, including Google Scholar, ResearchGate and Science Direct.

1.4.3 Research sample

Sampling is a key aspect in research, as the selection of a specific group of people represent a bigger population group (Onwuegbuzie & Collins, 2007). MacDonald and Headlam (2008) explain that a sampling group consists of a list of members representing a representative fraction of population. Therefore, a group of participants had to be chosen that would be able to represent the overall level of integration of DRR in URP curriculums at HEIs. However, the institutions that offer courses in URP had to be identified first to insure an accurate representation of all HEIs in South Africa. These HEIs were identified using the website of the South African Council for Planners (SACPLAN). SACPLAN is the statutory council that regulates the planning profession in terms of the Planning Profession Act. 2002 (Act 36 of 2002). The Council assures, amongst other things, the quality of planning qualifications – both degrees and diplomas – that are offered by educational institutions (SACPLAN, 2022). During this process, 11 accredited HEIs were

identified for this research study. These HEIs are indicated in Table 1-1 below, as well as the programmes they offer.

Table 1-1: SACPLAN accredited planning schools and qualifications (SACPLAN, 2022).

Institute	**Qualifications**
Cape Peninsula University of Technology	National Diploma: Town and Regional Planning
	Bachelor of Technology: Town and Regional Planning (BTech TRP)
Durban University of Technology	Bachelor of the Built Environment in Urban and Regional Planning
	Bachelor of the Built Environment Honours in Urban and Regional Planning
	Master of the Built Environment
	Doctor of Philosophy in the Built Environment
North-West University	Baccalaureus Artium et Scientiae (Planning)
	Bachelor of Science in Urban and Regional Planning
University of Cape Town	Master in Urban and Regional Planning (2-year programme)
	Master of City and Regional Planning (1-year programme)
	Master in City Planning and Urban Design
University of the Free State	Master in Urban and Regional Planning
University of Johannesburg	National Diploma: Town and Regional Planning
	Bachelor of Urban and Regional Planning Honours
University of KwaZulu-Natal	Master of Town and Regional Planning
University of Pretoria	Bachelor of Town and Regional Planning
	Master of Town and Regional Planning (by coursework)

Stellenbosch University	Master in Urban and Regional Planning (2-year programme)
University of Venda	Bachelor of Urban and Regional Planning
University of the Witwatersrand	Bachelor of Science Honours in Urban and Regional Planning
	Master of Science in Development Planning (2-year programme)
	Master of Science in Development Planning (1-year programme)

For this reason, purposeful sampling was used. Purposeful sampling refers to a sampling technique where participants are not selected at random, but selected based on their level of expertise and position, which makes them uniquely suited to answer certain questions (Suri, 2011). The ability to filter out and select a group of knowledgeable participants was ideal for this study, since there is a total of 11 Urban and Regional Planning Departments with about 60 UP lecturers across South Africa. The possibility existed that not all of them would have encountered the topic of DRR and even integrated it into their current teaching practices. Therefore, the sampling group that needed to be targeted for this study was lecturers who specialised in teaching disaster-related topics in Urban and Regional Planning (URP) at HEIs in South Africa. To gain access to this sample, a first round of purposeful sampling was directed towards the heads of departments at the URP faculties of the 11 HEIs identified (Table 1.1). These department heads were contacted via email and served as gatekeepers who could identify staff members best suited to participate in the study, therefor enabling snowball sampling as well. Snowball sampling is the sampling of random individuals identified from a given finite population known as the first stage (Goodman, 1961). In instances where department heads did not respond, some of the lecturers were directly approached via university email to take part in the study. Through this process, 18 [N=18] lecturers responded to the survey invitation and participated in the study.

The invitation that was sent out informed participants that the survey was voluntary, that none of the questions were compulsory, and that they could withdraw at any time. The layout of the survey is discussed in the next section.

1.4.4 Data collection

This research study collected primary data in the form of electronic surveys. Primary data is based on the observations, questionaries and data gathered by the researcher (Niknejad *et al.*, 2019). Surveys allowed the researcher to obtain data from a large sample population (Glasow, 2005).

The electronic survey was a web-based survey, and the questionnaire was available on Google Forms and could be completed online (McPeake *et al*., 2014). Due to the regulations of the COVID-19 pandemic in South Africa, the use of electronic surveys proved to be invaluable and highly effective for the purpose of this study. The use of electronic surveys has become an increasingly popular method of research due to its ability to research a large sampling group, low financial costs, efficient data entry, sampling control, and shorter response time (Sutherland *et al.*, 2013).

1.4.4.1 Survey layout

The electronic survey was a combination of open and closed-ended questions divided into five sections. Most of these questions were identified during the writing of the literature review. Some of the quantitative questions were also followed up with qualitative questions, thereby eliciting more detailed responses from the participants.

The survey consisted of 28 questions in total, and started with a demographic section concentrating on participants' profiles and their requirement for taking part in this study, such as experience and specialities. These questions consisted of educational qualifications, academic focus, and lecturing details. The second section focused on their field of teaching and whether it focused on their field of teaching and their perspectives on possible connections between DRR and UP. These questions revolve around the modules taught by the lectures and whether any include the topic of disasters. The third section intended to determine participants' knowledge of disaster risk and the role of UP in connection to DRR. Both their level of knowledge and experience regarding the integration of DRR and UP was questioned. The fourth section aimed to identify participants' understanding of DRR and the current levels of DRR integration into UP curriculums. In this section, various suggestions for improving curriculum integration were also indicated. The final section consisted of questions aimed at identifying the current issues impeding the process of DRR integration into UP curriculums, as well as the best practices of integration or recommendations for improving integration. The qualitative questions followed the quantitative questions to retrieve more in-depth data on participants' opinions and perspectives on the integration of UP and DRR. A complete version of the survey questionnaire can be allocated in *Annexure A* at the end of this dissertation.

1.4.5 Data analysis

Frequency and descriptive analysis were used to process the quantitative data generated in the study. Descriptive analysis is defined by Gabor (2010) as a multidimensional analysis tool mostly used in market research, that is effective when obtaining important information. In other words,

descriptive analysis aids in processing a large amount of data and reducing it to a simplified summary (Sharma, 2019). This analysis method was effective in assisting the researcher to draw conclusions from the data collected from the quantitative question of the survey. Frequency analysis relates to the collection, interpretation, and evaluation of statistical data, allowing an effective way to work through the primary data collected during the quantitative research surveys (Kapust & Seltzer, 1996). This assisted the researcher in representing the quantitative data and close-ended questions in the form of statistics. Since Google forms was used to create and distribute the questionnaire, and because the questionnaire consisted of close-ended questions, 16 of these questions were already statistically represented in the result. Due to the statistical format, frequency analysis helped the researcher to accurately evaluate and interpret the results.

The results of the qualitative data were examined by means of content analysis. With content analysis, a researcher can draw conclusions by making valid and replicable inferences from the text (White & Marsh, 2006). The use of content analysis proved valuable since the questionnaire contained open-ended questions. The responses of each question were individually analysed according to each survey section to identify any similarities and themes from the answers. These themes and similarities identified in each section were then cross referenced and compared to the other answers. Descriptive, frequency and content analysis were chosen to analyse the quantitative and qualitative data collected with the aim of providing possible recommendations for the incorporation of DRR in UP. These analysis techniques also enabled the researcher to compare the results from various questions. Thus is the case with question 1.2 and 2.1. (Sections 5.2.2. and 5.3.1) and question 2.3, 4.4 and 4.5 (sections 5.3.3, 5.5.4 and 5.5.5).

1.4.6 Reliability and validity

Validity in theory indicates whether the study has measured what it was intended to measure (Golafshani, 2003). In other words, was this research study able to measure the current level of DRR and UP integration in URP curriculums. Mixed methodology provides the opportunity for the researcher to not only gather data but to observe the results firsthand as well, thus improving the validity and reliably of the results (Abowitz & Toole, 2015). Using both qualitative and quantitative data allows for the triangulation of data that strengthens validity of the conclusions and recommendations of the research (Celano, 2014). To ensure the validity of this research, respondents were asked quantitative and qualitative questions. In most cases, the respondents were asked to elaborate on their answers for the quantitative questions, and hence the reasoning behind the statistical data was also included and analysed.

The ability of research results to consistently represent the sampled population over time is known as reliability (Golafshani, 2003; Ross, 2006). The reliability of this research was also enhanced

because only accredited SACPLAN institutions were approached to participate in the study. By using purposeful sampling, participants who had both knowledge and experience of the curriculum content and the teaching thereof were included to participate in this study. Therefore, the data was collected from qualified and reliable sources.

1.5 Ethical consideration

In qualitative research, it is crucial to consider all ethical issues to balance both potential research risks and research benefits (Arifin, 2018). This research study was ethically approved by the FNAS-REC (Faculty of Natural and Agricultural Sciences Research Ethics Review Committee), furnished with ethics number NWU-00538-21-A9, and identified as a research study of minimal risk. The formal ethics letters can be seen under Annexure B. To ensure that the study remained low risk, each respondent had to give informed consent before continuing with the survey. They were informed that:

i. Their participation was voluntary, and that they could withdraw from the study at any time.

ii. They could refrain from completing any questions that they preferred not to answer.

iii. Their identity, as well as their institution, would remain anonymous and that none of the data collected would be linked to them or their institutions during or after the completion of the research, and would not be disclosed to any third party.

iv. The outcome of the research would be published as part of an MSc dissertation in the form of research findings.

v. There would be no remuneration for participation in the research survey.

1.6 Challenges and limitations

The main challenges of this study came down to the availability of participants and the construction of the questionnaire. Of the 11 HEIs that were invited to partake in this study, one HEI was unable to contribute to the overall results. The deadline of the survey had to be adjusted various times to ensure maximum participation, thus delaying the process of analysis. This was mostly due to time, as participants were out of office at different time periods due to study leave or their own reasons. Another limitation was that the results do not include the input from all of the lecturers at each HEI identified in Section 1.4.3. Because the survey was voluntary, only some participants responded to the invitation. In addition, only six HEIs offer undergraduate URP

courses compared to the eight that offer postgraduate courses. However, some of the undergraduate courses include an honours degree as part of their qualification.

In the feedback from participants, one mentioned that the questions were too long. Reflecting on the analysis process, many of the respondents referred to their previous answers. In other words, many of their answers were the same for various questions. Even though each question had its own specific objective, the participants could have found the questions repetitive and lengthy. For example, two participants seemed to have misunderstood Question 3.2 (see section 5.4.2) judging by their motivations.

1.7 Structure and outline of the dissertation

This research study contains six chapters, each consisting of the answer to a research question. Each chapter and the question it address is summarised in this section.

Chapter 1: Introduction

The introductory chapter that provides a brief background on the effect of disasters on South African urban areas, urban resilience, the connection between DRR and UP, and the impact of education about DRR integration. Chapter 1 also includes an outline of the study's problem statement, aims, and research questions. The methodology that was followed is also discussed in full along with the ethical considerations and challenges encountered during the research. This chapter concludes by giving an outline of the chapters to follow.

Chapter 2: The South African disaster risk profile and the need to integrate Disaster Risk Reduction with Urban Planning

This chapter consists of a thorough literature review that assesses the current risk profile of South Africa in terms of urban disaster and provides an in-depth discussion on the need to integrate DRR with UP. It discusses the international scale of urban disaster by looking at heavy rainfalls, heatwaves, flooding, and wildfires as well as the connection to unplanned urbanisation, infrastructure, and the lack of DRR in urban environment. The urban risk profile of South Africa is formed by evaluating the occurrence and impacts of droughts, floods, sinkholes, wildfires, and informal urban settlement fires in urban areas. Chapter 2 considers the role and impact of socio-economic factors and climate change before discussing the foundation of urban planning, its connection to DRR, and the role of integration in decreasing urban disasters. In retrospect, Chapter 2 addresses the first two research questions by identifying 1) the various impacts that contribute to the increase in disasters in urban areas on a global and national scale, and 2) the

theoretical underpinnings motivating the integration between UP and DRR. Chapter 2, 3 and 4 consist of qualitative literature research and analysis.

Chapter 3: Policies that guide the integration between Disaster Risk Reduction and Urban Planning

Chapter 3 continues by exploring the various policies and frameworks that support the integration of DRR an UP through education. The international disaster risk frameworks that advocate for the integration between DRR and UP include the Yokohama Strategy and Plan of Action for a Safer World (1994), the Hyogo Framework 2005-2015: Building the Resilience of Nations and Communities to Disaster, the Sendai Framework for Disaster Risk Reduction 2015-2030, the New Urban Agenda, and the Sustainable Development Goals (IDNDR, 1994; UNISDR, 2005; UNISDR, 2015b; UNDRR, 2021b). The national policies governing DRR are the Disaster Management Act No. 57 of 2002 of South Africa, the National Disaster Management Framework, and the Integrated Urban Development Framework (South Africa, 2002; RSA, 2005; IUDF, 2022). Thus Chapter 3 states and explains the third research question.

Chapter 4: The role of universities in the integration of Disaster Risk Reduction and Urban Planning

Chapter 4 looks at role that universities have in integrating DRR and UP. It focuses on the four responsibilities of universities including training and learning, research, community outreach programmes, and consultation. This chapter also discusses the importance of practical learning, including students in community outreach programmes and the outline of curriculums that include DRR. Many of the literature and findings in this chapter contributed to the questions that were included in the questionnaire.

Chapter 5: Results and Data analysis

Chapter 5 presents the data obtained by the survey questionnaire. Using frequency and descriptive analysis, the results of the 28 questions are interpreted and represented in the form of figures and discussions. The results indicated that, even though there is some level of integration, there is still a need to increase the level of integration in URP curriculums and address the fourth research question regarding the current level of DRR integration. Chapter 5 also answers the sixth research question on the various challenges, gaps, and best practice cases of integration of DRR in UP within URP curriculums in South African HEIs.

Chapter 6: Conclusion

A conclusion of the entire study, including the main literature statements and data results are included in Chapter 6. It provides a final argument of the results by drawing conclusions and making five recommendations based on the results collected throughout this research study.

Bibliography

A consolidated list of all the literature resources used during the course of this study is included in the bibliography.

CHAPTER 2 THE SOUTH AFRICAN RISK PROFILE AND THE NEED TO INTEGRATE DISASTER RISK REDUCTION WITH URBAN PLANNING

2.1 Introduction

The earth's population continues to grow every year and aspects such as urbanisation and globalisation increase the urban population in cities (Albala-Bertrand, 2003). The upsurge in population growth and urbanisation has led to a rise in urban disasters, especially in developing countries like South Africa. The number of people affected by disaster in urban areas are significantly higher than those living in rural areas due to the increasing density of the population. The effect of these disasters often increases the level of poverty in the affected areas (Bull-Kamanga *et al*., 2003). Authors such as Wamsler (2004, 2006) recommend mainstreaming disaster risk reduction (DRR) with urban planning (UP) to reduce the effects of urban disasters. Wamsler further suggests that, with physical design, UP can reduce the risk of disasters because UP acts as an element of resistance. Although it cannot be completely eliminated, urban disaster risk can be reduced by integrating DRR with UP (Lall & Deichmann, 2012). Through UP and mitigation, disaster risk and the exposure of vulnerable people can be reduced (Richmond *et al*., 2018; Thiruppugazh, 2008).

This chapter discusses the impact of urban disasters on national and international level and illuminates the role of socio-economic and climate change drivers. South Africa's disaster profile is presented to create a contextual understanding of urban risk in the country. The chapter concludes by examining UP and considering how its integration with DRR could possibly reduce urban disaster risk. Furthermore, the chapter addresses the first two research objectives outlined in Chapter 1. The first objective relates to investigating the increasing impact of disasters on urban areas – globally and within the South African context. The second objective relates to establishing the theoretical underpinnings for the integration between UP and DRR.

2.2 Urban disasters: the international and South African context

Sanderson (2000) states that disasters are the ramification of natural hazards that affect a vulnerable group. Urbanisation increases the disaster risk in urban areas due the constant growth of vulnerable populations in urban areas (Lall & Deichmann, 2012). Developing countries are most at risk due to the presence of pre-existing socio-economic vulnerabilities, rapid urbanisation, and proliferation of unplanned or illegal informal settlements (Sanderson, 2000; Mofazali & Jahangiri, 2018; Parajuli, 2020). Disasters result in social, physical, and emotional strain on

communities and major damage to infrastructure (Norris, 2002; Schmude *et al.*, 2018; Markhvida *et al.*, 2020). This section unpacks the nature of urban disaster risk by investigating how urban disasters affect people nationally and internationally.

2.2.1 International

Cities and urban areas have been housing large populations for years, and when disaster strikes, the effects are often catastrophic (Rumbach, 2016; Yabe *et al.*, 2020). In 2019, the UN reported that the global population had increased by one billion people, which meant that the global population had reached 7.7 billion for the first time in human history (CRED & UNDRR, 2021). The UNCTAD (2021) reported that, as of 2020, the global urban population had surpassed the 4 billion benchmarks. With more people moving to urban areas, it stands to reason that more people are exposed to the effects of urban disasters due to the increase of possible hazards and vulnerabilities.

According to the OECD (2020), 389 disasters were reported in 2020. This is significantly higher than the annual averages reported from the year 2000 to 2019. During this 20-year time period, an average of 368 disasters were reported per year. In an international context, Asian countries such as Japan, India, China, Yemen, and Pakistan have been most affected by the global upsurge in disaster events, especially in 2018, 2020 and 2021 (Paz, 2019; Pervin *et al*., 2020; Zhou *et al.*, 2021). The sections that follow focus on specific risks and their effects on various environments across the globe.

2.2.1.1 Heavy rainfalls and heatwaves

In the summer of 2018, Japan experienced severe floods and heat waves within weeks of each other, resulting in the death of 300 people (Wang *et al*., 2019). In the summer of 2020, East Asia saw heavy monsoon rainfall that caused severe flooding and landslides and resulted in the displacement of millions of residents (Zhou *et al.*, 2021). As a result of climate change, rainfall was identified as the leading factor of future urban flood risks (O'Donnell & Thorne, 2020). Heavy rainfall, along with human factors such as blocked drainage channels and improper land use, contribute to increased flooding in urban areas (Tingsanchali, 2011). In 2006, Beijing experienced heavy rains, with volumes in the centre of the city measuring much higher than in surrounding rural areas. Of course, this resulted in increased flooding, property losses, and other economic costs (Miao *et al.*, 2011).

2.2.1.2 Flooding and unplanned urbanisation

Developing countries are especially vulnerable to disasters due to inadequate adaptative capacity (Hamidi *et al*., 2020). In countries such as Bangladesh, informal settlements have increased the risk of urban flooding and waterlogging (Pervin *et al*., 2020). The impact of flooding and storms on urban structures is severe and unplanned, poorly managed sewage and drainage systems are unable to withstand the pressure. In another example, strong El Niño winds, heavy rainfall and severe flooding contributed to further spreading the ongoing cholera epidemic in Yemen (Paz, 2019; Ng *et al*., 2020). Pakistan remains vulnerable to the impact of the cyclones that regularly occur in the region (1993, 1998, 1999, 2007, 2010 and 2015). The wide-spread destruction of infrastructure and human casualties are a clear indication of the country's low levels of resilience to extreme weather (Hamidi *et al*., 2020). Climate change is likely to exacerbate these problems and communities throughout South East Asia will have to deal with the effects without assistance from government structures (Martinez & Masron, 2020).

2.2.1.3 Wildfires and infrastructure

The frequency of wildfires and their devastating effects have also increased in recent years (Tedim *et al*., 2018). Countries most affected since 2014 include Australia, USA, Brazil, Bolivia, and Paraguay (Li *et al.*, 2020; Olson *et al.,* 2020; Gonzalez-Mathiesen *et al*. 2021). The Australian bushfires of 2019-2020 decimated nearly 19 million hectares, destroying 3000 houses and killing 33 people (Filkov *et al*., 2020). In 2018, wildfires in Northern California burned down more than 600,000 hectares, causing damage to 22,000 structures, and killing and injuring 95 people (Brown *et al*., 2020). When wildfires become unmanageable, the risk to people (i.e., becoming trapped by fire) and infrastructure in close proximity to wildland areas increases dramatically (Tedim *et al*., 2018). In densely populated and urbanised areas, fires can easily spread from one building to another (Navitas, 2014). In Southern California, a wildfire – dubbed the Thomas Fire after the place it was first reported, Thomas Aquinas College – lasted for nearly a month and caused $207 million (R2,98 billion) worth of damage to urban infrastructure (Addison & Oommen, 2020). The effects of wildfires do not necessarily endanger the lives of people if evacuation procedures are started on time, but wildfires can disrupt people's sources of income and livelihood in the long term (Tedim *et al*., 2018).

2.2.1.4 Lacking DRR and the long-term effects in urban environments

It has already been established that more people are at risk of being affected by hazards due to continuous increases in urban populations (Velasco *et al.*, 2020:1; Combs *et al.*, 2022). Olson *et al*. (2020) argue that urban disasters are the result of decisions about building standards,

population placement and DRR policies. DRR initiatives do not always take into consideration the effects of long-term urban space inequalities caused by poor land use planning (Fuentealba *et al*., 2020). As previously mentioned, developing countries are more at risk in the face of disaster. This is mostly due to the lack of resources and their inability to reduce or recover from the effects of a disaster (Chang *et al*., 2012). Most people living in poverty are forced to build and live in dangerous urban spaces such as riverbanks, floodplains and even landfills (Batteate, 2006). This results in urban hazards that could have secondary impacts and, eventually, escalate to a disaster. South Africa is considered a developing country and has also been impacted by drought, flooding, severe weather, and wildfires. This next section discusses the scale of urban disasters in South Africa.

2.2.2 South Africa

Seasonal flooding, veld and informal settlement fires, droughts, mining accidents, oil spills and outbreak of diseases are some of the disasters South Africa has seen over the years (Vermaak & Van Niekerk, 2004; Van Niekerk *et al*., 2018; Sitas *et al*., 2016). These disasters may seem small compared to those in the Americas and Asia as mentioned in Section 2.2.1, but still have a significant impact on local communities. Some of the most significant disasters and their historic impact on the South African communities are outlined below.

2.2.2.1 Droughts

In 2018, the City of Cape Town underwent a water crisis that was referred to as “Day Zero” (Zhang *et al.*, 2019). Due to a sharp decline in local rainfall since 2015, the city – home to nearly 3.7 million people – was at risk of being the first major metropolitan area on the planet to run out of water (Sousa *et al*., 2018; Burls *et al*., 2019). The possibility of Day Zero was mostly driven by the presence of prolonged drought conditions. Droughts are a regular occurrence in South Africa and most affect provinces such as the North-West, Free State, Northern Cape, Eastern Cape, and the Western Cape (Jordaan *et al*., 2013; Sitas *et al*., 2016; Vogel & Olivier, 2019; Orimoloye *et al.,* 2021). Apart from causing water shortages, droughts can also increase the risk of uncontrolled fire outbreaks and food insecurity in urban areas (Kraaij *et al*., 2018; Drysdale *et al*., 2019). Zhang *et al*. (2019) predict an increase in pollution-induced urban droughts in developing countries such as South Africa. In the Eastern Cape, the town of Makhanda has been suffering a water crisis since 2017 due to the impact of drought and aging water infrastructure (Masiangoako *et al.*, 2022). The effects of the drought have highlighted the extent to which the local municipality has been neglecting Makhanda’s water and sewerage infrastructure (DCES & HSRC, 2020). Gift of the Givers have taken over the provision of fresh water to residents of the town (Swain, 2019). The municipality has implemented a “two-days on, one-day off” arrangement to deal with the

pressure of the water crisis, but some of the urban townships have reported water cuts lasting up to five days (Masiangoako *et al.*, 2022).

2.2.2.2 Floods

Extensive flooding has become a prominent hazard in the provinces of KwaZulu-Natal, Mpumalanga, Limpopo, and the Western Cape. Flooding in Limpopo has caused tremendous damage to households and infrastructure since 2010, and has cost municipalities nearly R500 million (Musyoki *et al*., 2016). Informal settlements in Cape Town are at a constant risk of annual flooding due to biophysical conditions and settlement patterns (Ziervogel *et al.,* 2016). During the summer months of 2021, heavy rainfalls and flooding in Mpumalanga washed away houses and bridges and caused roads to collapse, leading to the death of eight people (Makhafola, 2021). In 2019, excessive floods in KwaZulu-Natal caused damage of nearly R749 million, left 1400 people displaced, and caused 71 casualties (Bopape *et al*., 2021).

In early April 2022, severe flooding and landslides resulted in the destruction of 4 000 houses and damage to 8 000, and the displacement of 40 000 people (OCHA, 2022). Most of the damage was concentrated around the eThekwini Metropolitan Municipality. Alexandra is the biggest informal settlement in Johannesburg and is affected by annual flooding, which results in widespread destruction (De Wet *et al.*, 2001; Mawasha & Britz 2021). In 2016, floods washed away many informal houses erected on the banks of the Jukskei River (Danielak, 2020). Despite the annual flooding, residents of informal dwellings continue to build their structures on the river, where rising water levels wash them away (De Wet *et al.*, 2001:21).

During the winter, flooding is often experienced in the Cape Flats in Cape Town due to heavy rainfall and a high water table (Drivdal, 2016). In the winter of 2008, 16 000 people were affected and R1 billion worth of damages was reported (Dube *et al.*, 2021). The lack of proper infrastructure, drainage systems and planning increase the vulnerability of people living in informal settlements on the Cape Flats (Drivdal, 2016).

2.2.2.3 Sinkholes

The geology of certain urban areas also exposes communities to disasters. The underlying dolomite in provinces such as the Northern Cape, North West, Gauteng, Mpumalanga, and Limpopo causes sinkholes to develop (Figure 2-1 below), which causes structural damage, injury, and even death (Oosthuizen & Richardson, 2011). Gauteng has an estimated population of 15.5 million people (Stats SA, 2020) who reside in cities such as Pretoria, Johannesburg, and Soweto. The dolomite in the Gauteng province (see Figure 2-1) is concerning in light of the fast and

unplanned urbanisation in the region (Coetzee & Van Niekerk, 2013; Heath & Constantinou, 2015). Oosthuizen and van Rooy (2015) conducted a study on the central business district (CBD) of Centurion in the southern part of Pretoria. The study found that 119 sinkholes had collapsed up to mid-2012; 69.7% of these sinkholes were classified as a medium hazard for sinkhole formation; and 93% of the instability of the CBD was due to man-made disturbances of the natural ground conditions.

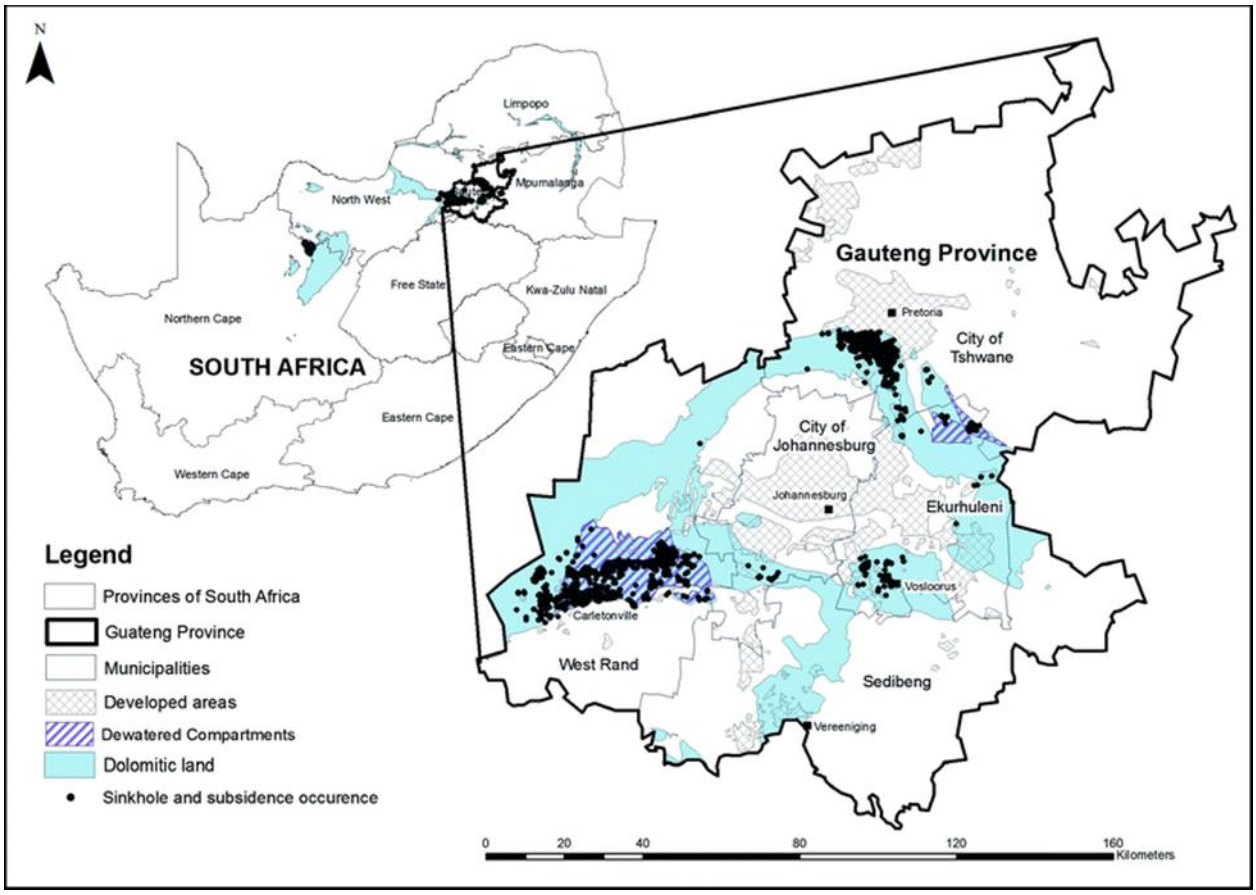


Figure 2-1: A map of sinkholes located in the Gauteng Province (Heath & Constantinou, 2015).

2.2.2.4 Wildfires

The intensity and frequency of seasonal fires are determined by weather and climate; however, its behaviour and ignition are determined by ignition mechanisms and precipitation (Strydom & Savage, 2017). Wildfires threaten homes, families, infrastructure, and ecosystems, and can cause just as much damage in rural areas as in urban areas (Heyns *et al*., 2021). This was apparent during the 2017 Knysna fires that destroyed nearly 15000 hectares over a period of four days, causing the death of seven people, damaging 800 buildings, and destroying over 5000 hectares of commercial forestry plantations (Kraaij *et al*., 2018). This led to an estimate of R3 billion in damages to the South Africa government, insurance, and forest industries (EM-DAT,

2021). Earlier in 2021, South Africa was plagued by more wildfires on the slopes of Cape Town's Table Mountain (Goldbaum & De Greef, 2021). According to reports, over 200 firefighters took part in combating the fires that burned 600 hectares and destroyed several buildings – some of historical value – such as the Jagger Library of the University of Cape Town (Gabbert, 2021; Bhengu, 2021). Wildfires are predicted to occur more frequently as climate change results in unusually high temperatures and droughts (CRED, 2015a).

2.2.2.5 Informal urban settlement fires

Urban and settlement fires are also common in South Africa, especially in informal settlements (Wang *et al.*, 2021). The informal settlements in Cape Town have been the focus of many studies of urban settlement fires, as nearly 2000 fires occurred in 2016 and 2017 alone (Wang *et al.*, 2020). These fires break out on a weekly basis, destroying homes and further crippling already fragile livelihoods (Pharoah, 2012). In March of 2017, four people were killed in the Imizamo Yethu informal settlement fire outbreak in Cape Town, displacing 9700 people and destroying 2194 informal dwellings (Kahanji *et al.*, 2019). It took 170 firefighters 13.5 hours to extinguish the blaze while navigating the narrow alleyways between houses (Kahanji *et al.*, 2019).

These informal settlements are vulnerable due to limited or no access to running water. As informal housing does not comply with building regulations, fire hydrants are absent (Pharoah, 2012). With the Alexandra fire of 2018, where 500 structures were destroyed, firefighters were unable to locate fire hydrants, as residents had erected their homes over the fire hydrants to use as domestic water source (Walls *et al.*, 2019). In 2015, a fire in Masiphumelele destroyed 1000 homes, left 4000 people homeless, killed two, and caused infrastructure damage of approximately R30 million (Walls & Zweig, 2017). Many of these makeshift homes are made from cheap and highly combustible building materials. Additionally, homes are built very closely together, increasing the risk of and rate at which residential fires spread (Gibson *et al.*, 2021). Fires are often caused by unsafe electrical connections, and the use of domestic fuels such as oil, gas, candles, and open fires for heating, lighting, and cooking purposes (Gibson *et al.*, 2019).

2.2.2.6 Overall risk profile of South Africa

In order to gain a holistic understanding of potential risks that could affect South Africa's urban environment, it is crucial to interrogate disaster events reported to international disaster databases. Table 2-1 in particular demonstrates the disasters recorded by EM-DAT (Emergency Event Database) for South Africa since 2015.

Table 2-1: Disaster history of South Africa since 2015 (adapted from EM-DAT, 2021).

Year	Date	Disaster	Occurrence	Province/ *National*	Area	People affected
2015						
	Feb, 25	Technological Disaster	Industrial accident at gold mine	Gauteng	Johannesburg	18 killed
	Apr, 28	Technological Disaster	Railway accident	Gauteng	Johannesburg	241 (1 killed)
0262	July, 17	Technological Disaster	Collision of two trains	Gauteng	Johannesburg	300
0360	Aug, 17	Technological Disaster	Bus falls from bridge	KwaZulu-Natal		21 (15 killed)
0388	Aug 29	Technological Disaster	Bus accident	Eastern Cape	Butterworth	54 (34 killed)[1]
0387	29	Technological Disaster	Mini-bus accident	Eastern Cape	Between Cradock and Graaff-Reinet	14 (9 killed)[2]
9500	2015-2017	Climatological Disaster	Drought (due to El Niño, with additional heat waves)	KwaZulu-Natal Free State Limpopo Mpumalanga North-West Western Cape		2,7 million
0520	Nov 29	Technological Disaster	Fire in informal settlement	Western Cape	Masiphumelele	4000
0519	29	Technological Disaster	Road accident	Gauteng	Near Westonaria	19
	Dec, 28	Technological Disaster	Informal settlement fire	Western Cape	Hout Bay	1500 (9 killed)
2016						

[1] https://www.gov.za/speeches/minister-dipuo-peters-butterworth-willowvale-bus-crash-and-wapadsbergpass-road-crashes-29

[2] https://www.dispatchlive.co.za/news/2015-08-29-breaking-news-29-killed-in-ec-horrific-bus-crash/

0036	Jan 1-10	Meteorological Disaster	Heat wave (45'C)	North-West	Ngaka Modiri Molema	20
0210	Jun 23	Technological Disaster	Collision between two trains	KwaZulu-Natal	Lamontville (Durban)	121
	Jul, 25-Aug, 3	Hydrological Disaster	Floods (due to heavy rain)	Western Cape KwaZulu-Natal	13 Towns and municipalities affected[3]	6900 (7 killed)
	Nov, 9	Hydrological Disaster	Floods	Gauteng KwaZulu-Natal		600 (6 killed)
			2017			
0120	Apr 21	Technological Disaster	Bus accident	Gauteng	Near Pretoria	19
	May, 14-19	Hydrological Disaster	Flood	KwaZulu-Natal	6 Towns affected[4]	200 (3 killed)
9211	May-2018	Climatological Disaster	Drought	Western Cape, Eastern Cape, Northern Cape		(1 267 028 000)
	Jun, 07-13	Climatological Disaster	Wildfire	Western Cape	Knysna	5500 (9 killed)
0178	Jun 07-08	Meteorological Disaster	Lightning/ Thunderstorms (caused additional fires and floods)	Western Cape	All along the coast[5]	6918
	Oct, 09-10	Meteorological Disaster	Lightning/ Thunderstorms	Gauteng	Johannesburg Ekurhuleni West Rand	518 (10 killed)

[3] Western Cape (Cape Town, Phillipi, Khayelitsha), KwaZulu-Natal (Durban, Cato Manor, Amanzimtoti, Inanda, Ntuzuma, KwaMashu, Umlazi, Yellow Wood Park, Chatsworth – EThekwini Metropolitan Municipality, Ugu District)

[4] Nquthu (Umzinyathi District), Zinkwazi (iLembe District), Mzingwenya (Uthungulu District), Umzumbe Municipality, uMdoni, uMuziwabantu (Ugu)

[5] Includes Kraaifontein, Lavender Hill, Strand, Kalkfontein, Delft, Mfuleni, Mandalay, Hout Bay, Kraaifontein (Cape Town), Rheenendal, Welbedacht, Knysna, Pacaltsdorp, Mossel Bay, George to Plettenberg bay (Eden), Welbedacht (Cape Winelands).

			(caused additional floods)	KwaZulu-Natal	Nqutu Durban	
2018						
0003	Jan 04	Technological Disaster	Collision between truck and train (caused additional fire)	Free State	Near Kroonstad (200km SW of Johannesburg)	254 (19 killed)
0022	Jan 09	Technological Disaster	Collision between two trains	Gauteng	Near Johannesburg	200
0392	Oct 19	Technological Disaster	Road accident	Limpopo		27
2019						
	Jan, 1-Dec, 31	Climatology Disaster	Drought	*South Africa*		750000
	Feb, 03	Technological Disaster	Industrial accident (Coal mine explosion)	Mpumalanga	Gloria (near Middelburg)	18 killed
	Mar, 8-12	Hydrological Disaster	Flood	KwaZulu-Natal	Ntuzuma, Verusalam, Inanda and KwaMashu towns	10 killed
0176	Apr 21-25	Hydrological Disaster	Floods and landslides (due to heavy rains)	KwaZulu-Natal Eastern Cape Free State		1000 (73 killed)
0182	May 02	Hydrological Disaster	Floods (due to heavy rains)	Eastern Cape		13 killed
0548	Nov 11	Meteorological Disaster	Severe and convective storms	KwaZulu-Natal	Inanda Town (North of Durban)	20 (4 killed)
0607	Dec 02-11	Hydrological Disaster	Floods (due to heavy rains)	Gauteng	Pretoria	3500 (2 killed)
2020						
0050	Feb 07-10	Hydrological Disaster	Flash floods (due to heavy rains)	Gauteng	Johannesburg	200 (3 killed)

	Mar, 02-03	Technological Disaster	Road accident	Eastern Cape	Near Qolweni	60 (25 killed)
0489	Nov 17-21	Meteorological Disaster	Severe and convective storms (additional hail and lightning storms)	KwaZulu-Natal Gauteng Eastern Cape Free State	 Tshwane City (Pretoria) Mthatha	210 (10 killed)
2021						
0036	Jan 24	Meteorological Disaster	Cyclone 'Eloise' (additional flooding)	KwaZulu-Natal Mpumalanga Limpopo	15 Towns affected [6]	3200 (4 killed)
0074	Feb 01-15	Hydrological Disaster	Floods (due to heavy rains)	Mpumalanga Free State Gauteng Limpopo KwaZulu-Natal Northern Cape		400 (31 killed)
0216	Apr 12-18	Climatological Disaster	Wildfires	Western Cape	Cape Town	
0258	May 03-09	Hydrological Disaster	Floods	Western Cape		

Table 2-1 demonstrates the disasters recorded by EM-DAT (Emergency Event Database) for South Africa since 2015. The table demonstrates a trend, which is that the sites of disaster are mostly urban areas/cities or highly populated provinces. It is apparent that technological disasters also pose a major threat in South Africa. Technological disasters include railway accidents, bus accidents, road accidents, industrial accidents, and informal settlement fires. Transport-related accidents are particularly damaging, specifically railway accidents, as they occurred most frequently – especially in 2015 and 2018. The industrial accidents that occurred in 2015 and 2019

[6] Umkhanyakude, Zululand (KwaZulu-Natal Province), Ehlanzeni, Mbombela, Bushbuckridge, Nkomazi, Thaba Chweu, Gert Sibande, Chief Albert Luthuli (Mpumalanga province); Capricorn, Lepelle-Nkumpi, Molemole, Mopane, Vhembe (Limpopo province).

occurred in mines. The two informal settlement fires happened in and around the City of Cape Town and affected the lives of 5500 people. According to the EM-DAT (2021) database, the informal settlement fires that occurred in 2015 are identified as miscellaneous accidents, meaning that the incident was caused by various triggers and people living too close to each other.

El Niño has been the cause of severe droughts and heatwaves in South Africa since 2015, with the Western Cape, Eastern Cape and the Northern Cape bearing the brunt. The country has suffered frequent flooding since 2016 with KwaZulu-Natal, the Eastern Cape, Western Cape, and Gauteng provinces and Johannesburg, Pretoria, Cape Town, and Durban most often hit. These floods are the result of heavy rains and can even lead to landslides. An increase in severe and convective storms with additional hail, thunder and lightning has also been apparent since 2017. These storms have affected urban areas such as Durban, Johannesburg, Pretoria, and large parts of the Western Cape. The Western Cape has also experienced two major wildfires since 2017. The effects of Cyclone Eloise were also felt in KwaZulu-Natal, Mpumalanga, and Limpopo as 3200 people and 640 households were affected by heavy rains and flooding (IFRC, 2021).

According to EM-DAT (2021), 87% of the disasters experienced in South Africa in the last decade are climate related. Floods occur most commonly, affect a large part of the population, and cost the economy millions in damages and earnings lost. Other disasters include storms, wildfires, drought, landslides, and extreme temperatures. The drought of 2015 lasted until 2017 and influenced the entire country and 2.7 million citizens (EM-DAT, 2021). This drought had an estimated financial cost of US$250 million (ZAR3.5 billion).

In South Africa and the world, floods, droughts, and wildfires affect a large number of people, leaving many displaced or injured and causing severe damage to infrastructure and economies. Socio-economic conditions are the primary reason for the escalation of many risks and hazards to urban disasters (Pharoah, 2012). Consequently, the next section takes a closer look at some of the main socio-economic drivers of South Africa's urban disaster risks.

2.3 Socio-economic drivers of urban disaster sin South Africa

Urban disasters are influenced by different underlying risk factors such as location, exposure to hazards, and vulnerability levels that are further increased by poor governance, misuse or exploitation of resources, and environmental degradation (UNDP, 2010). Despite the variety of drivers of urban disasters, this section focuses on the socio-economic aspects that are the results of South Africa's current level of economic and social decline. Ward and Shively (2017) state that the overall vulnerability of a society is determined by the political, economic, and social ideologies and structures that shape its functioning. It is predicted that countries in Africa and Asia will see

significant urban growth and development within the next two decades (Padgham *et al*., 2015). However, these countries consist mostly of low and middle-income regions that are pressured by the increase in urbanised poverty, which often occurs when the rate of urbanisation exceeds economic growth (Zhang, 2016). High levels of urbanised poverty in least developed countries (LDCs) and developing countries lead to elevated risks of disaster in urban areas.

2.3.1 Developmental context of South Africa

Statistics show that Africa is the continent with the highest number of LDCs in the world: 33 of the world's 47 LDCs are found on the continent (UNDP, 2021). LDCs are defined by the United Nations as countries with low-income levels that face serious structural impediments to sustainable development (UN, 2018a). Although South Africa does not fall under the classification of an LDC, it is still considered a developing country (UN, 2020). South Africa is rich in mineral resources that, historically, have ensured economic growth. However, it remains a developing country with high unemployment (32.6%) and poverty (55.5%) rates, and deeply embedded socio-economic inequalities (Arndt *et al*., 2018; Bakari & Ahmdi, 2018; Cook, 2019; Tenza, 2020; World Bank, 2020; Stats SA, 2021a). Many developing countries face challenges when adopting structural measures to reduce and manage disasters and climate change (Kita, 2017). However, Pelling and Wisner (2008) argue that, despite the world's view of Africa, the continent is being constantly urbanised and its disasters are multidimensional; but its countries have an indigenous capacity for disaster risk management. Since 2016, all 55 countries in Africa – including South Africa – have planned and/or implemented DRR strategies that correspond with the requirements of the Sendai Framework for Disaster Risk Reduction, 2015-2030 (SFDRR) (Van Niekerk *et al.*, 2020; UNDP, 2021). These strategies and aims are later discussed at length in Chapter 3. As can be seen from the above discussion, South Africa still has high levels of social inequality, high poverty and unemployment rates with many people still having poor or no access to education, healthcare, public service, and housing (Taylor & Yu, 2009; Cook, 2019; Gordon *et al*., 2020). Those most severely affected are living in rural areas or overpopulated settlements surrounding urban areas.

2.3.2 Informal settlements and overcrowding

In South Africa, the most socio-economically vulnerable people are those living in informal or overcrowded settlements, where the risk of hazards is that much higher (Wekesa *et al*., 2011). These hazards include fires, flooding, diseases, water shortages and a lack of service delivery (Landau *et al*., 2011; Musungu *et al,* 2012; Wang *et al*., 2020). The level of exposure to disasters are determined by socio-economic factors such as income, employment, education etc., as it defines people or a country's coping capacity (Ibem, 2011; Taş *et al.*, 2013). The UNDRR (2021a)

defines vulnerability as "*the conditions determined by physical, social, economic and environmental factors or processes which increase the susceptibility of an individual, a community, assists or system to the impacts of hazards"*. Rapid urbanisation, human activities and interaction, and climate change factors in African city centres increase people's vulnerabilities to various hazards (Salami *et al.,* 2017). Urban spaces are at risk from climate-induced disasters such as heatwaves, drought, and floods, endangering the large populations that inhabit it (Lankao & Qin, 2011).

Jamshed *et al*. (2020) argue that the size of cities and urban areas influences hazard vulnerabilities due to the number of resources available to handle and recover from disasters regardless of the population size. In other words, people living in cities are less vulnerable to disasters than those living in rural areas due to the higher level of resource accessibility. However, people living in urban areas face different forms of hazards compared to those living in rural areas, such as living in dangerous and poor conditions, exposure to pollution, and overcrowded living spaces (Abunyewah *et al.*, 2018). Even though cities generally have more resources available, they are not necessarily accessible to all residents (Salami *et al.*, 2017; Abunyewah *et al.*, 2018). For instance, a study by Rhodes and Mckenzie (2018) found that – after more than 20 years of democracy – access to piped drinking water and flushing toilets in South Africa is still considered a privilege. South Africans' access to these water facilities, especially sanitation, is determined by their household socio-economic status. People living in rural areas are especially affected by a lack of water service, but – although they live "in the city" – people living in informal settlements in urban areas also fall under this category (Rhodes & Mckenzie, 2018).

Rural-urban migration in South Africa has also contributed to the unsafe and overcrowded conditions in informal settlements (Stats SA, 2006). The influx of rural-urban migrants contributes to the shortage of adequate housing, basic services, and infrastructure (Tacoli *et al.*, 2015). For example, Johannesburg is a metropolitan city in South Africa and, since the 1990s, the upkeep and maintenance of buildings have been severely neglected by landlords, tenants, and the government (Dykes, 2004). In other cases, landlords have abandoned buildings, leaving it at the mercy of tenants who tend to overpopulate the buildings (Wilhelm-Solomon, 2016). In South Africa, more than a quarter of all formal and low-cost dwellings are overcrowded, with most occupants being from previously disadvantaged groups (black or coloured South Africans) (Nkosi *et al.*, 2019). The distinction between formal and informal housing in formalised townships is becoming increasingly blurred, as low-income housing is becoming informalized due to makeshift dwellings being built in backyards to accommodate more people or rent out for income (Pharoah, 2012).

2.3.3 Poverty

People who live in poverty or in communities with few resources are the most severely affected by disasters and their aftermaths. It is becoming increasingly important to sustain the livelihood of people before the occurrence of disasters as sustainable development and disaster risk management (DRM) reduces the overall effect of disasters on communities (Pairama & Le Dé, 2018). In other words, according to Dilley *et al*. (2005), 55 percent (30 million) of South Africa's population is living in poverty. Poverty causes people to migrate to urban areas in hope of a better livelihood (Castle, 2009). Unfortunately, this migration often has the opposite effect of causing people to make unsafe decisions out of desperation for survival (e.g., settling on dolomitic land because it is close to industrial activity and employment opportunities) (Abunyewah *et al.*, 2018). Hazardous conditions created by rapid and unplanned urbanisation are more likely to collapse in the event of disasters such as flooding and fire. It also creates breeding grounds for diseases and exposes more people to man-made hazards such as chemical spills, explosions, and pollution (Garenne, 2010; Zhou & Liu, 2012; Brandolini *et al*., 2018). Human actions have been labelled as main causes of urban vulnerability due to our exploitation of natural resources and increased environmental degradation (Ibem, 2011). Taş *et al.* (2013) state that vulnerabilities in communities can be reduced even if the hazard itself cannot.

2.3.4 Uncontrolled urbanisation

Urbanisation across the world causes cities to expand without any consideration to DRR (Taş *et al.*, 2013). Many developing countries have tried to balance both environmental concerns and socio-economic development but lack the necessary land-use management expertise and resources (Musakwa & Van Niekerk, 2013). The effects of disasters reflect the current social order i.e., in developing countries, poverty is often a major driver of disaster impacts (March & León, 2013). In many cases, the urban areas are more vulnerable due to the growth of the urban population exceeding the physical development of the city's infrastructure, economic growth and even the rate of global climate change (Ibem, 2011). The frequency of building in high-risk areas is also more common than it was 50 years ago (CRED, 2015b). The lack of disaster management and risk reduction policy development and enforcement further elevates urban vulnerability (Ibem, 2011). An example of this is the erection of informal settlements in hazard-prone areas with unsustainable materials and without compliance to building policies or risk reduction plans, as is the case with many townships in South Africa (Ibem, 2011; Walls *et al.*, 2019).

It is important to understand all of the underlying socio-economic causes of urban disaster risk mentioned to improve the effectiveness of DRR interventions in urban areas. By ignoring these underlying causes, disasters may continue to occur and increase in severity (Roth & Becker,

2011). DRR should be integrated into socio-economic development activities and is essential to ensure the sustainability of future developmental efforts. Another aspect that influences both DRR and socio-economic factors are the effects of climate change. The following section explains the influence of climate change on the socio-economic status and risk profile of urban areas in South Africa.

2.4 Climate change and the future of South Africa's risk profile

Overall, recurring disasters in South Africa are hydrometeorological extremes such as floods, drought, wildfire, and extreme weather conditions (Chapungu, 2020; EM-DAT, 2021). These types of disasters are likely to become more frequent and more intense with the advent of climate change (Botai *et al.,* 2015). The effects of climate change have a negative impact on economic, environmental, and social systems (Aleke & Nhamo, 2016). Predictions indicate that, within the next 50 years, the western part of South Africa will become increasingly drier and the eastern part, wetter (IFRC, 2012). Thus, the risk of droughts and floods and their effects on urban areas are greatly increased.

South Africa is situated in one of the most vulnerable parts of the world in terms of climate change (Rogerson, 2016). The increase in annual temperatures in this region is higher than in any other part of the world (SARUA, 2014). South Africa's geographic positioning makes it extremely vulnerable to the effects of El Niño and La Niña. As an emerging environmental issue in the country, climate change is likely to increase the intensity and impact of El Niño and La Niña cycles (IFRC, 2012; Lakhraj-Govender & Grab, 2019). The impact of climate change on the intensity of El Niño events has already had a severe effect on the South African agriculture sector when droughts in 2015 and 2016 caused the average area of maize planted to drop by 43% compared to the previous 10 years (Ainembabazi *et al.*, 2018). Lower food production in rural areas manifests in increased food insecurity in urban areas.

The National Disaster Management Centre (NDMC) of South Africa also agrees that the country's disaster risk levels are increasing, especially in terms of extreme weather hazards such as severe storms, droughts and even cyclones. In recent years, South Africa has been more exposed to the effects of cyclones (NDMC, 2016). In March of 2019, the tropical cyclone Idai made landfall in Mozambique. It caused severe floods in KwaZulu-Natal in April 2019, during which 71 people died and 1400 were displayed (Bopape *et al*., 2021). Extreme weather events such as these cause people to question South Africa's level of extreme weather preparedness and climate change adaptation abilities compared to that of other countries around the world (Boeckmann *et al.*, 2019).

The NDMC (2016) also states that large populations in urban and rural areas of South Africa live in chronic disaster vulnerable conditions, as they are exposed to both natural and man-made hazards. In other words, many South Africans live in conditions that leave them exposed to the effects of long-term disasters. Climate change will not only drive an increase in hazard triggers for disasters in South Africa, but will also exacerbate existing socio-economic vulnerabilities. Consequently, this will lead to a more precarious disaster risk profile categorised by overall higher levels of disaster risk and exposure. This will mostly likely be hardest felt by communities in urban areas due to projected levels of urbanisation for the country.

2.4.1 Climate change and its impacts on economic sectors: The case of the South African tourism sectors

Some of the impacts of climate change-related disasters have already been felt by certain sectors and the economy of South Africa. For instance, the tourism sector in South Africa is a major contributor to the country's economy, bringing in nearly R130.3 billion in 2017 and 2018 (OECD, 2021; Stats SA, 2021b). Extreme weather conditions such as drought and tropical storms cause great inconvenience to the tourism industry as it often results in financial losses and threatens the lives of clients and staff (Rogerson, 2016). Tourism provides financial stability for many South Africans living in urban, peri-urban, and rural areas in South Africa and is the backbone of socio-economic growth (Musavengane *et al.,* 2020). During January of 2012, a local state of disaster was declared in the Mopani District Municipality in Limpopo due to severe floods caused by the tropical storm Dando (Fitchett *et al*., 2016). This storm caused damage to tourism lodges (estimated at R58.92 million) throughout the area and lead to the collapse of the dam wall connected to the R531 arterial road (Fitchett *et al*., 2016). Along with infrastructure damage, 24 lodges reported losing R4.23 million in business revenue and R458 600 in long-term expenses, insurance, mitigation, and adaptation (Fitchett *et al*., 2016). This is concerning, as the Limpopo province employs approximately 32,888 people in the tourism industry, which is more than the construction, electricity, or finance industries (Mathivha *et al.*, 2017). Loss of employment in certain sectors of the economy could trigger mass relocations to urban areas that are ill equipped to deal with and provide services for the influx of new inhabitants. This unplanned urbanisation could lead to heightened disaster exposure and risk.

Climate change is probably one of the biggest culprits when it comes to urban disasters, as it could have different effects on the various areas in a country. Climate change is an important aspect of DRR and must be taken into consideration when integrating it with UP. On the other hand, proper UP could play a significant role in reducing urban disaster risk in South Africa and

the rest of the world. The following section defines UP to further elaborate on the need for DRR and its integration with UP.

2.5 Urban planning defined

The profession of urban planning (UP) had its origin in England during the aftermath of the Industrial Revolution in the 1800s (Hall, 2014). In year 1884, Queen Victoria appointed the Royal Commission on the Housing of the Working Classes to devise a plan to reduce the pollution that overwhelmed the city of London and to improve the slums and poor living conditions of the lower classes.

Taylor (1998) states how the first definition of the term 'urban planning' included the physical planning and design of society in close cooperation with the fields of civil engineering and architecture. The main theory of UP involves designing a 'blueprint' of the 'ideal city'. According to Taylor (1998), there are three main aspects of defining UP, namely, i) planning as physical planning and design, ii) planning as a rational process, and iii) planning as a political process.

i. Physical planning and design

Urban planning is regarded as an activity that is about the physical environment and the physical development thereof, as well as incorporating and assisting the development of 'social' and 'economic' elements (Taylor, 1998). Through the physical layout of an urban area, social and economic elements can be influenced in a beneficial or detrimental way. The design aspect emphasises using the existing aesthetic character and qualities of the landscape as a basis for future plans to improve the quality of that environment (Taylor, 1998). Similarly, Wang and Vom Hofe (2008) define UP as an activity that focuses on shaping people's living environment on various scales. In conclusion, these plans are viewed as blueprints or masterplans of future towns.

ii. Rational process

During the 1960s, two approaches to UP emerged, namely the 'systems view' and the 'rational process' (Taylor, 1998). The former was mainly drawn from what the objectives for the area are and what should be planned for it (Taylor, 1998). Thus, the system view occurs with one big picture in mind and all efforts directed towards achieving it. The latter is the theory of the planning process that occurs in a rational decision-making fashion, therefor taking everything a step at a time (Taylor, 1998). As of late, the process of UP became more concerned with reaching a certain deadline and starting with generalised diagrammatic picture than creating unique detailed structures (Hall & Tewdwr-Jones, 2011). There are five main steps of the rational planning process: identifying the problem or the goal, considering alternative ways to solve the problem,

evaluating any solutions arrived at in the previous step, implementing these plans, and monitoring the outcome and any side-effects (Taylor, 1998). Thus, rational planning is considered an ongoing process that adapts and changes according to circumstances. This also separates it from the physical or 'blueprint' planning approach. However, due to the ever-changing nature of UP, this approach cannot provide simple or formulaic answers to complex issues (Taylor, 1998).

Urban planners can influence a community's future, as they are able to combine a community's history with the desired economic, environmental, social, and even cultural growth (Wang & Vom Hofe, 2008). Since the 1960s, the basis of UP has shifted from being extremely detailed to focusing on broader principles (Hall & Tewdwr-Jones 2011). Currently, urban planners have become more aware of the importance of a community's wellbeing, non-spatial aspects of public management, and the influence of government policies and services (Lichfield *et al*., 2016). The aim of UP has shifted to ensuring economical, physical, and social security and prosperity for an area (Amin & Hasim, 2014).

iii. Political process

This last process of planning highlights how UP is not based only on scientific or technical judgment, but on political aspects (Taylor, 1998). This is because legislation and government procedures determine many of the final decisions made about the execution of these plans (Taylor, 1998). All urban development plans have to pass through some form of political process. However, some political controversy does emerge in terms of public control over private property rights. Planners are meant to act as 'advocates' for the client groups and the public, including minority groups, during the political process (Taylor, 1998). Thus, it is necessary to establish urban democracy where public citizens can play a role in decisions about public policy (Taylor, 1998). Decisions about the use and development of land affects various interest groups, which could be 'political' in a sense (Taylor, 1998). UP is multi-dimensional because it influences the economic, environmental, physical, and social functioning of cities (Barton & Tsourou, 2000). More recent definitions of UP echo this multi-disciplinary characteristic.

It is important to note that UP is a multifaceted profession that combines skills and knowledge from related fields such as architecture, civil engineering, public administration, economics, and social development (Taylor, 1998). However, while UP initially started as a discipline that focuses on the spatial planning and design of the urban environment, it evolved into a multi-dimensional discipline that includes various aspects, including the physical, social, economic, and natural environments.

Since the end of Apartheid, urban planners have been tasked with developing and reconstructing the spatially segregated and highly fragmented urban society (Donaldson, 2001). Currently, South African cities are a combination of colonial, formal apartheid and modern urban spaces that where originally meant for 'white' people only (Maharaj, 2020). Post-apartheid planning continues to be influenced by international trends such as enabling greater socio-economic and special flexibility by replacing detailed site-planning guidelines with more holistic development concepts (Steenkamp & Winkler, 2014). The socio-economic differences between races continue to influence the spatial inscription of class in urban spaces (Maharaj, 2020). This includes the poor coordination of institutional approaches to UP at central, provincial, and local level (Maharaj, 2020). There is still a need to find a balance between the interests of the private sector and economic growth with social fairness and inclusion of public goods (Totaforti, 2020).

History shapes the culture and urban setting of cities. UP is a combination of spatial planning and geological location that influences the economic, environmental, physical, and social aspects of an area. Strategies that are decided upon may have an important effect on how an area is shaped and whether it flourishes or weakens. In some cases, rapid urbanisation delays strategic spatial planning efforts and lead to challenging situations such as urban disasters. Physical exposure to natural elements does not automatically increase risk. However, when the rate of urban growth is not appropriately managed, it often leads to urban development in hazard-prone locations. Incorporating DRR techniques in building standards and UP can aid in avoiding disasters or mitigating their effects (Pelling, 2004). Proper UP can serve as a useful tool to minimise the impact of disasters in urban areas. In the next section, UP is discussed as an effective tool for reducing disaster risk in urban settings.

2.6 Towards the integration of urban planning and disaster risk reduction

Disasters reportedly affect more people living in urban areas than rural areas, which increases the need for DRR-influenced UP practices (León & March, 2017). Since the early 2000s, researchers and organisations have recognised the need for integrating DRR with UP; however, very little has yet been done in terms of implementation (Tearfund, 2005; Wamsler, 2006). The incorporation of DRR into UP practices remains minimal, even though various countries have recognised its importance (Wamsler *et al*., 2013). Etinay *et al*. (2018) state that urbanisation, environmental degradation, poor urban governance, and socio-economic inequality often shape the hazards that lead to extensive disasters. UP often has a strong influence on exacerbating or mitigating these factors (Twigg, 2004). Urban problems such as lack of service, poverty, pollution, and unemployment can often be traced back to poor urban management and planning (Barton & Tsourou, 2000).

Various authors have recognised UP as a key element of DRR (Pelling, 2003; Wamsler, 2004, 2006; Pelling & Wisner, 2008; León & March, 2017). UP that is conscious of the influence it has on the vulnerability of urban areas could decrease future disaster impacts by being aware of the structures and environments in which they are created (Wamsler, 2006). Perrow (2008) states that, "Society has shifted from external risks to manufactured risks. This is the outcome of increasingly large and complex technological systems, prone to have normal accidents due to their multiple components and relationships, not always clearly understood." Arguably, one of the areas where disaster risk is most manufactured in the contemporary world is in urban areas. This is due to the concentration of people, proliferation of unplanned settlements, poverty, and increased exposure to environmental hazards often found in urban areas (Bendimerad, 2003; Malalgoda *et al.*, 2013; Adelekan *et al.*, 2015). In this context, the possible contribution of integrating UP into DRR relates to the rearrangement of land uses and the adjustment of spatial arrangements of functions and facilities in urban areas to help mitigate the prevalence and proximity of hazards and vulnerabilities in these areas (León & March, 2017). The use of spatial planning in DRR helps to regulate long-term use of space and minimise human-induced threats and natural hazards (Chmutina *et al*., 2014).

DRR and UP have similar objectives that include the conservation of livelihoods, social protection, and alleviating the vulnerability of urban areas (March & León, 2013). These aims may well be accomplished if the two fields were to converge (Benson & Twigg, 2004). March and Kornakova (2017) state that UP has considerable potential for DRR; however, there is still an ongoing need to understand what UP is and how it is conceptualised and implemented.

Further merging between the two disciplines lies in the understanding of sustainability and resilience (March & León, 2013). Without understanding the dynamics of an area, creating sustainability for resilience, and developing a sense of community becomes increasingly complex (Wang & Vom Hofe, 2008). Amin and Hasim (2014) state that, "*Strengthening the instruments for the implementation of DRR and risk assessment is needed to ensure that more sustainable UP can be implemented in order to accommodate rapid development that goes hand in hand with rapid urban population growth in the future.*" Implementing sustainable development will lead to creating urban areas that are more resilient to the effects of disasters. Sustainable development depends on DRR and adjustment to climate change (Wamsler *et al*., 2013). The United Nations' Sustainable Development Goal 11 aims to make cities and human settlements safe, inclusive, sustainable, and resilient by 2030, and draws on DRR to achieve these goals (UN, 2016). Thus, the logical course would be for UP practitioners to include and combine these strategies and techniques. DRR, along with disaster risk management, are systemic approaches used to reduce the impact of disasters on built environments and climate change (Etinay *et al*., 2018). DRR and

climate change adaptation both aim to reduce the impact of climate-related disasters and by integrating it with other sectors such as UP, this can be achieved (Wamsler *et al*., 2013).

The necessity of integrating DRR and UP has also been highlighted by various United Nations agreements and countries since 1994 (Amin & Hasim, 2014). The Sendai Framework of Disaster Risk Reduction is only one of the latest frameworks to address building urban resilience against urban disasters that damage infrastructure and disrupt the functioning of basic services, and health and educational facilities (Etinay *et al*., 2018). n total, eight declarations and policy frameworks categorically advocate for the integration between the two fields, and Table 2-2 below highlights some of the specific provisions for integration from these documents. Some of these policies are also elaborated upon in Chapter 3.

Table 2-2: Policy frameworks highlighting the DRR and UP integration (Amin & Hasim, 2014).

Year	Declaration
1994	**Yokohama Strategy and Plan of Action for a safer World**
	Plan of Action II 11.I. '*Incorporate disaster reduction prevention or mitigation in socioeconomic development planning based on the assessment of risk*' [7].
1996	**UN Habitat Agenda**
	Subheading B: Sustainable human settlements Section 27(i) '*Reducing the impact on human settlements of natural and human-made disasters*'[8]
2001	**UN Declaration on Cities and Other Human Settlements in the New Millennium**
	Subheading D: Taking further actions Section 43 – '*Are committed to improving prevention, preparedness, mitigation and response capacities, with the contribution of national and international cooperation network, in order to reduce the vulnerability of human settlements to natural and human-made disasters and to implement effective post-disaster programmes for the*

[7] IDNDR (International Decade for Natural Disaster Reduction), 1994. Yokohama Strategy and Plan of Action for a Safer World: Guidelines for Natural Disaster Prevention, Preparedness and Mitigation.

[8] Habitat, U.N., 1996. The habitat agenda goals and principles, commitments, and the global plan of action. Istanbul: UN Habitat.

	affected human settlements, aimed, inter alia, at meeting immediate needs, reducing future disaster risk and making rebuilt human settlements accessible at all.'[9]
2002	**Johannesburg Plan of Implementation**
	Subheading VIII: Sustainable development for Africa Section 71 – '*Support African countries in their efforts to implement the Habitat Agenda and the Istanbul Declaration through initiatives to strengthen national and local institutional capacities in the areas if sustainable urbanisation and human development of efficient and effective governance systems in cities and other human settlements and strengthen, inter alia, the joint programme on managing water for African cities of the United Nations Human Settlements Programme and the United Nations Environment Programme.* '[10]
2005	**The Hyogo Framework for Action 2005-2015**
	Subheading: Priorities for action 4 Section 19(n) – '*Incorporate disaster risk assessment into the urban planning and management of disaster-prone human settlements, in particular highly populated areas and quickly urbanising settlements. The issue of informal or non-permanent housing and the location of housing in high-risk areas should be addressed as priorities, including in the framework of urban poverty reduction and slum-upgrading programmes.'* Subheading: Implementation and follow-up Section 34(c) '*Mainstreaming disaster risk reduction measures appropriately into multilateral and bilateral assistance programmes including those related to poverty reduction, natural resource management, urban development, and adaptation to climate change.*'[11]
2012	**The Future We Want (Rio+20)**
	Subheading: Sustainable cities and human settlements Section 135 – '*We commit to promote an integrated approach to planning and building sustainable cities and urban settlements, including through supporting local authorities, increasing public awareness, and enhancing participation of urban residents, including the poor, in decision-making. We also commit to promote sustainable development policies that support inclusive housing and social services; a safe and healthy living environment for all, particularly children, youth, women, and the elderly and disabled; affordable and sustainable transport and energy; promotion, protection and restoration of safe and green urban spaces; safe and clean drinking water and sanitation; healthy air quality; generation of decent jobs; and improved urban planning and slum upgrading. We further support sustainable management of waste through the application of the 3Rs (reduce, reuse, and recycle). We underline*

[9] United Nations (UN), 2001. Declaration on Cities and Other Human Settlements in the New Millennium.

[10] Report of the World Summit on Sustainable Development 2002 Johannesburg, South Africa, 26 August–4 September 2002, A/CONF.199/20

[11] UNISDR (United Nations International Strategy for Disaster Reduction). 2005. Hyogo framework for action 2005–2015: Building the resilience of nations and communities to disasters.

	the importance of considering disaster risk reduction, resilience, and climate risks in urban planning. We recognize the efforts of cities to balance development with rural regions.'[12]
2015	**The Sendai Framework for Disaster Risk Reduction 2015-2030**
	Subheading: Priority for action 3 Section 30(f) '*To promote mainstreaming for disaster risk assessment into land-use policy development and implementation, including urban planning, land degradation assessments and informal and non-permanent housing, and the use of guidelines and follow-up tools informed by anticipated demographic and environmental changes.*'[13]
2015	**The 2030 Agenda for Sustainable Development**
	Subheading: Sustainable Cities and Communities [Goal 11] 11.5. '*By 2030, significantly reduce the number of death and the number of people affected and decreased by [x] per cent the economic losses relative to gross domestic product caused by disasters, including water-related disasters, with focus on protecting the poor and people in vulnerable situations*.' 11(b) '*By 2020, increase by [x] per cent the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, develop and implement, in line with the forthcoming Hyogo Framework, holistic disaster risk management at all levels.*'[14]

The table above shows that the integration of UP and DRR is gradually improving and can be seen from the emphasis in various international policies. Wamsler *et al*., (2013) states that, despite this, the full potential of UP and DRR has not yet been reached and this has a direct bearing on building the resilience of cities. Amin and Hasim (2014) note how urban planners can determine the level of vulnerability and exposure faced by people in specific locations during a disaster. UP is a key aspect of reviving existing urban spaces and creating new spaces and can potentially increase resilience in the future (Sagar, 2017). March and Kornakova, (2017) argue that, "*UP can increase resilience that will improve risk profiles by pre-establishing building*

[12] UN, 19 June 2012-The future we want: outcome of the Conference on Sustainable Development, Rio de Janeiro, Brazil, 20-22 June 2012

[13] UNISDR (United Nations International Strategy for Disaster Reduction). 2015. Sendai framework for disaster risk reduction 2015–2030. Geneva: UNISDR.

[14]UN. General Assembly. Open Working Group on Sustainable Development Goals (2014 : New York)

standards, overall allocations of service and infrastructure across communities or regions, and the assumption that risks in existing settlements are within acceptable standards."

Many urban planners strive for sustainable development and improved resilience in cities that are threatened by hazards and disasters, and that can be protected by the incorporation of DRR (Amin & Hasim, 2014). The consequences of disasters may well be avoided by combining DRR and UP initiatives during the pre-disaster phase (Wamsler, 2004; Amin & Hasim, 2014). Furthermore, León and March (2017) emphasise the responsibility stakeholders have in terms of UP because of its potential to improve disaster risk management. Urban planners, whether private or public, have the authority to include DRR measures into planning strategies and activities (Amin & Hasim, 2014). If urban planners become more are aware of the benefits and effects of integrating DRR with their current practices, the result may well be beneficial for creating safer and more prosperous communities in the long term.

2.6.1 Benefits of DRR and UP integration

There are several benefits to the integration of UP and DRR. Firstly, if UP is conscious of DRR vulnerability levels that are often caused by unplanned urban development, it can be reduced (Rivera & Wamsler, 2014). UP plays a major role during disaster recovery, rehabilitation, and resilience by instilling a focus that goes beyond restoring and building services and infrastructure and includes underlying risks in the strategic planning of towns and cities (Etinay *et al*., 2018).

Secondly, UP has both structural and non-structural benefits when incorporated with DRR. Structural benefits include engineering and technological systems and developments. The engineering part of UP is responsible for researching, advancing, and adjusting existing dangers (Sagar, 2017). Non-structural benefits are related to the development or adaptation of policies, training and awareness programmes and regulations to integrate DRR. Non-structural measures can also include stakeholder contributions to strengthening mitigation and urban configurations to increase response activities can also form part of non-structural measures (León & March, 2017).

Thirdly, the integration of DRR and UP could lead to relieving the economic pressure of disasters on society. According to Rivera and Wamsler (2014), the economic cost of disasters will continue to rise in the future, unless risk reduction measures are instituted. From an economic perspective, creating sustainable spatial environments from the start is better than adjusting and repairing them after the disaster. Proper planning processes and flood protection structures would reduce the chances of urban flooding, which would reduce pressure on the economy to provide safe water, shelter, and repairs to damages (Vorhies, 2012).

2.6.2 Role of UP techniques and design in DRR

It can be argued that the connection between the DRR and UP is related to the type of disaster, thus the risk profile, affecting human settlements and why (March & León, 2013). By using UP initiatives, especially in the pre-disaster phase, disaster risks can be reduced (Wamsler, 2004; Amin & Hasim, 2014). Designing and building an environment with the ability to absorb the effects of hazards and disasters requires knowledge of disaster prevention and mitigation (Amin & Hasim, 2014). Integration is needed to mainstream disaster risk issues for UP rather than approaching it as a separate issue (Wamsler *et al*., 2013). All current and potential threats must be considered and understood. Therefore, the overall development framework should include a sustainable, disaster-resilient built environment agenda from the beginning of the planning and construction process (Amin & Hasim, 2014).

As discussed, various authors have been encouraging the integration of DRR and UP for more than two decades (Wamsler, 2004, 2006, 2013; Pelling, 2003; Pelling & Wisner, 2008; León & March, 2017). Both DRR policies and UP practices would benefit from the integration, as both fields have the same long-term goals such as sustainability and increasing resilience in urban areas. The importance of integration has been recognised by international organisations and national governments. However, even with the benefits of integrating the two fields, there is still a delay in the integration process. These delays are divided into four impending factors and are discussed in the following section.

2.6.3 Factors impending the integration between DRR and UP

The critical question is, if the integration of the two fields is so crucial, why is there so little development? Four factors have been identified that contribute to the lack of integration between the two fields. These factors are, (1) lack of public understanding, (2) taking the wrong approach or lack of acknowledgment, (3) lack of practical experience, and (4) lack of theory and training.

Factor 1: Poor public understanding

When urban planners and developers are unable to keep up with the rate of urbanisation, informal settlements grow, and this frequently leads to disasters (Bendimerad, 2003). March and Kornakova (2017) state that, "*The occurrence of a disaster addresses the underlying UP issues and vulnerabilities, but these opportunities are frequently undermined through slow transition process from response to recovery."* Amin and Hasim (2014) state that, on a local level, non-compliance with development plans and planning guidelines is a significant obstacle. The local public – especially those living in poverty and in informal settlements – are unfamiliar with UP and

DRR policies and guidelines. In general, current approaches in UP are very reactive: disasters are responded to when they happen, instead of pre-emptively instituting measures to limit effects (Bendimerad, 2003).

Factor 2: Approach and acknowledgement

León and March (2017) are of opinion that the difficulty of integrating DRR into UP practices is due to UP's primary focus on disaster management. UP tends to focus more on the mitigation phase of disaster risk management and prefers a top-down risk reduction approach. In other words, reacting to the effects of disasters rather than actively reducing the risks that lead to hazards. If stakeholders (local, regional, national etc.) share the responsibilities, hazards could be met with maximum action (León & March, 2017).

According to Bosher (2014), there is a general lack of awareness of stakeholders' roles and responsibilities for integrating DRR into UP. The lack of applied DRR could be associated with governments viewing DRR as an additional restriction on land use (Bendimerad, 2003). Economic growth is often the main goal during development, and DRR policies are often viewed as an annoyance (Pelling, 2003). On the other hand, disaster studies often neglect UP as an asset in risk reduction measures as it is often portrayed as a strictly physical approach (such as engineering) with no social perspective (Sagar, 2017).

Other challenges include the lack of allocation of resources and investment for DRR; although policies and regulations have been established in theory, they have not been translated into real investment priorities or practical implementation (Etinay *et al*., 2018). In fact, before 2015, DRR was rarely integrated or viewed as a crucial part of national or international development programmes (Bendimerad, 2003). Consequently, the focus and practices of DRR and UP continues to be on disaster management instead of the underlying drivers of vulnerability (UNISDR, 2015a).

Factor 3: Practical experience

A study by Chmutina *et al*. (2014) illustrated that, regardless of legislation, many stakeholders outside the planning department lack practical experience in dealing with DRR. Bosher (2014) states that there is insufficient understanding of the practical use of DRR for achieving built-in resilience. Limited research has been done on the design and development of cities that are resistant to urban disaster and disaster risk (León & March, 2017). It is also possible that the research seems lacking as existing studies on the integration of UP and DRR are concentrated on megacities (Sagar, 2017). These results cannot be applied to cities in developing countries, as they consist mostly of smaller metropolitan and megalopolis cities (Amin & Hasim, 2014).

Factor 4: Theory and training

The core aspects of the integration between UP and DRR are limited and "*weakly theorised and estimated*", which hampers mutual understanding (Sagar, 2017). This is further supported by March and León (2013), who state that UP and DRR can only be successfully integrated by understanding the common and contrasting goals. Wamsler (2004) notes that most literature on this topic is limited and focuses more on the economic aspects or sustainability in terms of UP, rather than the incorporation of DRR. Sagar (2017) states that the lack of integration can also be rooted in the exclusion of DRR from urban and regional planning curricula.

2.7 Conclusion

This chapter addressed the first two research objectives of this study, namely 1) to investigate the increasing impact of disasters on global and South African urban areas; and 2) to establish the theoretical underpinnings for the integration between UP and DRR.

Population growth and unplanned urbanisation will continue to increase the challenges associated with urban disasters. Developed and developing countries fall victim to urban disasters in the form of heatwaves, wildfire, epidemics, and heavy rainfalls that lead to flooding and landslides. South Africa has been affected by severe droughts, flooding, sinkholes, wildfires and fires in informal settlements, and transport-related accidents. These disasters occur in highly populated provinces and metropolitan areas such as Durban, Johannesburg, Pretoria, and Cape Town. Droughts and flooding have had great impacts on South Africans and their economy since 2015. People living in informal settlements are more vulnerable to the effects of disasters. More studies show that the impact of urban disasters is influenced by the building standards, population growth and deficient DRR policies.

Overpopulation and informal urbanisation are not the only contributing factors, as socio-economic drivers and climate change are also influential factors. Underlying socio-economic factors often increase the impacts of urban disasters. Social inequality among citizens further increases vulnerability, as many are too poor to afford proper housing in urban areas. They have no choice but to live in overcrowded informal settlements, which exacerbates unplanned urbanisation. Climate change, on the other hand, affects people regardless of their socio-economic status. The impact of climate change-related disasters has become more prominent in South Africa. Severe flooding disrupts the functioning of the country's tourism sector, which provides employment to people of all classes and aids in the country's economic growth. Cities often hold promises of better earning potential and explains why people migrate from rural areas. The attraction of economic wealth and stability offered by cities often dominate risk reduction strategies, as people

only take the urban risk seriously once they are affected by it (Lall & Deichmann, 2012). Closer cooperation between UP and DRR may hold some solutions to urban disaster risk.

Urban planning focuses on designing and regulating the physical form of an area while still increasing the economic, social, and environmental functioning of the location and society. DRR is a systemic approach to reducing the socio-economic vulnerabilities to and effects of a disaster. Academics, governments, and organisations have realised the need for integration between the fields and, since 1994, seven frameworks highlighting its importance have seen the light. Even though some integration between UP and DRR has been noted, various challenges remain. Studies in South Africa have highlighted the potential for integrating DRR elements into UP practices. The results could lead to improved resilience in urban areas. The next chapter unpacks the frameworks that support the integration of DRR and UP through training and education.

CHAPTER 3 POLICIES THAT GUIDE THE INTEGRATION BETWEEN DISASTER RISK REDUCTION AND URBAN PLANNING

3.1 Introduction

Disasters are not natural events and have dangerous ripple effects on the socio-economic development of society (Aitsi-Selmi *et al.*, 2015). Urban planning (UP) focuses on regulating and enhancing the physical form of society, while disaster risk reduction (DRR) focuses on regulating and reducing the risks of disasters on civilisation (Aitsi-Selmi *et al.*, 2015). To aid in the management and prevention of disasters, international and national policies and frameworks have been developed. Whether disasters are man-made or of natural origin, these policies are necessary to address the aftermath and mitigate against the impact of future disasters (Thorpe *et al.*, 2015). Policies and frameworks act as guidelines for the mitigation, preparation, and prevention of disasters (Tozier de la Poterie & Baudoin, 2015).

This chapter addresses the third objective of the study, i.e., to investigate the international and national DRR policy prescriptions for the integration of DRR and UP. Firstly, the chapter unpacks the international frameworks that address the integration of DRR and UP. The international frameworks under consideration include the Yokohama Strategy, the Hyogo and Sendai Frameworks, as well as the New Urban Agenda and the Sustainable Development Goals. The chapter concludes by exploring South Africa's national disaster management policies to see whether they advocate for the integration between DRR and UP. Particular attention is paid to how the Disaster Management Act of South Africa and the National Disaster Management Framework support the integration of DRR and UP in university curriculums.

3.2 International disaster risk frameworks that advocate for the integration between DRR and UP

This section is dedicated to investigating the different international DRR policies and legislative frameworks and explain how they advocate for the integration of DRR with UP. Frameworks such as the Yokohama Strategy and Plan of Action for a Safer World, the Hyogo Framework, the Sendai Framework, and other collaborative frameworks are discussed here.

3.2.1 Yokohama Strategy and Plan of Action for a Safer World

Global cooperation on DRR has undergone dramatic development since 1994, when the Yokohama Strategy and Plan of Action for a Safer World were implemented (Enia, 2020). This was the first framework of its kind to be recognised and used at international level to act as guideline for the preparation, prevention, and mitigation of disasters (Tozier de la Poterie & Baudoin, 2015). The importance of community involvement in DRR as highlighted in the framework was a product of the International Decade of Natural Disaster Reduction (1990-2000) and the World Conference on Natural Disaster Reduction hosted in 1994 (Tozier de la Poterie & Baudoin, 2015; Zimmermann & Keiler, 2015). The framework emphasises the improvement of coping mechanisms to ease the recovery process (Tozier de la Poterie & Baudoin, 2015). It also advocates for the incorporation of indigenous and traditional knowledge with scientific DRR literature (Tozier de la Poterie & Baudoin, 2015).

The framework maintains that the key to reducing hazards lies in improving disaster resilience and sustainable development (Zimmermann & Keiler, 2015). The Yokohama Strategy also emphasises the need to change from reactive disaster strategies towards a more proactive disaster prevention approach (Zimmermann & Keiler, 2015). The centrality of urban risk is highlighted and, in section 1(a)(3), the framework emphasises how vulnerability is increased with high urban population due to the complexity and accumulation of population and infrastructure in limited areas (Davis, 2000):

> *In all countries the poor and socially disadvantaged groups suffer most from natural disasters and are least equipped to cope with them. In fact, disasters contribute to social, economic, cultural, and political disruption in urban and rural context, each in its specific way. Large-scale urban concentrations are particularly fragile because of their complexity and the accumulation of population and infrastructure.* (IDNDR, 1994)

Sections 1(b) and 8(e) state that professionals involved in DRR and related fields should be educated and trained on ways to prioritise disaster reduction:

> *Education and training programmes and facilities for people professionally involved and the public at large have not been sufficiently developed with a focus on ways and means to reduce disasters. Also, the potential of the information media, industry, scientific community, and the private sector at large has not been sufficiently mobilized.* (IDNDR, 1994)

When ratifying the document, governments took responsibility for making DRR a priority and enhancing the risk reduction capabilities of their countries on national and local level (Lewis & Mioch, 2005). A part of this commitment relates to the integration of DRR with all development planning to ensure that sustainable development is achieved. Section 1(10) of the framework further states that each country is responsible for the protection of its own citizens and infrastructure, and the maintenance and enhancement of its infrastructure. Although not explicitly stated, the statement below has implications for the integration of DRR and UP by suggesting the use of existing resources (human, physical and financial) in the field of disaster reduction to improve infrastructure and protect people from the impacts of disasters:

> *Each country bears the primary responsibility for protecting its people, infrastructure, and other national assets from the impact of natural disasters. The international community should demonstrate strong political determination required to mobilise adequate and make efficient use of existing resources, including financial, scientific, and technological means, in the field of natural disaster reduction, bearing in mind the needs of the developing countries, particularly the least developed countries.* (IDNDR, 1994)

Section 2(11)(f) could also have an implication for the integration between DRR and UP by focusing on increasing the resilience of built infrastructure:

> "*Take measures to upgrade the resistance of important infrastructure and lifelines*." (IDNDR, 1994)

The Yokohama Strategy highlights how each country should act to secure and improve its own infrastructure. It also demonstrates that urban areas are becoming more vulnerable to disaster impacts and in order to protect urban population and infrastructure, risk reduction interventions are needed. One such risk reduction endeavour encouraged in the framework is for the increase in education and training programmes for all professionals involved in practices or fields related to the practice of DRR. Although not explicitly stated, this could include Urban and Regional Planning professionals, as they are involved in developing safe and economically sustainable built environments. Arguably, by providing DRR education and training programmes for UP practitioners, the goal of achieving more resilient, safe, and economically suitable cities becomes more achievable. Some of the foundational principles established in the Yokohama Strategy were further developed in its successor document, the Hyogo Framework for Action 2005-2015.

3.2.2 Hyogo Framework for Action 2005-2015

The Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disaster (HFA) was designed to be a comprehensive and action-orientated response to international concerns regarding the rise in disasters and the impacts on the development of nations, communities, and individuals (Matsuoka *et al.*, 2009). This framework was adopted by 168 governments, including South Africa (Sternberg & Batbuyan, 2013; Olowu, 2010). The HFA aims to promote the effective integration of disaster risk principles into the planning, policy-making, and programming of sustainable development (Stanganelli, 2008). Countries are provided with guidelines aimed at reducing the loss of lives and the loss of social, economic, and environmental assets (Sternberg & Batbuyan, 2013). The HFA identified five main priorities for action (PFA):

(1) Ensure that DRR is a national and a local priority with a strong institutional basis for implementation;

(2) Identify, assess, and monitor disaster risks and enhance early warning;

(3) Use knowledge, innovation, and education to build a culture of safety and resilience at all levels;

(4) Reduce the underlying risk factors; and

(5) Strengthen disaster preparedness for effective response at all levels (UNISDR, 2005).

The HFA states that elements such as unplanned urbanisation increases vulnerability (UNISDR, 2005). Each of the PFAs under the HFA to some extent highlight the incorporation of DRR into UP in order to reduce the effects of underlying risk factors (Matsuoka *et al.*, 2009). For instance, paragraph 17(k) under the second PFA states the importance of enhancing training and research to improve risk assessment and early warning systems. A cursory review of the various PFAs show that PFA two to five mention either training, UP, or the integration of DRR. Hence, the next section unpacks PFAs two, three, four and five and how each one advocates for the training and integration of DRR with UP. Table 3-1 then follows as summary of the previous discussion.

PFA 2: Identify, assess, and monitor disasters risk and enhance early earning

The second PFA aims to identify, assess, and monitor the disaster risks and enhance early warning systems. For instance, under the second PFA, paragraph 17(k) states the importance of training and research to improve risk assessment and early warning systems. Paragraph 17(k) mentions using research, training, and partnerships to improve the scientific and technological methods used for disaster assessment. It also encourages the use of different techniques relating

to geography and geographic information system (GIS). These techniques are often used in UP and disaster risk practices. Although it is not directly stated, this paragraph identifies that research and training partnerships between sub-disciplines and institutions are needed to enhance the methodologies and tools used to reduce risk. For instance, the integration between DRR and UP theories and methodologies could lead to the development of tools that are better able to assess and prevent disaster which, in the long term, will improve the resilience of urban areas affected by disasters.

PFA 3: Use knowledge, innovation, and education to build a culture of safety and resilience at all levels

The third PFA focuses on using knowledge, innovation, and education to create a culture of safety and resilience on all levels of society. Paragraphs 18(d)(f) and (g) are especially relevant to the integration of DRR and other fields such as UP. Paragraph 18(d) explains that information supporting DRR should be taught and exchanged among different categories of users. Paragraph 18(g), in turn, emphasises the need for DRR information to be updated and included in relevant curriculums and research. This would imply a need for DRR concepts to be integrated and actively taught in UP curriculums at a university level with the view to producing urban planning professionals who can develop safe and resilient urban areas.

Paragraph 18(f) of PFA 3 also describes that urban development institutions are tasked with providing disaster reduction options prior to construction, land use or land sale to the public. These institutions should be included in the DRR information-sharing network, which includes formal training. Although it is not overtly stated, it can be assumed that formal university training in disaster risk reduction would allow urban development institutions to consider DRR elements before any construction.

Paragraphs 18(h) and 18(k) highlight issues pertaining to the integration of DRR into formal and informal training interventions. The former talks to integrating DRR in all levels of education and school curricula – including university levels – whilst the latter states the importance of creating DRR training programmes for development planners. Arguably, urban planners can also be classified as key professionals in development planning. Therefore, these two paragraphs collectively state the need for urban planners to be educated and taught in DRR by incorporating it in UP university curricula.

PFA 4: Reduce the underlying risk factors

The fourth PFA concentrates on reducing the underlying risk of disaster. Paragraph 19(n) mentions incorporating disaster risk assessment into urban planning, especially in urban areas

that are prone to disaster, highly populated and was urbanised in a very short period. Integrating DRR into UP curricula at university levels will empower urban planners to be more cognisant of possible disasters in their urban planning process, and will be able to actively avoid such risk or incorporate disaster mitigation measures into their plans.

PFA 5: Strengthen disaster preparedness of effective response at all levels

PFA number five focuses on strengthening disaster preparedness for effective response at all levels, and paragraph 20(a) calls for the strengthening of policies, technical and institutional capacities of disaster management in terms of training. Universities and research institutions could contribute greatly to this cause by creating curriculums that integrate DRR across related fields of study. The integration between various fields of study will lead to a more holistic theoretical and practical approach to complex issues such as urban disaster risk management. Table 3-1 below provides a summary of the paragraphs from the HFA that support the cause of this research study. The paragraphs are direct quotations from the HFA, and the table indicates whether the paragraphs mention the terms UP, training or DRR integration.

Table 3-1: The HFA: Emphasis on training and integration between UP and DRR (adapted from the UNISDR, 2005).

Section	Description	UP	Training	DRR integration
Priorities for action (PFA)				
PFA 2, paragraph 17 (k)	Support the improvement of scientific and technical methods and capacities for risk assessment, monitoring, and early warning through research, partnerships, training, and technical capacity-building. Promote the application of *in situ* and space-based earth observations, space technologies, remote sensing, geographic information systems, hazard modelling and prediction, weather and climate modelling and forecasting, communication tools and studies of the coast and benefits of risk assessment and early warning.		X	
PFA 3, paragraph 18 (d)	Promote the use, application and affordability of recent information, communication and space-based technologies and related services, including earth observation, to support disaster risk reduction, particularly for training and for the sharing and dissemination of information to different categories of users.		X	
PFA 3, paragraph 18 (f)	Institutions dealing with urban development should provide information to the public on disaster reduction options prior to construction, land purchase or land sale.	X	X	

PFA 3, paragraph 18 (g)	Update and widely disseminate international standards terminology related to disaster risk reduction, at least in all official United Nation languages, for use in programme and institutional development, operations, research, training curricula and public information programmes.		X	
PFA 3, paragraph 18 (h)	Promote the inclusion of disaster risk reduction knowledge in relevant sections of school curricula at all levels and the use of other formal and informal channels to empower youth and children with information; promote the integration of disaster risk reduction as an intrinsic element of the United Nations Decade of Education for Sustainable Development (2005-2015).		X	
PFA 3, paragraph 18 (k)	Develop targeted DRR training and learning programmes for specific sectors (development planners, emergency managers, local government officials etc.).	X	X	X
PFA 4, paragraph 19 (n)	Incorporate disaster risk assessment into the urban planning and management of disaster-prone human settlements, in particular highly populated areas and quickly urbanising settlements. The issue of informal or non-permanent housing and the location of housing in high-risk areas should be addressed as priorities, including in the framework of urban poverty reduction and slum-upgrading programmes.	X		X
PFA 5, paragraph 20 (a)	Strengthen policy, technical and institutional capacities in regional, national, and local disaster management, including those related to technology, training, and human and material resources.		X	

The Hyogo Framework emphasises the importance of DRR research and educating stakeholders about DRR, including stakeholders who are part of urban development, especially since factors such as unplanned urbanisation increases disaster vulnerability. It also states that DRR should be incorporated in UP, especially in disaster-prone urban areas. The HFA also emphasises the role of including DRR concepts in the curriculums used to train professionals in related developmental fields to ensure risk reduction becomes part of all aspects of society. Arguably, Urban Development and Urban and Regional Planning schools at institutions of higher learning could play a leading role in integrating and teaching DRR in their curriculums. It highlights the importance of including DRR in curriculums at all levels of education. By including DRR in UP curriculums at a university level, urban planning students will be educated on the principles and techniques of disaster risk. They will be able to incorporate their skills and knowledge of disaster risk in the professional setting and so help to achieve the aim of incorporating DRR and UP. This

will contribute to building urban settings more resilient to the effects of disasters. This correlates with the importance of training as stated in the Yokohama strategy.

3.2.3 Sendai Framework for Disaster Risk Reduction

The latest internationally recognised policy was implemented in 2015 and is known as the *Sendai Framework for Disaster Risk Reduction 2015-2030* (SFDRR) (Enia, 2020). The SFDRR is the successor of the *Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disaster* (UNISDR, 2015b). The framework aims to reduce the substantial amount of disaster risk, loss of lives, health, and livelihoods, as well as cultural, environmental, economic, social, and physical assets of communities and countries within 10 years (UNDRR, 2021b). The SFDRR has seven clear targets and four action priorities, some of which highlight the need to integrate DRR and UP. The priorities for action (PFA) include:

1. Understanding risk;
2. Strengthening disaster risk governance to manage disaster risk;
3. Investing in disaster risk reduction for resilience; and
4. Enhancing disaster preparedness for effective response and to Build Back Better in recovery, rehabilitation, and reconstruction (UNISDR, 2015b).

PFA 1: Understanding Risk

The first PFA is dedicated to understanding risks. Paragraph 24(g) of PFA 1 stresses the need to increase the knowledge and experiences shared between all sectors and stakeholders by using methods such as training and education through existing education mechanisms, and peer learning. Paragraph 24(l) further urges the promotion of incorporating DRR knowledge and skills with all forms of education including professional training and education. Including elements such as disaster prevention, mitigation, preparedness, response, recovery and rehabilitation in UP curriculums in higher education could contribute to decreasing the incidence of urban disasters in the long run. These two paragraphs highlight the need to integrate DRR through the use of training and education (indicated in Table 3-2 below) to reduce the effects of disasters.

PFA 2: Straightening disaster risk governance to manage disaster risk

PFA 2 looks at different ways to strengthen disaster risk governance in order to manage disaster risk. Paragraph 27(d) calls for the establishment of mechanisms to ensure the compliance of regulations and safety-enhancing provisions related to building codes, land use, and urban planning to ensure proper focus on disaster risk management. This paragraph highlights how

DRR should be incorporated in the day-to-day protocol of UP (as indicated in Table 3-2) to increase resilience and reduce vulnerability in urban areas. Paragraph 27(d) does not mention anything about DRR integration through education, but it could be used as a possible method to incorporate DRR in UP. This is further supported in PFA 3.

PFA 3: Investing in DRR for resilience

The third PFA searches for ways to invest in DRR for resilience. Paragraph 30(f) of PFA 3 further supports the previous paragraph to promote the mainstreaming of disaster risk assessment into UP as well as land-use policy development and implementation, and land degradation assessment. This paragraph mentions both UP and the integration of DRR, as seen in Table 3-2. In order to assist with specific challenges, paragraph 31(c) of PFA 3 recommend that academic, scientific and research institutions cooperate with networks and private sectors to create new products to support DRR. Paragraph 31(c), like paragraph 24(g) and (l), mentions both DRR and training and education as ways to reduce disaster risk.

International cooperation and global partnership

As part of the international cooperation and global partnership section of the SFDRR, paragraph 47(d) states the need to incorporate DRR measures in all development assistance programmes across all sectors related to topics such as urban development.

Table 3-2 is a summary of the paragraphs from the SFDRR that support the cause of this research study and should be read the as Table 3-2.

Table 3-2: A line-up of SFDRR PFAs relevant to this research study (adapted from the UNISDR, 2015b).

Section	Description	UP	Training	DRR integration
Priorities for action (PFA)				
PFA 1, paragraph 24 (g)	To build the knowledge of government officials at all levels, civil society, communities, and volunteers, as well as the private sector, through sharing experiences, lessons learned, good practices and training and education on disaster risk reduction, including the use of existing training and education mechanisms and peer learning.		X	X (indirect)
PFA 1, paragraph 24 (l)	To promote the incorporation of disaster risk knowledge, including disaster prevention, mitigation, preparedness, response, recovery, and rehabilitation, in formal and non-moral		X	X

	education, as well as in civic education at all levels, as well as in professional education and training.			
PFA 2, paragraph 27 (d)	To encourage the establishment of necessary mechanisms and incentives to ensure high levels of compliance with the existing safety-enhancing provisions of sectoral laws and regulations, including those addressing land use and urban planning, building codes, environmental and resource management, and health and safety standards; and update them where needed to ensure an adequate focus on disaster risk management.	X		
PFA 3, paragraph 30 (f)	To promote mainstreaming for disaster risk assessment into land-use policy development and implementation, including urban planning, land degradation assessments and informal and non-permanent housing, and the use of guidelines and follow-up tools informed by anticipated demographic and environmental changes.	X		X
PFA 3, paragraph 31 (c)	To promote cooperation between academic, scientific and research entities and networks and the private sector to develop new products and services to help to reduce disaster risk, in particular those that would assist developing countries and their specific challenges.		X	X
International cooperation and global partnership				
Paragraph 47 (d)	To incorporate DRR measures into multilateral and bilateral development assistance programmes within and across all sectors related to poverty reduction: sustainable development, natural resource management, the environment, urban development, and adaptation to climate change.	X		X

The need to integrate DRR with UP is mentioned throughout the SFDRR; even more so than in the previous two frameworks. DRR training and education should be prioritised in all sectors and all forms of education, including Urban and Regional Planning departments. It calls for DRR mechanisms to be included in urban planning and urban policies. The frameworks also state that DRR should be promoted in academic and scientific research institutions. Like its preceding counterparts, it emphasises the incorporation of DRR in all development programmes, which include urban development. The need for the integration between DRR and UP is not only emphasised in global DRR policies, but also in other major developmental agendas such as the *New Urban Agenda* and *The Sustainable Development Goals* (UN-Habitat, 2016b; UN-Habitat, 2016). These are elaborated on in the following sections.

3.2.4 Integration between DRR and UP in other global development policies

The need for integration between DRR and UP is not only touched on in global DRR policies, but in global development policies that aim to bring about sustainable development in a holistic fashion. Specifically, the SFDRR has been developed to augment with other 2030 Agenda agreements such as *The New Urban Agenda* and *The Sustainable Development Goals* (UNDRR, 2021b).

Under the Sustainable Development Goals (SDG), SDG 11 aims to make all cities and human settlements around the world sustainable, inclusive, resilient, and safe by 2030 (UN, 2018b). In conjunction with the SFDRR, it works to reduce global disaster mortality and the number of people affected by developing early warning systems and improving DRR and disaster risk management in countries (UN-Habitat, 2016a). It is stated more specifically in Targets 11.5 and 11(B) that there is a need to increase investment in DRR policies, interventions, and strategies to make cities resilient. Target 11.5 focuses on reducing the overall economic loss and loss of life as a result of disasters. Target 11.B (11.B.1 & 11.B.2) highlights the objective of increasing the number of cities and human settlements that implement the integrated policies and plans in line with that of the SFDRR on local and national government level. These two targets underline the need for integration between urban planning and DRR on a practical level. Although these targets do not allude to integrating DRR and UP at a theoretical and research level, it can be assumed that the skills needed to realise the goal of the targets would need to be built in at university level through the training of future urban planners.

The *New Urban Agenda* (NUA) aims to strengthen the resilience of urban areas in line with the standards of the SFDRR in paragraph 77 of the NUA (UN-Habitat, 2016b). This includes taking a holistic approach that mainstreams DRR and improved data collection and analysis at all levels with a view to creating a more resilient urban society. In paragraph 77, the NUA pertinently states that:

> *We commit ourselves to strengthening the resilience of cities and human settlements, including through the development of quality infrastructure and spatial planning, by adopting and implementing integrated, age- and gender-responsive policies and plans and ecosystem-based approaches in line with the Sendai Framework of Disaster Risk Reduction 2015-2030 and by mainstreaming holistic and data-informed disaster risk reduction and management at all levels to reduce vulnerabilities and risk, especially in risk-prone areas of formal and informal settlements, including slums, and to enable household, communities, institutions and services to prepare for, respond to, adapt to and rapidly recover from the effects of hazards, including shocks or latent stresses. We will*

> *promote the development of infrastructure that is resilient and resource efficient and will reduce the risks and impact of disasters, including the rehabilitation and upgrading of slums and informal settlements. We will also promote measures for strengthening and retrofitting all risky housing stock, including in slums and informal settlements, to make it resilient to disasters, in coordination with local authorities and stakeholders*. (UN-Habitat, 2016b).

The commitment to integrating DRR with UP elements is reiterated in paragraph 101, which refers to the cooperation and coordination among all sectors, including building capacities of local authorities and implementing DRR in evacuation and response plans. In paragraph 102, the NUA aims to improve the capacity of UP and provide UP training on national and local levels (UN-Habitat, 2016b). Even though the NUA does not expressly mention the integration of DRR with UP curricula, it does highlight the need for integrating DRR with UP as well as improving UP training.

All the policies and international frameworks discussed above have been accepted by many countries, including South Africa. Even though international frameworks and policies exist, it is the responsibility of governments (local and municipal) to ensure implementation (Johnson, 2011). As mentioned, neither NUA nor SDG directly address the need to integrate DRR into UP curricula on a higher educational level, and only call for the integration of UP and DRR in order to reduce the vulnerability of urban areas and increase resilience on a practical level. Arguably, for UP practitioners to be able to adhere to the urban resilience and vulnerability reduction goals of the SDGs and NUA and achieve them in practice, they would have to be exposed to DRR concepts, tools, and methodologies during their training at university. Therefore, although not directly stated, the integration of DRR and UP in university curricula subsumes the successful achievement of the goals in practice.

3.3 South African National policies governing DRR

As previously mentioned, the SFDRR clearly emphasises the importance of integrating DRR policies into legislation. The SFDRR suggest that all local governments develop and adopt DRR strategies with the targets, indicators, and timeframes aligned with the SFDRR (UN-Habitat, 2016a). As a result, South Africa has taken measures to ensure that the country's disaster management legislative and policy frameworks are in line with the SFDRR's objectives, which includes addressing potential climate change risks (COGTA, 2019). On a national level, the enforcement of DRR with development is challenging, as DRR must be the central element of ongoing policy development (Pelling, 2004). The growth of urbanisation in the country does not come without its own challenges. The public finances available for public investment is reduced

due to the increasing number of urban inhabitants (Arndt *et al.*, 2018). However, some challenges have delayed the implementation and execution of policies in South Africa e.g., socio-economic inequality caused by apartheid that still has an effect on governance and development today, and still affects the efforts of concerted policies and large investments to improve housing, infrastructure, and the quality and delivery of public services and goods (Cook, 2019).

In spite of such challenges, South Africa was one of the first countries to have disaster management legislation that integrated development and disaster (Manyena *et al*., 2013:1789; Van Niekerk, 2007). The country has two legislative frameworks used to support and guide all DRR efforts: the Disaster Management Act No. 57 of 2000 and the National Disaster Management Framework 2005 (COGTA, 2016). The Disaster Management Act serves as a guide to the legal establishment of the National Disaster Management Framework (Vermaak & Van Niekerk, 2004). As the preeminent piece of disaster-related legislation in South Africa, the Disaster Management Act and specific prescripts relating to the integration between UP and DRR are discussed first with additions from the Disaster Management Amendment Act where applicable.

3.3.1 Disaster Management Act No. 57 of 2002

As mentioned before the South African Disaster Management Act is one of the leading disaster management legislations globally. As an overarching goal the Disaster Management Act (DMA) No. 57 of 2002 aims to:

> "…*provide for an integrated and co-ordinated disaster management policy that focuses on preventing or reducing the risk of disasters, mitigating the severity of disasters, emergency preparedness, rapid and effective response to disasters and post-disasters recovery; the establishment of national, provisional and municipal disaster management centres; disaster management volunteers; and matters incidental thereto*" (South Africa, 2002).

The aim of the DMA recognises the importance of coordinating and integrating the activities and expertise of various specialist fields under the umbrella of the legislation to reduce disaster impacts in the country and move towards a more resilient society. Although not overtly mentioned in the stated aim, DRR and UP would need to integrate and coordinate their activities very closely. This is especially true in the context of increased urbanisation and the country's changing risk profile mentioned in Chapter 2.

Furthermore, in sections 15 and 20(2), the DMA calls for the integration of DRR education in primary and secondary school curricula in South Africa (Minister of Provincial and Local

Government, 2005). Therefore, children at NQF level 1-4 should be educated and made aware of the main aspects of disaster risk management and DRR. The DMA does not pertinently identify the role of universities and Higher Education Institutions (HEIs), but it does provide for NQF (National Qualifications Framework) levels 5-8 education and training. However, it highlights the need to educate and train all professionals and practitioners (NQF level 5-8) associated with disaster risk management, which could include current and prospective urban planners (Minister of Provincial and Local Government, 2005). Additionally, Section 7(2)(m) and 21 state that primary, secondary and all relevant tertiary disciplines should include aspects of disaster risk management in their curricula (Minister of Provincial and Local Government, 2005).

Currently, South Africa's DRR efforts are to mainstream DRR across all sectors with the aim to implement the SFDRR through broad-based integrative measures (Busayo *et al.*, 2020). In 2019, the SFDRR became more dominant as it was implemented to guide DRR policies on national and local level. In terms of risk-avoidance enforcement mechanisms, section 20(1) (a-d) of the DMA states that:

> "*Critical components of effective DRR are regulations, standards, by-laws, and other legal enforcement instruments that discourage risk-promotive behaviour and minimize the potential for loss. National, provincial and municipal organs of state must assess the disaster risk management component of their functional areas and introduce measures to ensure alignment with the requirements specified in the Act.*" (South Africa, 2002)

This would include the amendment of urban planning standards within provincial and municipal spheres (Minister of Provincial and Local Government, 2005). As the legislative document that serves as framework of all disaster management activities in South Africa, the Act does not serve as the sole document to guide the integration, training and awareness of DRR in related developmental fields such as UP. The National Disaster Management Framework fleshes out some of the broad ideas espoused in the Disaster Management Act.

3.3.2 National disaster management Framework (NDMF)

The NDMF was developed as supplement to the National Disaster Management Act, with the purpose of providing practical guidance and key indicators for implementation and performance management for disaster management in South Africa. The NDMF has four key performance areas (KPAs) followed by three supportive enablers aimed at achieving the objectives laid out in the KPA. This subsection unpacks the first three KPAs, and the second Enabler, and their relevance to the integration of UP and DRR in university curriculums. These three KPAs with the

second Enabler all advocate for training in and integration of DRR with UP, which applies to the aim of this study.

KPA 1: Integrated institutional capacity for disaster risk management

The first KPA focuses on ensuring that the necessary institutional arrangements are in place for the implementation of disaster risk management (DRM) on all levels of government. It explains the process and mechanics of establishing co-operative arrangements between South Africa and other international role players (RSA, 2005). In Section 15(1-4) and section 21, a key responsibility of the National Disaster Management Centre (NDMC) is to "*make provision for a national educational, training and research strategy*", which includes the corresponding facilities, as stated under sections 15(1)(h), 20 and 22 (RSA, 2005). This suggests that part of the government's responsibilities is to ensure that there are infrastructural mechanisms in place for education and training on disaster risk and DRM at all levels. Though it does not necessary identify specific universities or HEIs as facilities, these institutions are very important organs of both research and education. Under Sections 30(1)(h-i) and 33(1)(iii), it is the responsibility of the Provincial Disaster Management Centre (PDMC) to initiate and co-ordinate DRM capacity-building through education, training and research by incorporating programmes into school curricula (RSA, 2005). This emphasises that, even at provincial level, government departments responsible for DRM should promote the integration of DRR into diverse curricula at school level. This could include integrating DRR into the curricula of relevant university modules and courses such as Urban and Regional Planning.

KPA 2: Disaster risk assessment

The second KPA addresses the need for disaster risk assessment (DRA) as it pertains to monitoring, prioritising, guiding risk reduction, and monitoring the effectiveness of risk reduction efforts (RSA, 2005). This KPA highlights the vulnerability of urban areas to informal settlement fires, and how the expertise of urban developers and UP could assist in preventing future outbreaks (RSA, 2005). In Sections 20(1)(a)(1-ii), 33(1)(a)(i-ii) and 47(1)(a)(i-ii) of the DMA, it mentions how the development planning elements such as infrastructure development and maintenance, urban growth, and changing land-use patterns contribute to our growing vulnerability to disasters in South Africa. Arguably, tools, concepts and methodologies that already exist in urban planning can be integrated into current risk assessment procedures to ensure that some of the unique drivers of societal vulnerability in urban contexts are identified and properly addressed. Additionally, by integrating DRA into their everyday activities, urban planners will become more cognisant of issues of disaster risk and, subsequently, factor in ways

to reduce the underlying drivers of vulnerability and hazards into their planning of new urban areas.

KPA 3: Disaster risk reduction

DRM planning and implementation is introduced in the third KPA to inform and develop plans, projects and programmes that will aid in reducing the risk of disasters (RSA, 2005). Section 20(1)(a-d) of the DMA mentions some critical components of effective DRR that can be used to minimise potential loss. These include regulations, standards, bylaws and legal enforcement to discourage risk-promotive behaviour (RSA, 2005). These components should be enforced by national, provincial and municipal state organs. The NDMF mentions some elements that are related to UP that may be implemented, such as the amendment of UP standards, land-use regulations, and zoning.

Section 39(2)(a) states that hazards and vulnerability factors that influence disaster risk is a reflection of "*spatial development frameworks*" (RSA, 2005). The NDMF mentions how disaster risk assessments are directly applicable to spatial development planning (RSA, 2005). It is the responsibility of both the PDMC and Municipal Disaster Management Centres (MDMC) to secure mechanisms to provide relevant spatial information for DRR planning, whilst ensuring the incorporation of risk information with spatial development plans and maps (RSA, 2005). In relation to this research study, Section 39 of the NDMF supports the notion of integrating DRR and UP for more disaster risk-aware urban and spatial planning (RSA, 2005).

Under section 7(2)(g-h), it is the responsibility of the National Disaster Management Centre (NDMC) to promote the "*culture of prevention*" by using and providing examples of DRR (RSA, 2005). This includes the development of DRR through components of education, training, and capacity-building in terms of the best DRR practices for South Africa[15]. This could include the creation of learning materials and different risk scenarios with supported guidelines[16] (RSA, 2005). This section of the KPA therefore supports the notion of including examples, material and guidelines on the best DRR practices for dealing with disasters characteristic to South Africa through the use of education and training. It can thus be assumed that, by including these features in UP curriculums in universities, a "*culture of prevention*" is taught to Urban and Regional Planning students, which results in the integration of DRR and UP. By using knowledge and

[15] This also is also referenced in section 17(1)(d), section 19(e), and section 20(1)(a)(iii)

[16] This is referenced in section 20(1)(b), section 20(1)(c) and section (20)(2)

material that actually apply to the South African context, disaster risk in urban areas is reduced over the long term.

Enabler 2: Education, training, public awareness, and research

All the DRM priorities in terms of education, training, research, and public awareness are addressed in the second Enabler of the NDMF (RSA, 2005). Section 15 and section 20(2) of the DMA encourages the culture of risk avoidance, and the promotion of DRM training and education, and its research thereof (RSA, 2005). This Enabler works to integrate DRM education, training and research into other strategic areas and programmes, including relevant disciplines such as UP. This also includes determining the criteria for disaster risk research for both academics and students, which could include Urban and Regional Planning students (RSA, 2005). Further integration includes mainstreaming DRM research into "*development planning and practices*" (RSA, 2005). A training and education framework must also be created to act as a recording mechanism of all national and international programmes and courses (RSA, 2005). The Enabler further states that aspects of DRM should be integrated into existing education programmes and curricula that are relevant to disaster risk (RSA, 2005). In this regard, disaster risk programmes at universities and HEIs that enhance career paths in DRM must be further developed and implemented by the tertiary institution according to the approved academic requirements and standards (RSA, 2005). It is the responsibility of the NDMC to ensure the quality and standard of all educational and training programmes, as well as monitoring all existing programmes that include DRM (RSA, 2005).

Both the DMA and the NDMF correlate with the guidelines of the SFDRR. Importantly, both documents also strongly advocate for the integration of DRR into related developmental fields on both practical and educational levels. Hence, this creates a context where the argument can be made that, on a policy level, there is strong support for the integration between DRR and UP, as they are strongly related developmental fields. In additional to the DMA and NDMF, the Integrated Urban Development Framework also forms part of the effort to mainstream DRR in all sectors in South Africa, including urban planning and urban development.

3.3.3 The Integrated Urban Development Framework (IUDF)

The South African Government stated that the country has ongoing efforts aimed at mainstreaming DRR throughout various sectors in the country and is working towards all-encompassing implementation of the SFDRR using of broad-based integrative efforts, such as the *Integrated Urban Development Framework* (IUDF) (COGTA, 2019). The IUDF is the policy initiative that is coordinated by the Ministry of Cooperative Governance and Traditional Affairs

(COGTA) for the Government of South Africa (IUDF, 2022). The objective of this policy is to create urban areas that are safe, liveable, and resource-efficient, where the inhabitants participate in urban life that is globally competitive, economically inclusive, and socially integrated (IUDF, 2022).

The IUDF identified nine policy levers that, in addition to other factors, should develop and implement holistic disaster management at all levels (COGTA, 2016). It encourages the use of disaster risk information in land-use planning to identify and monitor areas prone to hazards (COGTA, 2016). The first policy lever mentions how spatial planning could be used and modified to address the challenges caused by hazards, regulate vulnerability, and reduce disaster risk (COGTA, 2016). By incorporating DRR, development investments are protected from the effects of disaster (COGTA, 2016).

The first policy lever also identifies academic and research institutions, and professional bodies (COGTA, 2016). These stakeholders possess and provide valuable resources, knowledge, and skills that could contribute to government entities improving and changing current spatial patterns (COGTA, 2016). Academic and research institutions use practical and evaluation-based learning to help inform and improve the development of urban and spatial planning (COGTA, 2016).

The seventh policy lever calls for the cooperation between governments and other parties, including academic and research institutions to increase training and awareness amongst locals and professionals (COGTA, 2016). The framework aims to create safe living spaces by using disaster risk information in the planning and monitoring of hazard-prone areas. This will lead to reducing the overall disaster risk vulnerability.

The framework further identifies academic and research institutions as important contributors to the disaster risk researcher. It concludes by calling for the cooperation between governments and academic institutions to increase the training of DRR among professionals and the community. Thus, the IUDF is in line with the DMA and the NDMF in terms of using education and training to promote DRR integration with UP.

The SFDRR emphasises the importance of incorporating DRR measurers into national legislation. South Africa has taken a leading role in establishing a legislative basis for the function of DRR since 2002 and has since made adjustments to correspond with the requirements of the SFDRR. Especially regarding the incorporation of training and education of DRR. A key emphasis of South Africa's DRR policy is to ensure multi-stakeholder involvement in DRR and to ensure DRR measures are implemented and adopted by various sectors and stakeholders across the country. In this instance, stakeholders such as universities could play a key role in the integration of DRR

into the curriculums of development fields such as UP within the country. The role of these stakeholders is discussed in further detail in Chapter 4.

3.4 Conclusion

Policies and framework development are important aspects in the reduction of disaster risk. The first (Yokohama Strategy) and second framework (HFA) highlighted how the improvement of coping mechanisms and the integration of disaster risk with planning could lead to creating sustainable development. The HFA corresponded with the Yokohama Strategy about how unplanned urbanisation increased an area's vulnerability to disasters. The Yokohama Strategy mentions that the need to implement and strengthen the resilience of infrastructure was an indication for the integration of DRR and UP. Both stated the importance of training those involved with disaster risk and even including DRR in school curriculums. Urban development institutions should provide disaster reduction options prior to construction. The incorporation of DRR and UP is also mentioned. In relation to this study, the HFA could be summarised as motivating the integration of DRR and UP through including DRR in UP curriculums that ensure the inclusion of DRR on a professional and practical level.

The latest international policy is the SFDRR that was implemented in 2015. The Sendai Framework corresponds with the policies made in the previous two frameworks, but it provides more in-depth guidelines to implementing and achieving these goals. The framework looks at the underlying disaster risk drives such as unplanned urban planning and poor land-use management. It stresses the need to increase knowledge and experiences of disaster risk and sharing it among all relevant sectors through education. Disaster risk knowledge and skills should be incorporated into everyday professions. This study supports the notion of universities and HEI using their resources to integrate DRR in UP curriculums and thus sharing the information and knowledge with UP students and professional urban planners. The Sustainable Development Goals (SDGs) and the New Urban Agenda (NUA) are both aligned with the approaches of the Sendai Framework and work towards achieving sustainable development by encouraging the integration between DRR and UP.

As part of South Africa's efforts to implement DRR, the Disaster Management Act and National Disaster Management Framework were created. They provide guidelines on mainstreaming DRM in South Africa's national, provincial, and municipal sectors. This includes urban planning and development, which led to the development of the Integrated Urban Development Framework. All three frameworks identify the importance of training and education in the efforts to integrate DRR and UP. This chapter discussed the third research objective of this study, and investigated the international and national DRR policy prescriptions for the integration of DRR and UP. The

integration and inclusion of DRR in education is supported by multiple national and international frameworks. Although it is not directly stated, frameworks and literature indicate the need to include DRR in UP and in UP curriculums.

CHAPTER 4 THE ROLE OF UNIVERSITES IN THE INTEGRATION OF DRR AND UP

4.1 Introduction

In Chapter 3, policies and frameworks such as the Sendai Framework (section 3.2.3) and the National Disaster Management Framework of South Africa (section 3.3.2) highlighted the importance of using education in the process of integrating disaster risk reduction (DRR) with related fields such as urban planning (UP). Chapter 4 further investigates the possible integration of DRR into UP curriculums at universities and higher education institutions (HEI). Universities can contribute the integration of DRR-related topics into existing UP curriculums through their traditional functions of research, teaching and learning, consultancy, and community outreach. Although DRR education is not limited to formal university settings, universities can fulfil a major role in providing training and skills development interventions to communities and government officials already working in the urban planning sector through continuous education (Chen & Adefila, 2020). Therefore, universities have a multiplying effect on building disaster knowledge and expertise in the urban planning sector (Reimers, 2021). By incorporating DRR into Urban Planning (UP) curriculums, universities are enabling students and professionals to plan for more resilient urban spaces (Reimers, 2021).

This chapter aims to create an understanding of the connection between universities and their role in the integration of DRR and UP. This aligns with the fourth objective formulated for this study, i.e., to evaluate the current levels of integration of DRR with UP at urban and regional planning departments and curriculums within HEI in South Africa. The chapter looks at how universities have influenced DRR and UP integration by discussing the four main responsibilities, namely teaching and learning (4.2.), research (4.3.), community outreach programmes (4.4.) and consultation (4.5).

4.2 Teaching and learning

Comprehensive disaster management requires effective education and training, along with programmes to raise awareness (Thayaparan *et al.*, 2015). Given the influence of education on society and the economy, it is no surprise that universities are expected to be responsive to the ever-changing needs of society (Shaw *et al.*, 2011). Disasters have been a topic of study since it was first argued that measures can be taken to prevent them from resulting in widespread destruction (Nifa *et al.,* 2018). Higher education institutions improve and ensure the quality of disaster risk activities through increased DRR education and training, characterised by sharing of

knowledge, skills, and experiences (Didham & Ofei-Manu, 2020). A theoretical overview of teaching DRR within the university setting is discussed alongside how it influences the integration of DRR and UP. This section focuses on DRR and UP integration in undergraduate and postgraduate modules, and integrated curriculum development.

4.2.1 Theoretical aspects of teaching DRR

Training is a method of teaching that allows the development of both skills and knowledge (Yakovleva & Yakovlev, 2014). Universities provide training that stresses the importance of critical thinking, communication, applied focus, and skills that can be transferred to students who will enter professional careers (Peake & Potter, 2022). When previously unknown information is presented to a student, it challenges them and allows for skills to emerge that would benefit them when carrying out a task in a professional environment (Yakovleva & Yakovlev, 2014). Education strengthens people's cognitive capacity and problem-solving abilities, which are crucial skills that need to be developed to address complex problems such as urban disaster risk (Didham & Ofei-Manu, 2020). The incorporation of DRR into existing UP curriculums aims to create awareness and develop relevant skills amongst students, professionals, and other UP stakeholders (Apronit *et al.,* 2015).

There are various ways of transferring knowledge at higher education level, such as lectures and coursework, fieldwork, internship, research connections, and market demand/socialisation (Shaw *et al.*, 2011). Lectures and coursework are the most common methods; however, there is often a knowledge gap between lecturers and students. DRR lectures tend to be more effective when there are open communication networks between students and lecturers (Shaw *et al.*, 2011). Some students may even have been impacted by disasters and DRR education could create an opportunity for them to share their experiences and drive peer-to-peer learning in the classroom environment. In a lecture environment, fieldwork could also assist with students gaining first-hand knowledge of the impact of disaster and techniques that reduce associated risks (Shaw *et al.*, 2011). The experience gained during fieldwork is very important in teaching and understanding DRR. Students acquire skills including observation, problem solving, cooperation, experimentation, communication, investigation, and decision-making (Shaw *et al.*, 2011).

Ideally, DRR education should focus on experience and action-orientated learning events that connect formal and non-formal education (Didham & Ofei-Manu, 2020). Formal learning consists of organised programmes accredited as qualifications or partial qualifications delivered though educational institutions (Thayaparan *et al.*, 2015). Non-formal learning (e.g., short courses) is delivered the same way as formal learning; however, it does not result in a formal degree certificate (Thayaparan *et al.*, 2015). However, non-formal learning may have more educational

value due to students gaining more knowledge and developing skills as it occurs subconsciously through experience (Rogers, 2014). The importance of formal learning lies in setting a basis of values, and understanding techniques taught through theory before applying it (Rogers, 2014). In the context of DRR education, students are taught the core aspects of DRR (Risk = Hazard x Vulnerability) and are later equipped to apply that knowledge to real situations.

DRR is mainly taught on four different levels namely: (1) foundation courses, (2) cores, (3) electives, and (4) specialisations. The first level, *foundation*, involves teaching the basic origins and dynamic nature of hazards and vulnerability, the social construction of disaster risk, and the need for interdisciplinary action to address disaster risk (Shaw *et al.*, 2011). This level is typically included in first-year modules where students are expected to study and understand theory. *Core courses* focus on establishing more in-depth knowledge of disaster management concepts of vulnerability and risk and introducing and applying pre and post-disaster assessment and analysis (Shaw *et al.*, 2011). Consequently, students in their second or third year are introduced to the application of theory in hazardous situations at this second level. *Electives* are determined by the student's interests and can possibly lead to the student *specialising* in a certain topic (Shaw *et al.*, 2011). At this level, students are expected to apply the theory they acquired in the previous years to real-world situations. Formal education forms a vital part of the first two levels; informal learning is also applicable to the second level but is crucial on the third and fourth levels. The next section explains how teaching and learning furthers the integration of DRR and UP.

4.2.1.1 Teaching and learning UP

Like DRR, UP also has set ways of transferring skills and knowledge to students in the form of three competencies. These are 1) generic, 2) core, and 3) functional competencies. The first competencies consist of essential skills, behaviours, and attributes that apply to all planners, regardless of their function and level (Sihlongonyane, 2018). These are often basic and mandatory competencies that are based on expectations and requirement. This includes critical thinking, leadership, ethical behaviour, communication, and professionalism.

The concept of core competencies is a compilation of specialised abilities, skills, knowledge, and experience that are crucial for professional planning practice. This is what separates urban planning from other professions that interface with planning, such as built environment, natural environment, and community development. A few examples are planning sustainable cities, environmental planning and management, integrated development planning, and urban land economics (Sihlongonyane, 2018).

Finally, functional competencies are the skills and behaviours required to complete the tasks at hand. They often respond to specific tasks that require technical needs. It focuses on the techniques and methodologies, including those of other disciplines. These competencies are used locally and international and often include strategic assessment, layout planning, survey, and analysis, as well as planning and implementation (Sihlongonyane, 2018).

The preceding sections indicated that both DRR and UP have their own unique ways of structuring teaching and building learner competency. Curriculum development plays a crucial role in bridging some of the pedagogical differences between the two fields.

4.2.2 Curriculum development

It is argued that universities and research institutions should take the lead in incorporating DRR into curriculums and educating students (Bosher *et al.*, 2016). A curriculum can be defined as the set educational programme/course offered at academic institutions to students (Toombs & Tierney, 1993). In other words, curriculums are formal academic course that emphasises theoretical content with practical learning to develop the knowledge and skill level of students (Lunenburg, 2011).

According to Shaw *et al.* (2011), DRR should be mainstreamed in all development activities and there should be a separate section for disaster management at each university faculty or department. By incorporating DRR into relevant curriculums, a culture of prevention and resilience is created, thus transferring both knowledge and skills that can later be taught and shifted into the working practices of planning professions (Apronit *et al.,* 2015). Through the creation of an interactive curricula, students and teachers have access to more resources, allowing courses to move from a theoretical approach to a practical and problem-orientated approach (Bayuo *et al.*, 2020). Research has determined that curriculum development is a key aspect of meeting social needs (Bayuo *et al.*, 2020). Issues in curriculums should be addressed on a general and inclusive level (Shaw *et al.*, 2011). This can only be achieved by cooperation between faculties, technical support units, and the university administration. For instance, in Town and Regional Planning faculties, DRR should be a crosscutting element of the planning curriculum (Roy *et al.*, 2017).

It is important to note the difference between the inclusion of DRR and the effectiveness of DRR in curriculums and practice (Bosher *et al.*, 2016). Quality education for sustainable development is achieved by developing a well-coordinated curriculum that continuously improves the quality of its teaching methods and learning environment, whilst still encouraging cooperative learning (Didham & Ofei-Manu, 2020). Disaster management is not just a curriculum, it is a way to deliver suitable and reliable solutions to communities (Abedin & Shaw, 2015). Even though it is

challenging, it is necessary to consider the future of planning education and planning practice (Roy *et al.*, 2017; Poxon, 2001). Planning education and curriculums are connected and influenced by real-world occurrences and changes in the planning practice to ensure that the effort remains relevant in the professional field (Roy *et al.*, 2017; Hamnett, 1999). The challenge for HEI is to change and adjust curricula whilst still responding to the professional needs and requirements of the industry (Thayaparan *et al.*, 2015).

When formulating a curriculum, enough time should be allocated for both students and lecturers to master the material and to interact with each other to ensure effective learning (Shaw *et al.*, 2011). Education in sustainable development-related fields such as DRR and UP should aim to create learning for change and focus on cross-curricular and interdisciplinary approaches that connect theory with practical application (Didham & Ofei-Manu, 2020). The process of integrating DRR into existing UP curriculums should focus on including basic DRR concepts and theories, including climate change adaptation, global warming, and the scientific aspects of different disasters (Shaw *et al.*, 2011). Attempts should be made to educate people about hazardous agents to create awareness and initiate risk-informed urban planning amongst future urban planners (Khan & Ahmed, 2011). However, theoretical knowledge is not enough. A study by Apronit *et al.* (2015) indicates that students have limited knowledge and skills associated with disaster response, management, and recovery, due to lack of practical experience. A balanced DRR curriculum should pair theory with practical and field-orientated teaching (Shaw *et al.*, 2011).

4.2.2.1 Practical leaning

Theoretical knowledge alone is not enough to improve DRR. A study by Apronit *et al.* (2015) indicates that, upon leaving university, students often have limited knowledge, skills and practical experience in disaster response, management, and recovery. In other words, the application of existing knowledge is lacking due to insufficient practice-based knowledge transfer, training or even regulation (Bosher *et al.*, 2016). However, practical experience and teaching are synonymous with many URP curriculums in South Africa (Sihlongonyane, 2018).

It is crucial for integrated DRR-UP curriculums to allocate enough time for students to not only understand the theoretical aspects of disaster risk, but also to master the practical skills of the discipline (Apronit *et al.,* 2015). HEI are often assessed on whether the curriculums taught correlate with the skills required for students to enter a professional practice, and whether the content is too theoretical and disconnected from the actual fields (Reimers, 2021). UP employers are especially concerned and are demanding that universities upgrade and improve their curriculums to encourage spatial techniques and critical thinking (Sihlongonyane, 2018). This also applies to sufficient student access to relevant resources and effective practical lessons (Reimers,

2021). In their research, Patel *et al.* (2020) noted that, even though students require curriculums where they can understand the factors of DRR and disaster risk preparedness, very few courses address this issue. They further state that the main challenge in developing a practical DRR course is knowing how to teach and learn the appropriate practical DRR skills. (Patel *et al.*, 2020). Since URP is already a very practical subject, integrating DRR in the curriculum might be less complicated (Sihlongonyane, 2018).

A focus on practice-oriented skills development to acquire knowledge may well benefit the teaching and learning of DRR and spatial planning (Didham & Ofei-Manu, 2020). Giving students exposure to real-life situations where they can assess preparedness measures, mitigation and vulnerabilities will aid in connecting theory with practice (Shaw *et al.*, 2011). Actual practical training allows students to learn relevant skills and gain experience related to reducing potential risk and disaster losses (Patel *et al.*, 2020). Through fieldwork, practical experience can be gained and lead to discovering new techniques for identifying disaster risk, socio-economic vulnerability, and assessing capacity in urban contexts (Shaw *et al.*, 2011). Urban planners in South Africa are also required to gain enough practical experience before registering as professional planners (Sihlongonyane, 2018).

DRR teaching also has an element of social learning, which further motivates the need to incorporate more practical teaching and learning opportunities into the curriculum (Didham & Ofei-Manu, 2020). Practical training allows students to identify underlying DRR factors e.g., environmental degradation, and use their knowledge of DRR and their experience to build a disaster-resilient built environment (Parvin *et al.*, 2013).

4.2.3 Role of teaching and learning in DRR and UP integration

Universities have a vital role to play in implementing DRR education since they are important centres for research and education (Patel *et al.*, 2020). DRR measures, including skills development, aim to protect the lives and assets of people from the effects of disasters by means of prevention, mitigation, preparedness, and advocacy (Khan & Ahmed, 2011). A solution to reducing urban disaster risk lies in integrating efficient risk reduction measures in UP, and learning to understand the reasons for urbanisation, the layout of urban areas, and the existing risk profile of urban environments (Parvin *et al.*, 2013).

It is important for urban planners to prepare for disasters rather than just responding to them in order for communities to recognise the building of urban resilience (Djalante *et al.*, 2021). To minimize urban disaster risk, preparedness and mitigation measures should be incorporated as part of pro-active planning (Parvin *et al.*, 2013). This leads to planners having to re-assess the

basis of urban development in terms of future-oriented strategic planning and land-use management as well as policies, legislation and local guidelines that regulate development (Roy *et al.*, 2017). By incorporating the different disaster concepts (mitigation, preparedness, response, and recovery) into UP modules, interdisciplinary teaching and learning takes place that focuses on the identification of hazards and vulnerabilities in the urban environment. This type of learning also identifies appropriate urban planning tools and approaches to address these problems and thereby avoid future disasters (Didham & Ofei-Manu, 2020).

Planning for disaster and climate change requires the appropriate skills to respond to uncertain and complex situations (Roy *et al.*, 2017). This includes the ability to recognise disaster patterns (Parvin *et al.*, 2013). Crossing disciplinary boundaries to solve problems is an important element of education (Shaw *et al.*, 2011). There are various aspects of disasters that should be considered to understand them, including the type, nature, intensity, and frequency of the disasters. This is further influenced by the damage caused by disasters and the response, relief, recovery, prevention, mitigation, and preparedness measures taken (Shaw *et al.*, 2011).

When applied effectively, DRR education could enhance the sustainability of society (Nifa *et al.,* 2018). Through training and education, universities minimise the impact of disaster by producing 'trained manpower' in the form of students and graduates with knowledge on preparedness management (Shaw *et al.*, 2011). An objective of DRR education is to integrate DRR into programmes where skills, knowledge and experience can be gained to prevent and solve immediate problems (Khan & Ahmed, 2011). Therefore, graduates will enter professions and perform their tasks while considering methods to lessen vulnerability, reduce exposure to hazards, and improve preparedness and risk-conscious land and environmental management (Thayaparan *et al.*, 2015; Khan & Ahmed, 2011). Urban planners will thus be equipped with DRR skills that empower them to deal with hazards and reduce risk factors to increase urban resilience to disasters.

Literature has shown that a substantial portion of the world's environmental problems can be directly and indirectly linked to urban lifestyles (Parvin *et al.*, 2013). Sustainable lifestyles and developments can recover from and cope with the aftermath of disasters, while maintaining its assets, enhancing its capabilities, and proving opportunities for future generations (Khan & Ahmed, 2011). The process of development is hindered by disasters, and the integration of DRR and UP via education can improve the resilience and sustainability of development (Mutasa & Munsaka, 2019). Literature indicates that DRR should be mainstreamed in relevant university courses (Shaw *et al.*, 2011). As a result, the following section elaborates on universities that have incorporated DRR in both under and postgraduate courses.

4.2.4 DRR Integration at undergraduate and postgraduate levels: Global examples

There has been an increase in university courses on disaster risk management, especially in postgraduate studies (Twiggs, 2015). The discipline has also become more popular with university students in recent years (Abedin & Shaw, 2015). Some universities offer short courses in disaster management whilst others offer postgraduate diplomas, master's degrees, and doctoral degrees in DRR and disaster science (Abedin & Shaw, 2015). Elements of disaster risk management are also added to mainstream courses such as Human Geography, Environmental Science, Development Studies, etc. (Twigg, 2015; Bosher *et al.*, 2016).

Other academic courses already have some elements of disaster studies included in their curricula, e.g., Geography, Engineering, Geology, Environmental Science, Communication, Art, and History (Shaw *et al.*, 2011). In a study done by Bosher *et al.* (2016), it was noted that universities in Australia broadly include disaster risk management in UP undergraduate degrees but fall short when focusing specifically on risk reduction in the curricula. Universities that already have DRR components included in their UP curriculum encourage their postgraduate students to pursue and incorporate DRR in their research (Roy *et al.*, 2017). Students, especially at master's level, are encouraged to explore the basic and core issues of planning, e.g. urban infrastructure, environmental planning, urban basic service, transport planning, and housing (Roy *et al.*, 2017). Some universities in India, for instance, included a course in disaster management for UP students at both bachelor's and master's degree levels (Abedin & Shaw, 2015).

As indicated through literature and the case study examples above including DRR in the foundation of UP education and practice through teaching will go a long way to creating greater integration between the two fields whilst also creating safer urban communities. The following section focuses on research and its role in DRR integration.

4.3 Research

Research is one of the key responsibilities of universities and is governed by university policies (Hicks, 2012). It is an important part of education and is intertwined with teaching in most universities (Sedlacek, 2013). Academia is a main contributor of disaster risk research, which serves as a means for universities to engage with society and solve real-world disaster risk management problems (Thayaparan *et al.*, 2015; Chen & Adefila, 2020). This section explains the theoretical importance of research in universities, followed by the impact of research on the integration of DRR and UP. This section concludes by looking at some of the crucial aspects of DRR research used to integrate with UP.

4.3.1 Theorical aspects of research

Universities are crucial contributors to research and knowledge infrastructure (Trippl *et al.*, 2015). The research done and published by universities is fundamental to national innovation systems (Hicks, 2012). Through research, universities could scan and work though external knowledge, test theories, and execute solutions that apply to specific situations (Ardito *et al.*, 2019). Universities have a high level of "absorptive capacity" when it comes to collecting data, research activities and knowledge interaction (Ardito *et al.*, 2019). In other words, universities can store and create large volumes of data and research on a recurring basis. The main purpose of research in universities is to produce and transfer knowledge to other stakeholders, which serves to connect stakeholders from universities, governments, and the public and the private sectors (Sedlacek, 2013).

Research activities are also opportunities for universities to expand their knowledge base through research collaborations, community programmes, professional development, contract research, consultancy, and industry research (Bölling & Eriksson, 2016). A university's research quality is determined by their researchers' abilities to combine academic excellence and industrial contacts (Bölling & Eriksson, 2016). Kawasaki and Rhyner (2018) stated that research should foster future experts and create a system where research and data is properly communicated to other stakeholders in an understandable language of science and technology. University research allows the transfer of knowledge between multiple stakeholders and various academic disciplines, including those of UP and DRR (Sedlacek, 2013). This could also be transferred to the public and communities affected by disasters, thus creating awareness within society and improve effective decision-making.

4.3.2 Role of research in DRR and UP integration

Universities have access to knowledge, facilities, resources, and instruments that could aid in exploring new and different aspects of DRR to increase future resilience (Nifa *et al.,* 2018). Due to their capacity for data storage and networking, universities have access to knowledge about complex social issues such as urban disaster risk (Ardito *et al.*, 2018). University staff members do not only write and publish research work, but also provide reflection and insight gained by their experiences (Shaw *et al.*, 2011). Therefore, universities and HEI can process and evaluate both internal and external knowledge (Ardito *et al.*, 2019). According to Twigg (2015), the knowledge and understanding of disaster management and related subjects are constantly improving and, as research repositories, universities are ideally suited to create effective knowledge-sharing channels.

Scholars could bridge the gap between experts and practitioners (Izumi *et al*., 2019). In disaster studies, a lot of the research depends on the work of previous scholars due to modern authors not understanding the core aspects of disaster (Alexander *et al*., 2021). It can be assumed that this impedes the process of curriculum integration because basic and core aspects of the field are often overlooked. Universities are important role players when it comes to incorporating DRR into all levels of education (Chen & Adefila, 2020). The ability of universities to aid in building disaster resilience through their capacity to educate and conduct research will increase a society's overall DRR knowledge base and experience and will in the long run facilitate more informed decision-making by government and stakeholders in the private sector, including those in UP (Abedin & Shaw, 2015).

The disaster literature produced through research also plays a fundamental role in stimulating co-knowledge production through the involvement of various role-players, including the private sector, NGOs, and other research entities (Seifi *et al*., 2019). Ardito *et al.* (2019) state that research is a core component to building urban cities that can co-exist with the ecosystem. Combining the work of sustainable development with DRR can result in improving the relevance and quality of education (Didham & Ofei-Manu, 2020). This further motivates the necessity for interdisciplinary research between DRR and UP.

Research is an important factor for universities as the data and knowledge developed can be used to upgrade and adapt their modules and curricula (Ardito *et al.*, 2019). Suzigan and Albuquerque (2011) agree that including and linking research to graduate courses dealing with interrelated issues such as DRR and UP leads to a more holistic understanding of both topics. The following section elaborates on the third role of universities, which is community outreach programmes and its importance for the integration of DRR and UP.

4.4 Community outreach programmes

Community outreach is one of the main responsibilities of universities and HEI. Universities in Africa have committed to increase efforts to engage with their communities through outreach programmes designed to address the living conditions of vulnerable communities and to create strong relationships between parties (Nampala *et al.*, 2016). This section discusses the involvement of universities in community outreach programmes. The role of outreach programmes in DRR and UP integration is followed by an explanation of the importance of including students in these programmes.

4.4.1 Community outreach programmes in theory

Community outreach programmes are the social responsibility of universities, who participate for the opportunity to promote community development and strengthen relationships with industries (Narasimharao, 2009). Universities provide scientific information and knowledge to society, which aids in creating transparency between the community members and academics (Matsuura & Razak, 2019). HEI are important actors in increasing regional development due to their knowledge and expertise in various subjects (Sedlacek, 2013). Universities are major role players in providing resources for communities (Feld, 1998). They are viewed by communities as important partners when dealing with and solving local problems (Weerts, 2005). Universities offer education and training as well as neighbourhood development, needs assessment, outcomes evaluation, coalition building, knowledge exchange, guidance and feedback, technical and financial support (Feld, 1998; Basler, 2005; Narasimharao, 2009).

Community involvement and inclusion provides opportunities to demonstrate and promote practical application of research findings (Trippl *et al.*, 2015). Through outreach programmes, public responsibility is emphasised and the research and education activities of universities aid in connecting both communities and universities (Sedlacek, 2013). It is important to note that the success of the outreach programmes provided by universities is determined by the effectiveness of the long-term goals (Basler, 2005). Depending on the situation and the community, academics use various strategies and approaches to ensure effective collaboration and inclusivity (Narasimharao, 2009). Some challenges faced by universities include the thinking processes of both parties, including the way they perceive each other (Basler, 2005).

Outreach programmes are developed based on the needs, issues, and capacities of the community (Narasimharao, 2009). The programmes must be relevant to the challenges faced by the communities, and, in return, the needs of the communities should also be relevant and within the range of the university in terms of goals, objectives, and resources (Chalker-Scott & Tinnemore, 2009). Funding is often provided to universities for the development of programmes that provide opportunities for transferring knowledge to other stakeholders including communities, governments, etc. (Trippl *et al.*, 2015).

4.4.2 Community outreach programmes in theory

Universities are able to influence communities to integrate and adapt strategies related to DRM due to the trust that society has in them (Dzvimbo *et al.*, 2022). Audefroy (2011) states that the future of disaster prevention should begin at grassroots level. As institutions of learning, universities should take the lead in organising disaster risk programmes and curriculums for

communities through the development of short course training programmes in collaboration with government entities responsible for DRR and UP or NGOs involved in DRR and UP (Abedin & Shaw, 2015). DRR education aids in minimising the impacts of disasters and ensure that the people who are affected get the assistance needed to both recover and prepare afterwards by teaching people how to avoid hazards through the use of resources, preparedness plans and mechanisms (Parvin *et al.*, 2013).

Disaster education is a crucial role of universities, along with understanding disasters from a research perspective. This results in providing relief and support to communities (Abedin & Shaw, 2015). These programmes allow universities and academics to incorporate indigenous knowledge in disaster management and UP (Izumi *et al.*, 2019; Dzvimbo *et al.*, 2022). Using techniques, methods and materials that have been adjusted and improved on are expected to be more readily accepted if communities participated in the development of such interventions (Audefroy, 2011). It is necessary to balance responsibility between academics and community members (Basler, 2005). Alexander *et al*. (2021) stated how some of the challenges faced by DRR scholars is navigating through different traditions and approaches in disaster studies. This can be improved through open communication, sharing information, building trust, securing linked future relationships, learning how to transfer research findings and scientific practices to governments and other stakeholders (Izumi *et al*., 2019). Therefore, it facilitates a structure that functions as a two-way flow of knowledge between communities and universities (Weerts, 2005).

Social learning is a particular form of teaching communities that has shown exemplary results in DRR research related to community-based DRR and participatory approaches (Kitagawa, 2021). Through social learning, universities are able to equip communities with new skills that can be applied as potential solutions to community challenges, such as urban risk (Bayuo *et al.*, 2020). Through such training programmes, communities will not only be aware of the hazards and risks but will be equipped with the necessary knowledge and skills for them to act both individually and collectively to manage and practice DRR (Khan & Ahmed, 2011). When UP practices take on adaptation and community-based risk mitigation measures, it is possible to achieve long-term risk-reduction goals and minimize urban disaster vulnerability (Parvin *et al.*, 2013). This includes risk reduction activities such as land-use planning, building codes and zoning ordinances (Sadiq & Weible, 2010).

4.4.3 Student and community outreach programmes

Community outreach programmes are excellent opportunities for students to apply academic knowledge in addressing real-world problems and learn from community members (Kumpoh *et al.*, 2021). As previously mentioned, practical experience is a very valuable learning method.

Introducing university students with knowledge of DRR to communities who require assistance could establish resilience and sustainability in communities whilst allowing students to gain practical experience and insight (Chen & Adefila, 2020). For example, a study lead by lecturers and URP students in Manchester, UK, showed how the students used mobile technology and community participation to address disaster resilience issues related to stormwater infrastructure (Meyer *et al.* 2018). Community members used a mobile mapping app to identify hazards and aid the research students by collecting primary localised data (Meyer *et al.* 2018). Students were thus encouraged to thoroughly examine and understand a community's struggles before taking on any communal activities (Kumpoh *et al.*, 2021).

Ultimately, students will be able to understand the perspective of the community though dialogue and consultation, thus providing the community with disaster education, support, and relief (Abedin & Shaw, 2015). Part of DRR research includes understanding how people learn and relate to DRR and can therefore be used to increase informed decision-making amongst community members (Kitagawa, 2021). Practical skills include disaster drills, disaster simulations, community hazard mapping and experiments (Apronit *et al.,* 2015). Techniques used in DRR include factor and risk analysis and is centred on knowledge management and collaborative resources (Didham & Ofei-Manu, 2020). Other practical skills that develop include self-management, critical thinking, problem solving, teamwork, and communication (Thayaparan *et al.*, 2015. This is all part of the paradigm shift from conventional emergency response to comprehensive DRR (Khan & Ahmed, 2011).

4.5 Consultation

Government departments, NGOs, communities, the private sector, and universities are all stakeholders that have their own unique role in implementing DRR. Only through greater collaboration can disaster awareness and resilience be strengthened (Abedin & Shaw, 2015). Universities are able to facilitate professional development in various intersecting DRR challenges through consultation services (Matsuura & Razak, 2019). Academic consultation is defined as the act of providing an academic service to external organisations via viable agreements (Shugan, 2004). Consultation is discussed theoretically, followed by its role in integrating DRR and UP in universities.

4.5.1 Consultation with universities

Universities are useful sources of external knowledge and expertise that can benefit NGOs, businesses, and governments (Wagner, 2012). Large companies or organisations pursue university consultation in an attempt to extend their own basic research. Thus, external academic

judgement and expertise add reliability and validity to existing research endeavours (Perkmann & Walsh, 2008). The relationship between universities and industries has evolved from small-scale assistance to direct collaboration (Perkmann & Walsh, 2008). Consulting with universities contributes to generating knowledge that is available to all without compromising curiosity-driven research (Perkmann & Walsh, 2008). Many studies have revealed that academic consultation is a crucial method of transferring knowledge between industries and universities (Rentocchini *et al.*, 2014).

Many universities have taken on consultation work as commissioned projects (Gunter & Mills, 2017). Consultation projects contribute to a university's annual income, provides funding for academic departments, and contributes to research agendas (Perkmann & Walsh, 2008; Rentocchini *et al.*, 2014). Literature shows that many consultants started out as academic researchers (Czarniawska & Mazza, 2013; Gunter & Mills, 2017). Historically, universities allowed academics to accept consultation work individually, but have since included consultancy work as part of their services (Hobbs *et al.*, 1968; Shugan, 2004). Personnel are often encouraged to partake in consultation by allowing 20% of their annual time to outside activities (Perkmann & Walsh, 2008). Young academics have been combining academic research with consultation in the early stages of their careers (Czarniawska & Mazza, 2013; Gunter & Mills, 2017). Consultation enhances and reinforces the process of research and aids in establishing networks amongst academics and researchers in other companies (Rentocchini *et al.*, 2014). Academics are also able to benefit from consultation by using the data and experience gained from a project for their own academic research and credibility (Shugan, 2004).

However, consultation does differ from research in terms of objectives, theory, practice, and observation. In other words, consultation often focuses on key variables, specialised applications, and immediate benefits, whereas research emphasises variables not previously investigated, and generalisability and replicability of data (Shugan, 2004). The consultation processes allow academic researchers to identify new research topics while taking advantage of the available infrastructure, data access and financial payoffs offered by the private sector (Rentocchini *et al.*, 2014; Bölling & Eriksson, 2016).

4.5.2 DRR and UP integration and the role of university consultation

Consultation generates the exchange of knowledge and expertise between universities and their clients (Perkmann & Walsh, 2008). Consultation also leads to the building of networks and these networks are important for combating complex issues such as urban disaster risk (Abedin &

Shaw, 2015). Through consultation, universities are able to integrate and align their own efforts with that of governments and NGOs that specialise in urban disaster risk management and mitigation (Dzvimbo *et al.*, 2022). The multi-stakeholder relationships brought about by consultative relationships are crucial in the planning and implementing of holistic disaster preparedness plans, policy, and regulatory measures, since these efforts cannot be effective without accurate information and cooperation from various sectors (Abedin & Shaw, 2015). For instance, consultation and collaboration between universities and urban planners removes barriers and leads to converged attitudes, sharing of common goals, and mutual understanding (Thayaparan *et al.*, 2014).

Professionals such as urban planners, who are part of the construction sector, are key role players in disaster management due to the knowledge they possess about urban design and land-use within urban environments. This information contributes significantly to any disaster reduction preparedness, response, and recovery efforts (Aldunate *et al.*, 2006). Therefore, it is important to regularly consult with professionals who have specialised knowledge of UP to contribute to DRR interventions (Thayaparan *et al.*, 2014). On the other hand, UP firms should also collaborate with universities, as they have specialised departments that that have mastered the drivers of disaster risk and emergencies, which makes them ideal partners in efforts to build disaster-resilient and sustainable built environments. Greiving *et al.* (2006) cite an example where the University of Dortmund aided in developing an integrated risk map identifying and weighing both hazards and vulnerability for the EU (Sutanta *et al.*, 2010). The aim of this project was to determine the total risk potential of sub-national regions, including urban areas (Greiving *et al.*, 2006). Universities can also assist urban planners and other built-environment specialists with addressing post-disaster reconstruction challenges and improving the risk-reduction capacity (Thayaparan *et al.*, 2014). The ability to plan, respond, manage and adapt to disasters within urban environments are skills that can be effectively built by consultation between universities and the UP (Abedin & Shaw, 2015; Thayaparan *et al.*, 2015). Consequently, it can be said that collaborative networks created between universities and the private sector via consultation could lead to greater integration between DRR and UP on the levels of theory, teaching and practice (Suzigan and Albuquerque, 2011).

4.6 Conclusion

This chapter aligned the role of universities with integrating DRR and UP in order to understand the fourth objective of this study, i.e., to evaluate current levels of integration of DRR with UP at Urban and Regional Planning Departments and in the curriculums of higher education institutions in South Africa.

Universities are great contributors to the advancement of knowledge, especially in the form of teaching and research. This chapter looked at how teaching, research, community programmes and consultation contribute to the integration of DRR and UP. DRR is already a multi-disciplinary field linked to agriculture, economics, engineering, environmental science, geography, and even urban and regional planning. Being able to cross boundaries to solve problems is an important element of education, making universities an ideal vehicle for this integration. Integrating DRR in UP curriculums could lead to better quality education and training for future UP professionals. It also creates opportunities for co-ordinated research that fosters a better understanding of both subjects. The knowledge created through research should also be shared with public sector officials and NGOs that work in the urban risk reduction space.

Increasing and fostering the skills needed for DRR application in UP falls under the responsibilities of universities. Universities are major advocates for the research and development of academic fields. Academia is the main contributor to the development of disaster risk research. Important DRR skills aim to protect both people's lives and assets. The adaptive capacities of communities are strengthened through education. Integration of DRR and UP should be realised on a theoretical and practical level. On the theoretical level, UP students should be exposed to curriculums that teach them about elements of DRR, such as climate change and global warming, and how disasters can be reduced using mitigation, preparedness, response, relief, recovery, and preparedness measures. On a practical level, an integrated curriculum should develop practical skills such as problem solving, critical thinking, communication, self-management, and teamwork. All of these skills form part of long-term efforts to incorporate DRR and UP in professional settings. The development of these skills will also contribute to the reduction of the effects of disasters on urban areas. The integration fostered between UP and DRR through teaching should also be supported by targeted research, community outreach, and consultancy efforts amongst universities, UP companies, and public sector departments.

Universities should evaluate existing UP courses and curriculums to ensure the inclusion and integration of DRR concepts, theories, and methodologies. The development of UP curriculums that include DRR will create a culture of disaster prevention and resilience amongst students who will become future researchers and professionals responsible for the development of the built environment.

Although there is a clear role for universities to play in the integration between DRR and UP through their core activities, it is not clear to what degree UP and DRR is currently being integrated in universities. This is also a challenge in South Africa. Chapter 5 attempt to shed light on the

status quo of the integration of DRR an UP at South African universities through the analysis and discussion of data collected for this study.

CHAPTER 5 RESULTS AND DATA ANYLISIS

5.1 Introduction

Chapter 4 explained the integration of Disaster Risk Reduction (DRR) with Urban Planning (UP) curriculums at universities by focusing on the four responsibilities of these institutions, namely: (1) teaching and learning; (2) research; (3) community outreach programmes; and (4) consultation. Chapter 5 addresses the fourth and fifth research objectives of the study respectively, i.e., to evaluate the current levels of integration of DRR with UP at Urban and Regional Planning departments and curriculums in higher education institutions in South Africa: and to identify integration gaps and best practice cases of integration of DRR in UP within Urban and Regional Planning curriculums in South African HEIs. Electronic questionnaires were sent out to 11 higher education institutions (HEIs) in South Africa that offer courses in Urban and Regional Planning (URP). Surveys were sent to heads of URP departments at each university to serve as gatekeepers and to identify individuals within their units who were best suited to answer the questionnaires. A total of 18 participants were identified by gatekeepers to participate in this study. The respondents who took part in this study where informed that their participation was voluntary, that they could withdraw at any moment, and they could refrain from answering any questions that they preferred not to answer.

The survey consisted of 28 open and closed-ended questions and the findings are presented according to the five themes that constituted the five sections of the survey, i.e., Demographics, Field of Teaching and Disaster Risk, Current Knowledge, Curriculums, and Challenges.

5.2 Demographic (SQ1)

This section collected demographic data to reflect the profiles of the participants who participated in this study. These questions consisted of educational qualifications, academic focus, and lecturing details (see research questions 1.1 to 1.4 of the survey questionnaire). The aim of these questions was to indicate the respondents' qualifications and expertise and to identify their expertise in the field of URP.

5.2.1 Highest qualification (SQ1.1)

Lucky & Yusoff (2015) argues that staff qualification is an important characteristic in ensuring high-quality education. Consequently, the higher the degree attained by personnel, the more likely they are to develop quality courses and curriculums. As such, the first question of this section identified the highest qualification of the participants. Of 18 respondents, the majority [66,7%; N

= 12] indicated a doctorate as their highest qualification, whereas the remainder of respondents hold a master's degree [33,3%; N = 6] (See Figure 5-1 below).

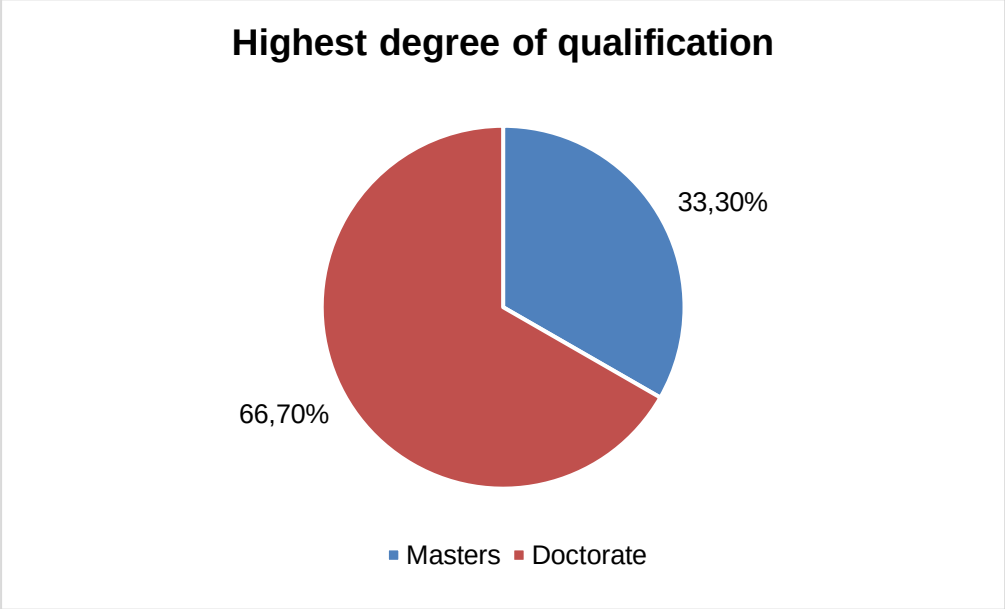


Figure 5-1: The highest qualification of the respondents (SQ1.1).

5.2.2 Years of experience as a lecturer (SQ1.2)

In Question 1.2 of the survey, the respondents were asked to identify the number of years they have been lecturing. These results are later compared to the data obtained in Question 2.1. Nearly half of the respondents have been lecturing at HEIs for more than 15 years [44,4%; N = 8] (see Figure 5-2 below). There was an equal distribution of lecturers teaching for 5-10 years [22,2%; N = 4], and 11-15 years [22.2%; N = 4]. Only two of the respondents indicated that they had less than five years lecturing experience [11,1%; N = 2].

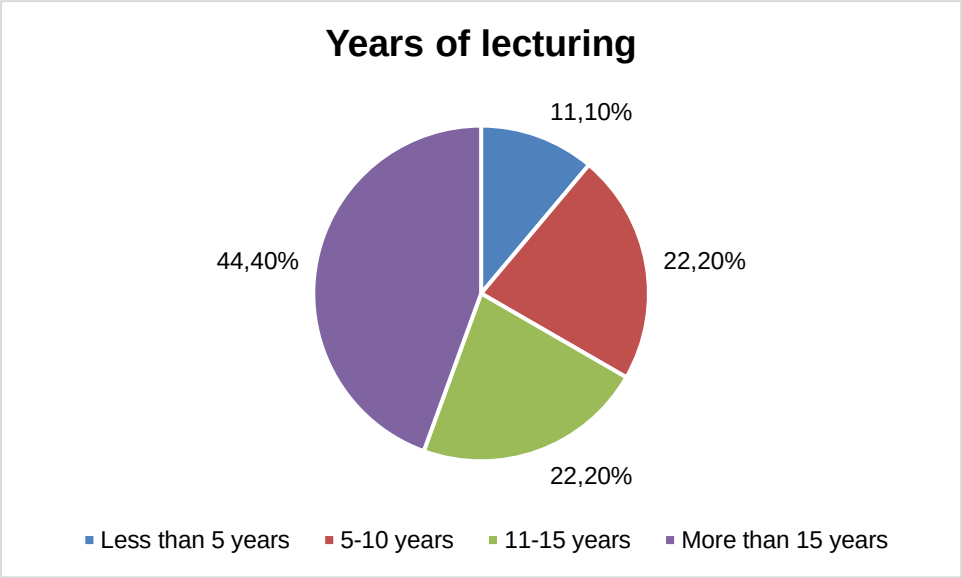


Figure 5-2: Years of lecturing at HEIs (SQ1.2).

5.2.3 HEIs that participated in the study (SQ1.3)

The survey was sent out to 11 HEIs in South Africa that offer URP as a course. These HEIs included the Cape Peninsula University of Technology, Durban University of Technology, North-West University, Stellenbosch University, University of Cape Town, University of Johannesburg, University of KwaZulu-Natal, University of Pretoria, University of the Free State, University of Venda, and University of Witwatersrand. These 11 HEIs were selected for this study due to their offering of qualifications accredited by the South African Council for Planners (SACPLAN).

Eleven of the HEIs responded to the survey. Seven of the universities had at least one respondent [5,6%; N = 1] and were coded randomly as University A - J, as well as one respondent who identified their institution as “other”. Even though the latter institution offers URP courses, they were not listed as a SACPLAN-accredited planning school. Furthermore, University E was the institution with the most respondents (27,8% [N = 5] of respondents), followed by University G, [16,7%; N = 3] and University D [11,1%; N = 2] (see Figure 5-3 below).

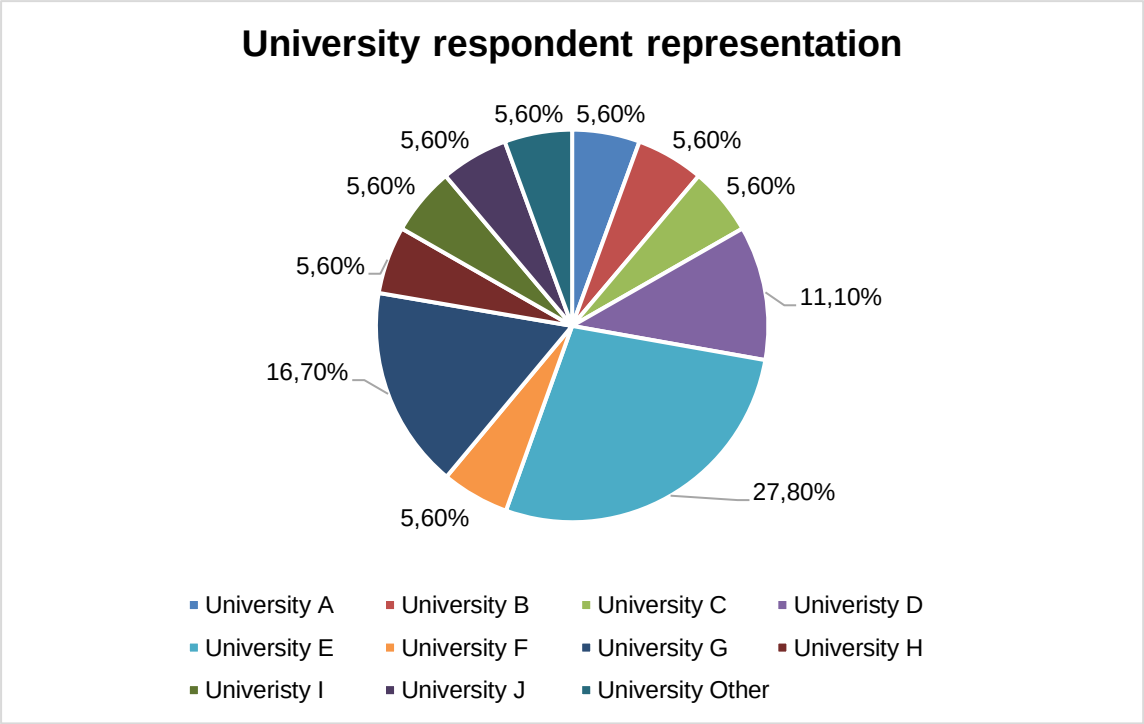


Figure 5-3: Representation of university respondents (SQ1.3).

5.2.4 Fields of speciality (SQ1.4)

In the last question that formed part of this section, Question 1.4 asked the respondents to identify their field of speciality as UP lecturers. Respondents indicated that their specialities included infrastructure planning (urban design, transport planning, and upgrading of informal settlements), environmental planning (ecosystem service management and urban ecology), participatory planning (collaborative planning and community engagement), planning education (research methodology, educational theory and educational pedagogies), spatial planning (strategic spatial planning, spatial analysis and modelling), development planning (human settlement designs, housing and real estate development), sustainable development, and planning law.

Even though this was a small sample of respondents, they all have high academic qualifications and have been lecturers for more than five years. The sample group are from a wide spectrum of HEIs and have both experience and knowledge that can provide a valuable insight on the current level of DRR and UP integration at HEIs. The next section elaborates on those fields of speciality in teaching and the inclusion of DRR.

5.3 Field of teaching and disaster risk (SQ2)

Of the findings in this theme focused on giving the participating lecturers the opportunity to elaborate on the fields they are currently teaching in, and if there are existing connections

between URP and DRR in what they are teaching. Additionally, the questions revolved around the key modules taught by lecturers, and whether any included the topic of disaster. These questions form part of Section 2, Question 2.1 to 2.5 of the survey questionnaire. The first question considered the number of UP modules taught by the respondents, followed by two questions on how many of these modules and teaching responsibilities included DRR. The final two questions explored reasons for including DRR in modules previously taught and topics of DRR that had already been included in their modules. The findings are presented in the sub-themes below. This will give an overall idea of the level of DRR integration in UP modules and reasons for their inclusion.

5.3.1 UP modules teaching (currently and previously) (SQ2.1)

In Question 2.1 of the survey, respondents were asked to indicate how many URP modules they are lecturing in order to evaluate their current level of lecturing experience in UP. A question evaluating their experience level in lecturing modules related to DRR was asked later in Question 4.1. In Question 1.2 (see section 5.2.2) of the survey, The findings of this study shows that respondents indicated that 66,6% of the respondents have at least more than 10 years' experience in lecturing. In previous years, only one respondent lectured more than 15 models [N = 1], six respondents [N = 6] had lectured less than five modules, and another six [N = 6] between five and ten modules. No data was reported for 11-15 modules currently or previously taught. Currently, the majority [N = 14] of the respondents are lecturing less than five modules related to URP, with only three respondents [N = 3] lecturing between five and ten URP-related modules. Only one participant had previously lectured more than 15 models [N = 1] (see Figure 5-4 below).

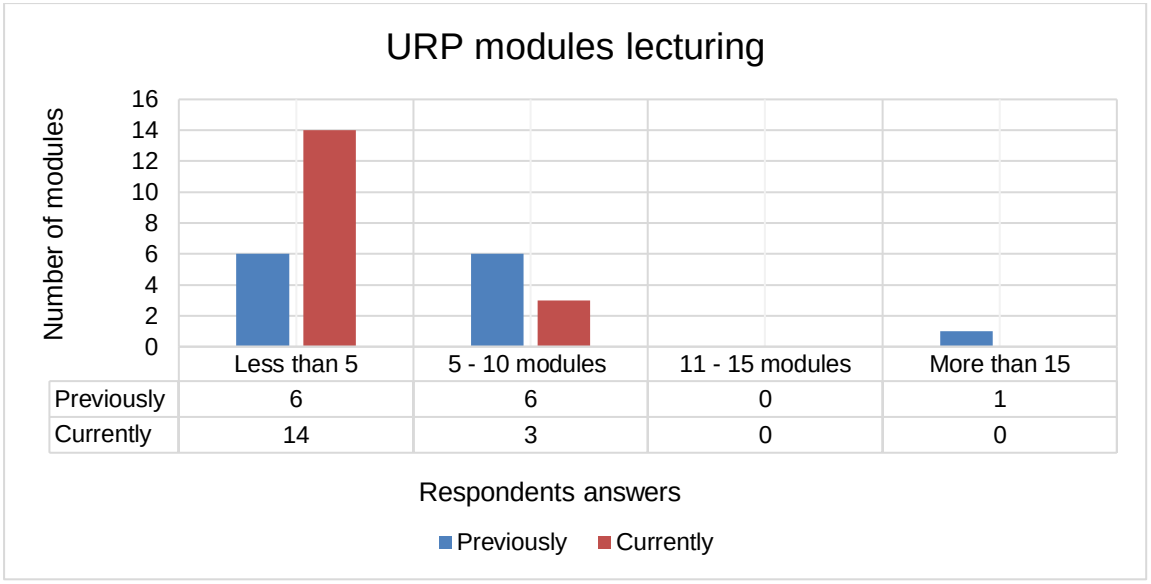


Figure 5-4: The previous and current number of URP modules taught by respondents (SQ2.1).

Figure 5-4 above demonstrates the number of modules taught by the respondents. At the time of the survey, all of the respondents were lecturing between 1-10 URP modules. The following question further identified whether DRR forms any part of the respondents' lecturing responsibilities.

5.3.2 Is DRR included in curriculums? (SQ2.2)

To understand the influence of DRR in the respondents' teaching, Question 2.2 of the survey asked to identify whether DRR forms part of their existing lecturing responsibilities as highlighted in Question 2.1 of the survey. The question also requested that the respondents elaborate on their answers and include whether this applied to undergraduate or postgraduate teaching. The majority [66,66%; N = 12] of respondents indicated that disaster risk is included in their lecturing responsibilities. Disaster risk is included in modules related to sustainable development, environmental planning, spatial planning and resilience, flood planning, urban design and infrastructure, metropolitan planning, planning law, housing and development policy, city security and safety (respondents from Universities C, E, F, and G). One respondent from University H noted that disaster risk could be mitigated in human settlements through design. Design and location are major components that can contribute to reducing risk in hazardous areas.

Two respondents [11,11%; N = 2] claimed that disaster risk does not form any part of their lecturing responsibilities as it does not form part of their modules (University E and Other). The remaining respondents [16.6%; N = 3] agreed that disaster risk forms a small, indirect, or unspecific part of their responsibilities. Some of the modules have incorporated small elements of disaster prevention, resilience, and climate change, or some of the elements in modules such as Environmental Planning and GIS (geographic information system) application are more related to Geography than DRR. The respondent from University G emphasised how DRR forms a small part of planning modules related to policies and legislation by stating that:

> *There is a very small component of module in Housing Development and Policy Studies 2. Specifically, it looks at policy responses available to victims of disaster in informal settlements. Planning Law also looks at the City of Cape Town Bylaw and Provincial legislation deals with emergency housing programmes made available through national programmes.* (Respondent from University G)

A total of nine respondents articulated a response when asked whether they are incorporating DRR into their current teaching responsibilities at undergraduate or postgraduate level. The majority [55,5%; N = 5] of these responses indicated that DRR is taught within postgraduate modules, 33,3% [N = 3] responded that it is included in undergraduate modules, and 11,1% [N =

1] indicated that it was taught on both levels. In their responses, they indicated that, as part of the postgraduate curriculum, students are expected to develop a Spatial Development Framework (SDF) for a chosen site:

> *Yes. In the postgraduate courses I am involved in, students develop [a] SDF for chosen site. Students are required to address issues within the site relating to DRM and mitigation. This year (2022) in particular, the focus was quite strong, as the selected site was in KwaZulu-Natal.* (Respondent from University E)

> *We focus on the undergraduate level in Disaster Risk Mitigation and Spatial Resilience – where flexibility in spatial plans, policies and land use management systems are accommodated to ensure sustainable livelihood in communities most likely to suffer the impacts of economic and environmental shocks*. (Respondents from University G)

According to a respondent from University A, modules related to storm-water management, floodplain, and river-corridor management are also included as part of the undergraduate curriculums (especially in the third year). These modules look at floor retention/detention dams, storm hydrographs, the design of water sensitive urban areas, habitat fragmentation, habit connectivity, and the potential of wetlands in mitigating both flood and drought episodes. The next question identified the level at which DRR is currently integrated in undergraduate and postgraduate modules taught by the respondents.

5.3.3 The percentage of DRR inclusion in undergraduate and postgraduate modules (SQ2.3)

In an effort to expand on the information provided in the previous question, Question 2.3 asked that respondents identify the current percentage of DRR-related topics and content included in URP modules. Specifically, the respondents were asked to indicate whether DRR was included in their undergraduate or postgraduate modules. In addition, Question 2.3 requested that the respondents indicate the amount of DRR inclusion in their modules in terms of percentages. Three respondents [N = 3] indicated that, of the existing modules that included DRR-related topics in both undergraduate and postgraduate modules, DRR makes up 20% - 50% of the five modules (respondents from Universities C, E and H). The undergraduate indicator showed five of the respondents [N = 5] indicated 15% - 56% of DRR-related topics were included in their seven modules (respondents from Universities A, E, G and J). Most of the respondents [N = 8], indicated that DRR make up 5% - 70% of their twelve modules (respondents from Universities B, D, E, F and I). One respondent from University G indicated that DRR is included in two modules of the National Diploma offered by their institution. Of the 18 respondents, only one [5,55%; N = 1] said

that DRR does not apply to their lectured modules (respondent from Other university). Table 5-1 below provides a summary of the number of undergraduate and postgraduate modules that include DRR-related topics and the percentages of the modules it applies to at various HEIs.

Table 5-1: The number and percentage of DRR in undergraduate and postgraduate modules at various HEI's.

Academic level	Number of modules containing DRR content	% Content of module relating to DRR	Institution
Undergraduate	1	25%	University A
	1	*Information not provided*	University E
	2	56% [Module 1] 44% [Module 2]	University G
	2	15% [Both modules]	
	1	*Information not provided*	University J
Postgraduate	1	5%	University D
	2	5% [Both modules]	
	1	20%	University I
	2	*Information not provided*	University F
	1	*Information not provided*	University E
	3	50%-70%	
	1	1 lecture	
	1	*Information not provided*	University B
Both	3	50% [All 3 modules]	University H
	1 (Undergraduate) 1 (Postgraduate)	20% 50%	University C
	1	*Information not provided*	University E
Other: Second year diploma programme	2	*Information not provided*	University G

Some of the respondents indicated that DRR is included in the environmental planning modules that they are lecturing (respondents from Universities E and G). A comment from one of the respondents highlighted that there is too much material to cover and not enough time to include DRR:

At a postgraduate level, unfortunately, I can only devote one lecture session (± 3hours) to DRM. There is too much other environmental planning material to cover. (Respondent from University E)

From the result, it is evident that the majority of current modules relating to DRR are part of the postgraduate courses. However, it does seem that the undergraduate modules cover more DRR material with a minimum of 15%, whereas postgraduate courses have a minimum of 5% of DRR content included. These results will later be compared to the results of Question 4.4. (See section 5.5.4) and 4.5 (see section 5.5.5) to give further indication of whether DRR should be integrated into undergraduate or postgraduate modules according to the respondents. The next section will investigate the respondents' reasons for including DRR-related topics in their modules.

5.3.4 Reasons for including DRR in modules previously taught (SQ2.4)

Question 2.4 of the survey asked respondents to elaborate on the reasons they include DRR in their modules. Of the 15 responses received, four themes could be derived, Findings in this theme reveals a variety of reasons for including DRR in UP modules and these include i.e., i) To address disaster risk, ii) Legislation, iii) Part of planning, and iv) Environmental planning.

i. <u>To address disaster risk</u>

The first theme consisted of responses relating to preventing disasters from happening. Two respondents from Universities C and H agreed that disasters are occurring more frequently. The respondent from University H indicated that disasters have become recurring and evolving incidents must be dealt with:

For human settlements, residential areas, and cities to be sustainable, disaster risk should be reduced. It is imperative that the community should reside in safe environments where they are able to also work and play without being exposed to any danger. (Respondent from University H)

A respondent from University D further stated the importance of reducing the risk of disasters from the planning stage to prevent developments in locations that are hazardous:

I believe the prevention of disasters starts at the planning stage. If we prevent developments in hazardous locations, we can reduce the risk of disaster. (Respondent from University D)

ii. <u>Requirements of legislation</u>

Two respondents from University G included DRR in their modules due to the four development principles of the Spatial Planning and Land use Management Act 16 of 2013 (SPLUMA). These principles include spatial justice, spatial sustainability, spatial resilience, efficiency, and good administration. Spatial resilience in particular can be linked to DRR because it requires land-use management systems that ensure livelihood sustainability for communities that are at risk of suffering from environmental and economic shocks. The one respondent from University G elaborated by stating:

> *National legislation (SPLUMA) in terms of their developing principles mandates it. The principle of spatial resilience requires land use management systems that can ensure sustainable livelihood in communities most likely to suffer the impact of economic and environmental shock.* (Respondent from University G)

iii. Part of planning

According to three of the respondents from Universities D and E, DRR is part of planning. One respondent from University E highlighted the importance of informing students about DRR, and that it should be part of any planning endeavour. The other respondent from University E stated that Environmental Impact Assessment (EIA) and DRR is a part of planning and is a vital part for reducing the impacts of disasters for future planning efforts:

> *It is part of planning. Together with EIAs, DRR ensures that forward planning is cognisant of environmental aspects and their resulting natural disasters*. (Respondent from University E)

It is thus important for students to know about DRR as it ensures, along with EIA, that any future planning is conscious of the environmental aspects that could lead to disasters if handled poorly.

iv. Environmental planning

Environmental planning was the theme that elicited the most feedback [N = 4]. Both local and global disasters are directly linked to the demise of environmental capital, according to the respondent from University G. It is crucial in the training of urban planners, as DRR is part of environmental mitigation (respondent from University E). Some of the respondents from Universities E and F included climate change as their motivation for including DRR in their modules:

DRR forms a critical component of environmental planning and sustainability, specifically given the current global environmental and climate change, and their impact on the future. (Respondent from University E)

One respondent from University A stated that the reason for including DRR in their modules is rooted in civil engineering rather than DRR initiatives, and elements such as storm-water management was already included and considered as a part of infrastructure planning and municipal service provision. Another respondent from University J mentioned that URP is a science that is integrated with and reflected in various other sectors such as disaster risk. There were only two respondents (from University E and Other university) who stated that they do not include DRR in their modules, as it does not apply to their subjects.

5.3.5 DRR related topics that have been included in modules (SQ2.5)

The respondents were asked to provide a broad description of the DRR-related topics that they have currently and previously included in their URP modules (see Research Question 2.5 of the survey). During the analysis, five main topics were identified, namely: i) Storm-water and water management, ii) Infrastructure, iii) Environment, iv) Disaster risk, and v) Legislation and government. Two [12,5%; N = 2] of the 16 respondents indicated that DRR does not apply to their modules and that they have not included any information based on DRR.

i. Storm water and water management

Four respondents from Universities A, D, E and G [N = 4] indicated that DRR is included in modules related to storm water and water management (Water-Sensitive Urban Design, in particular). These modules would include topics such as regulating flood lines, heaving/swelling of clay, flood retention, collapsing sand, sinkholes, detention dams, and power lines (respondent from Universities A and D), all of which have a bearing on DRM. According to a respondent from University E, students are required to monitor flood plains, waste management, water management, land/ground typologies, contours/gradient, and similar phenomena that form a crucial part of site analysis and feeds into the urban design process. More DRR elements are included in Floodplain and River Corridor Management through the use of storm hydrographs.

ii. Infrastructure

According to three respondents from Universities F and H, infrastructure and the creation thereof can be linked to DRR. The respondent from University H mentioned that infrastructure, housing, and basic service delivery would not be greatly affected by disasters if they were adequately designed. This was supported by the respondent from University F, who stated that:

In our Urban Infrastructure class, we teach largely around infrastructure failure and how that is dealt with by the state and communities. Additionally, in our Metro Planning class, we look at how local government is mandated to manage disasters and also how it is accommodated in the spatial development framework. (Respondent from University F)

iii. Environment

So far, environmental planning has been one of the most consistent connections between UP and DRR. Three of the respondents from Universities E and I supported this by mentioning that DRR is related to environmental planning and climate change. This includes applying the concepts of resilient cities, Human Ecosystem module, the Habitat Agenda, Research in Disaster, and Green Infrastructure (respondents from University E and I). The one respondent from University E gave a detailed explanation by elaborating that:

The DRR component looks at the nature of disaster risk, how climate change and DRM affect planning, specifically urban planning, bringing into conversation the disaster cycle, vulnerability, risk mitigation, preparedness and adaptation, and structural approaches/strategies to DRM, to name a few. (Respondent from University E)

iv. Disaster risk

Three respondents from Universities C, E, and G directly indicated the link between DRR and UP, especially regarding the disaster risk cycle. The respondent from University G referred to the connection between DRR and spatial resilience:

Disaster risk mitigation is related to and Spatial Resilience – whereby flexibility in spatial plans, policies and land use management systems are accommodated to ensure sustainability livelihoods in communities most likely to suffer the impacts of economic and environmental shocks. (Respondent from University G)

v. Legislation and government

The last two main topics related to legislation and government were identified by both respondents from University G in their responses:

The disaster risk mitigation/response strategies relate to those mandated in terms of National Housing Act e.g., the Emergency Housing Programme as well as in terms of municipal planning bylaws as it pertains to the provisions of the zoning scheme. (Respondent from University G)

We draw mostly from local government responses by including the municipal DRM plan as part of the curriculum and inviting guest speakers on specific programmes. (Respondent from University G)

These results are very important with the aim of identifying best practice of integrating DRR in UP curriculums. By looking at the themes and topics identified in the last two questions, it is obvious that the prevention of disasters is very important; especially as it relates to water management, infrastructure, and the environment. Legislation and governances also play a major role. The next section explores the respondent's current level of knowledge related to DRR.

5.4 Current knowledge (SQ3)

The inclusion of this questioning was to determine the participants' knowledge of disasters and DRR and the need for fostering greater connections between the field op UP and DRR (see Section 3.1 to 3.3 of the survey questionnaire). Both their level of knowledge and experience of the integration of DRR and UP was questioned. The respondents were asked about the relevance of DRR integration with URP as well as their knowledge of current legislation supporting it. This was compared to the literature and legislation highlighted earlier in Chapter 3. These sections indicate the overall perspective on respondents' knowledge and awareness of DRR and UP integration.

5.4.1 Lecturers' current knowledge on DRR (SQ3.1)

It is important to understand the current level of knowledge the respondents have about the field of DRR as part of evaluating the level of integration in UP curriculums. In Question 3.1, respondents were requested to indicate their level of knowledge pertaining to the concept of DRR by selecting either detailed knowledge, sufficient knowledge, some/slight knowledge, limited knowledge, or no knowledge. All 18 respondents selected options varying between detailed and limited knowledge as indicated in Figure 5-5 below. Figure 5-5 shows that none of the respondents indicated that they have no knowledge whatsoever of the concept of DRR. Specific degrees of knowledge were outlined as follows: only three respondents [16,7%; N = 3] indicated that they had detailed knowledge, whilst the majority demonstrated that they had sufficient knowledge [38,9%; N = 7] relating to the concept of DRR. Six respondents [33,3%; N = 6] indicated that they had at least some knowledge of DRR, and two [11,1%; N = 2] indicated that their knowledge of the concept was limited.

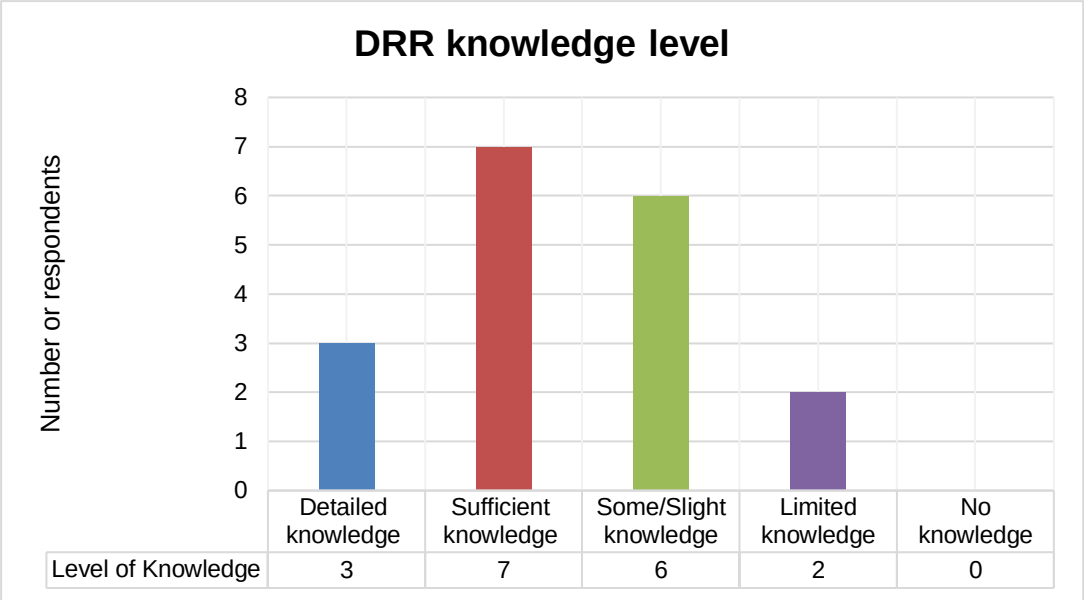


Figure 5-5: The current level of knowledge of the concepts of DRR amongst lecturers (SQ3.1).

Even though the results indicated that 58,8% of the respondents [N = 10] had sufficient to detailed knowledge of the concept of DRR, the other 41,2% of the respondents [N = 8] only had some or limited knowledge of DRR. This corresponds with the literature from Chapters 2 and 4 regarding a shortage of knowledge and understanding of the subject of DRR that prevents the integration of it in URP curriculums. The next question identified whether the respondents agreed with the relevance of DRR in URP curriculums.

5.4.2 DRR relevance to UP (SQ3.2)

Question 3.2 asked respondents to what extent they agree with the following statement: *Disaster risk reduction has no relevance in the field of urban planning*. The respondents were given a selection of options from *strongly agree, agree, neutral, disagree* to *strongly disagree*. In order to understand the reasoning of the respondents' feedback, they were asked to elaborate on their reasoning for their answers. The respondents' feedback is represented in Figure 5-6 below.

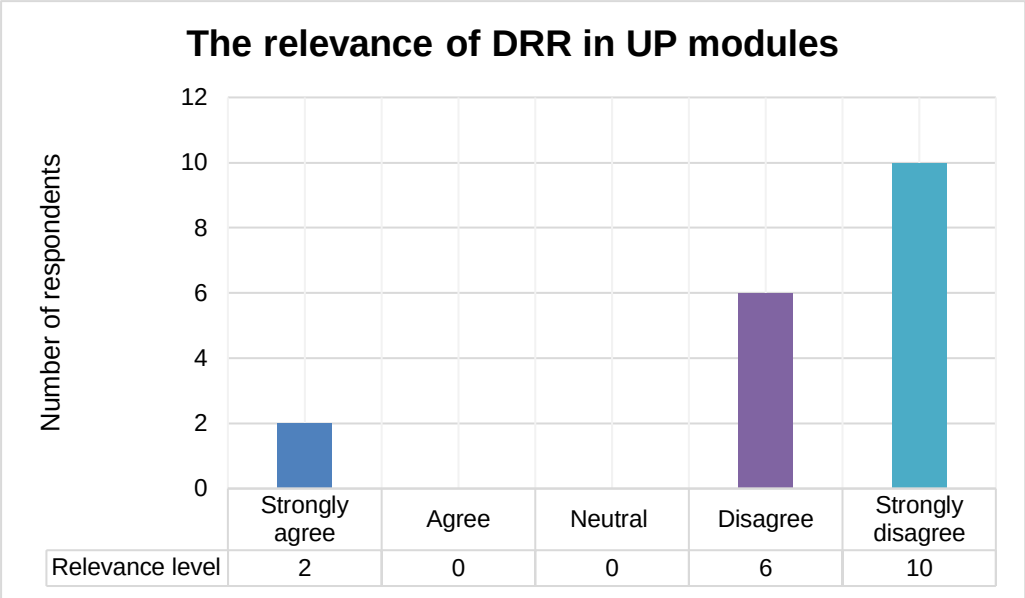


Figure 5-6: Lecturers' opinion on the relevance of DRR in UP modules (SQ3.2).

None of the respondents agreed on the statement. In fact, two of the 18 respondents [11,1%; N = 2] *strongly agreed* with the statement. Reflecting on this question, it may be possible that the two respondents who *strongly agreed* did not fully understand the question, as their responses alluded to the fact that there is a role for DRR in UP. Specifically, one respondent from University H indicated that, if the built environment is designed and created to be resilient, disaster risk due to climate change and other conditions would be reduced. The respondent continued to state that, by being aware of the impacts of disasters on people in urban and rural communities would encourage the planning of adequate infrastructure and housing. The second respondent from University E motivated their answer by referencing the NEMA further stating that planners are primary mitigators of disaster.

Most of the respondents [88,8%; N = 16] disagreed that DRR is relevant for UP., did not select any degree of *agree* with the statement. In fact, this is composed of 33,3% [N = 6] of participants who *disagree* and 55,6% [N = 10] who *strongly disagree*. Those who disagreed with the statement demonstrated that planning is dependent on context and without considering the possible hazards and understanding the environment, the results could have a negative impact (respondent from University E). The respondent from the Other university supported their answer by saying that planners should always do a feasibility study to predict any risk e.g., research the flood lines in an area to see if it is prone to floods. Other important elements to take into consideration include existing development restrictions, protected areas, and water/waste management protocols. Some respondents motivated their answers by connecting it directly to disaster risk (respondent from University E). It is therefore the responsibility of urban planners to aid in reducing the effects

of disasters by performing adequate assessments and by planning infrastructure that is resilient (respondents from Universities A and G):

> *Settlement planning can aid in mitigating the effects of disasters caused by natural phenomena and man-made hazards*. (Respondent form University A)

> *There's enough evidence to suggest that poorer communities are the most at risk when it comes to disasters and that they may have the greatest difficulty in recovering from losses suffered, the cost on society overall are therefore greater*. (Respondent from University G)

Two respondents who strongly disagreed with the statement from University D motivated their answers by explain that planning is a holistic 'science' in which the environment at large is critical for decision-making, and most disasters are environmental in character. Hence, considering the environment could contribute to preventing disasters by limiting development in hazardous locations. Sustainable development and sustainable planning were identified by two respondents from University G as being a crucial part of UP and how DRR contributes to that:

> *In accordance with SPLUMA, DRR forms part of the four development principles of SPLUMA being 'spatial justice, spatial sustainability, spatial resilience, efficiency, and good administration*. (Respondent form University G)

> *Sustainable development is central to contemporary urban planning which means human and non-human disasters are central*. (Respondent form University G)

The respondent from University F mentioned that spatial planning is strongly interrelated with disaster risk and climate change. This is supported by two other respondents from Universities B and C, who also referred to disaster risk and climate change:

> *DRR is relevant for the field of UP because of the dynamically changing natural environment within which UP is practised as a profession. Natural disasters are expected to occur at an unprecedented rate as a result of CC and cities are not exempted from this. Seeing as most of the global population are now living in cities and seeing that cities house most of the financial assets, it is imperative to include DRR as part of the UP process so as to reduce the vulnerability of cities to natural disasters*. (Respondent from University B)

> *We are living in an increasingly urban world where the impacts of safety, security and disasters are partially an everyday experience making cities hostile places that require*

better planning to mitigate and adapt and to build resilience in the face of these guaranteed events. (Respondent from University C)

In conclusion, their respondents demonstrated that DRR is important for a development that is sustainable and resilient to the effects of climate change and disasters. One of the respondents also mentioned the need to adhere to SPLUMA as a way to motivate the relevance of DRR in URP. The following section identifies participants' awareness of international and national policies that support the integration of DRR with UP.

5.4.3 Awareness level of national and international policies in promoting integration of DRR an UP (SQ3.3)

Chapter 3 elaborated on the various international and national frameworks and policies that highlight the need to integrate DRR and UP. Question 3.3 of the survey asked the respondents to indicate their awareness level in terms of national and international policies that promote the integration of DRR and UP. All 18 respondents provided feedback on this question, with the majority of 61,1% [N = 11] indicating that they are aware of these policies and frameworks, and 38,9% [N = 7] stating that they are unaware of these policies and frameworks. The feedback of the respondents is represented in Figure 5-7 below.

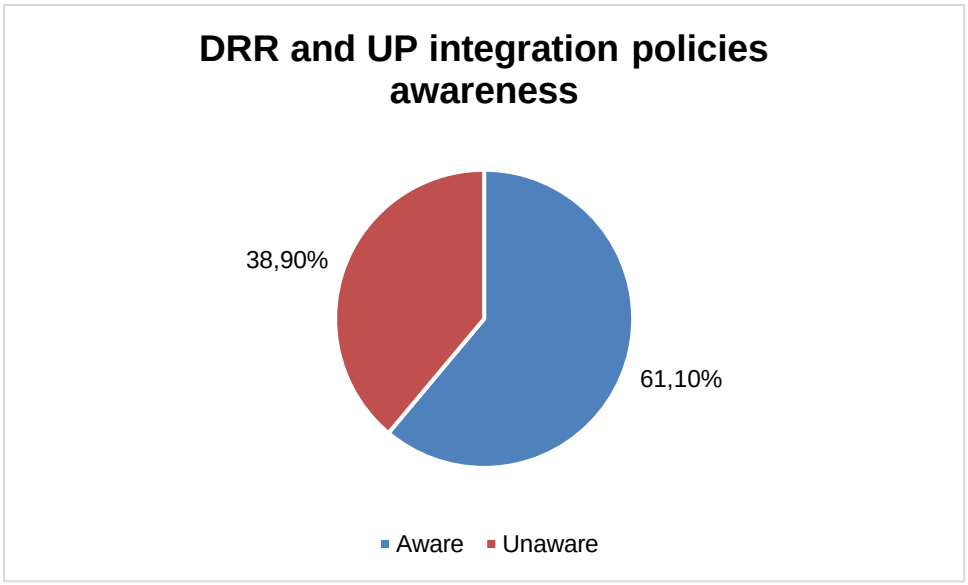


Figure 5-7: Lecturers' awareness level in terms of DRR and UP integration policies and frameworks (SQ3.3).

In order to compare the literature gathered in Chapter 3, the respondents were asked to name and/or elaborate on some of the policies and frameworks of which they were aware. Of the ten respondents that elaborated on their answers, six respondents [60%; N = 6] listed the Disaster

Management Act (Universities C, D, E, H and Other), and two mentioned the National Disaster Management Framework [20%; N = 2] (Universities D and E). In terms of international frameworks and policies, four respondents [40%; N = 4] mentioned the Sendai Framework for Disaster Risk Reduction (SFDRR) (University D), one [10%; N = 1] mentioned Sustainable Development Goals 4, 9, and 11 (University H), and one [10%; N = 1] mentioned the New Urban Agenda (University D), respectively. Two respondents from University E referenced the Hyogo Framework for Action and the Yokohama Strategy of 1994, noting the two frameworks that preceded the SFDRR. National frameworks mentioned, but not included in Chapter 3, are SPLUMA – mentioned by three respondents [30%; N = 3] (Universities D, E and G), and the National Environmental Management Act 107 of 1998 [30%; N = 3] (Universities E, and G). Other frameworks mentioned are illustrated in Table 5-2 below.

Table 5-2: National and international frameworks and policies that encourage DRR and UP integration.

Other frameworks	1	Housing Act 107 of 1997	University D
	2	Local Government: Municipal Systems Act 32 of 2000	University F
	3	The FAO Medium Term Plan (2010-2013) – - It identifies outcomes related to disaster preparedness, prevention, and mitigation	University H
	4	Integrated Development Planning - It promotes a safe and healthy environment that includes disaster management	
	5	United Nations Environment Programme (UNEP)	University G
	6	Local Government: Municipal Structures Act 117 of 1998 - It establishes three categories of municipality	
	7	The Integrated Coastal Management Act	
	8	IFRCRCS (International Federation of the Red Cross and Red Crescent Societies)	University E

Respondents identified a number of frameworks that were not included in Chapter 3 that could maybe be included in a future study. However, it is evident that, even though 60% of the respondents are aware of a number of frameworks and policies, 40% of the respondents are not aware of any. This could hamper the development of holistic DRR curriculums that take note of complex interrelated development issues such as climate change and sustainable development. This section identified the current level of URP lecturers referring to DRR, as well as the relevance

of DRR in UP. The following section looks at the current level of DRR integration in URP curriculums in South African HEIs.

5.5 Curriculums (SQ4)

The fourth section aimed to identify the participants' understanding of the current levels of integration of DRR with UP curriculums at their respective HEIs. The experience of respondents of curriculum integration was compared to their perspectives on whether DRR should be integrated with UP curriculums. Therefore, this section examines the current level of integration and whether it should be improved. This is followed by identifying whether UP students would benefit from the integration and, if so, in which academic year the integration should be applied. In order to get a realistic view of the current level of DRR integration in HEIs, the respondents identified which and how many of their current modules already included DRR elements. The ratio of theoretical to practical modules is identified, as well as the modules best suited for DRR integration, practical DRR learning, and whether DRR should be presented as a subcomponent or a standalone module. This section refers to Research Questions 4.1 to 4.9 of the survey questionnaire.

5.5.1 Experience level in integrating DRR and UP in curriculums (SQ4.1)

The first question in this section (Question 4.1) asked the respondents to rate their overall level of experience in integrating DRR and UP in their curriculums. The 18 respondents could rate their level of experience from *extensive, acceptable, some, limited*, to *no experience*. Two respondents [11,1%; N = 2] declared that they had no experience in DRR integration, and six [33,3%; N = 6] indicated that they had limited experience. The majority of the respondents [55,6%; N = 10] indicated that they had *some* [11,1%; N = 2], *acceptable* [38,9%; N = 7] and *extensive* experience [5,6%; N = 1]. Figure 5-8 below provides a graphic representation of the respondents' feedback. These results are nearly identical to the results of Question 3.1 (see Section 5.4.1) about respondents' knowledge of the concepts of DRR, where results indicated that 58,5% of the respondents had *sufficient* to *detailed* knowledge and 41,2% had *some* to *limited* knowledge. Figure 5-8 below demonstrates that 55,6% of respondents' have *extensive* to *some* experience of DRR integration, whereas 44,4% had *limited* to *no experience*. It can be assumed that there is a close relationship between the level of knowledge of DRR and experience of integrating DRR into curriculums.

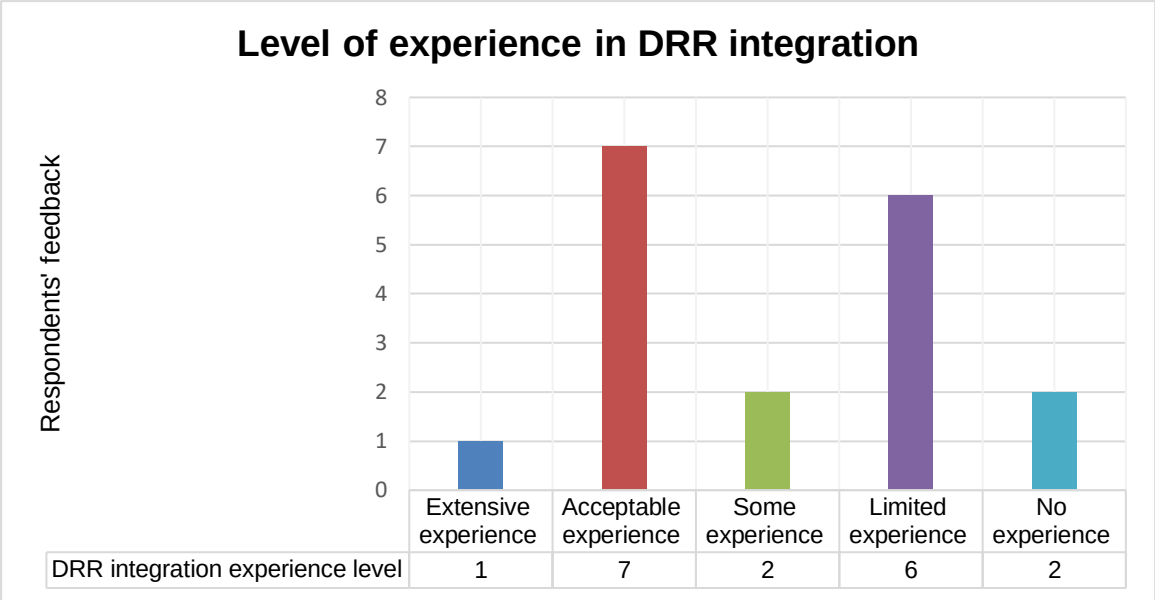


Figure 5-8: Overall experience of DRR and UP integration in curriculums (SQ4.1).

Additionally, the respondents were asked to elaborate on their answer to Question 4.1 to provide better insight into how to increase the level of DRR integration in UP curriculums. One respondent identified that they had no experience of integrating DRR into their courses; however, they still showed interest in integrating DRR in UP curriculums by commenting that:

> *I have no experience but it's an interesting topic since we see floods that have affected KwaZulu-Natal and taken lives, leaving people homeless*. (Respondent from University Other)

The two respondents from Universities G and D who had limited experience stated that DRR was not included as a core part of their modules or that DRR formed only a small part of it. Another two respondents from Universities G and J indicated that, even though they had limited knowledge, they were interested in including DRR in their modules in some form. The respondent from University J stated that they had identified the need to include such a module in their programme, whereas the respondent form University G expressed that a lack of space in their curriculum hampered their process of incorporation:

> *This is a relatively new area that we are trying to incorporate into our Environmental planning suite of subjects, but it is challenging with such a full curriculum*. (Respondent from University G)

A respondent from University E stated that the reason why they had limited experience was due to DRR being a subject mostly shared among people who specialise in disaster risk:

> *Knowledge in these areas is based mostly on shared literature, workshops, seminars, knowledge of peers in the school who are more involved in the particular field*. (Respondent from University E)

Another respondent from University E stated that they had some experience of DRR integration due their involvement in curriculum design and engaging. The other respondent from University D taught a module on 'basic planning practice' that involved the practical implications and application of DRR measures.

Among those who indicated acceptable experience in DRR, one from University F, in particular, stated that they had been indirectly including DRR in their teaching for 20 years. Another stated that their knowledge and experience in DRR was mainly due to their knowledge of the concepts of resilient cities and its incorporation in planning practice. Three other respondents responded that they had gained experience in DRR due to it already being incorporated into other modules; however, these modules do not cover all the elements of DRR:

> *Acceptable knowledge of resilient city concept and its incorporation in planning practice.* (Respondent from University I)

> *That's because the topics incorporated in the modules I teach do not cover all the elements of Disaster Risk Reduction*. (Respondent from University H)

> *The approach has varied from green infrastructure to mitigating and adapting to climate change events as well as rapid urbanisation and the safety and security of cities to urban agriculture to help improve food security*. (Respondent from University C)

It is noticeable that some of the participants view DRR from a physical infrastructure perspective and focus on the technical solution of the hazard component. Finally, the respondent who claimed to have extensive experience of DRR stated that they are the person to have introduced DRR into the UP curriculum at their institution (respondent from University E). The next question identified whether there is a need for DRR integration in curriculums.

5.5.2 The need for DRR integration into existing UP curriculums (SQ4.2)

This question aimed to identify to what degree respondents agreed that there is a need for integration of DRR into existing UP curriculums. By comparing the results of Question 4.2 with the results from Question 4.1 above, this study was able to determine whether there is a need to increase the current level of DRR integration. The respondents were given five options to select from, including *strongly agree, agree, neutral, disagree* and *strongly disagree*. None of the 18

respondents disagreed with the integration of DRR. The majority of the respondents [94,4%; N = 17], either *agreed* [22,2%; N = 4], or *strongly agreed* [72,2%; N = 13] with the integration of DRR into their curriculums. Only one respondent indicated that they were *neutral* [5,6%; N = 1]. Figure 5-9 below gives a graphic representation of the respondents' feedback.

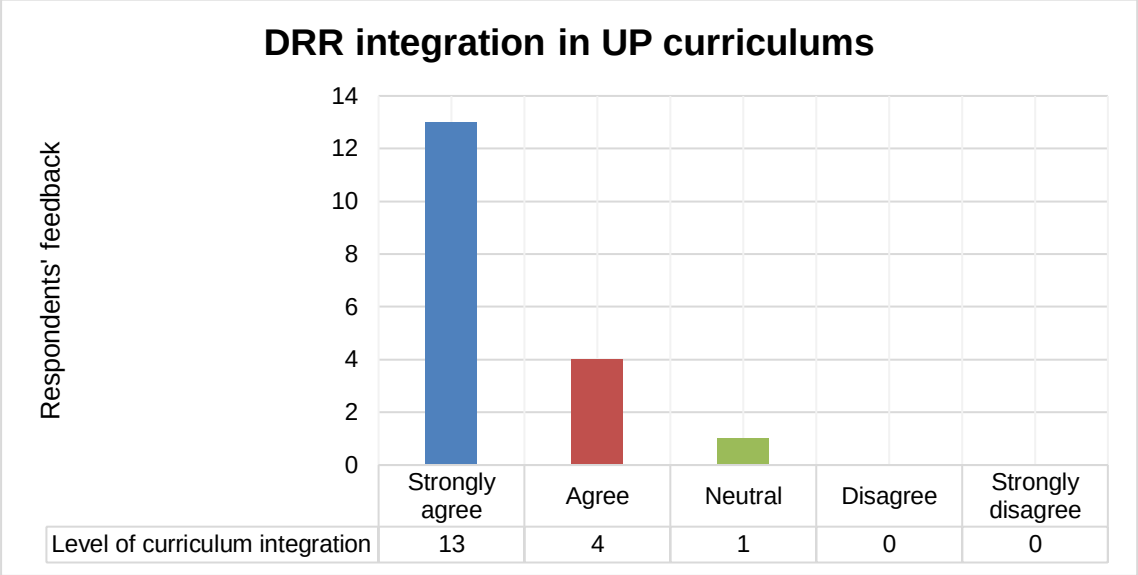


Figure 5-9: Lecturers opinion on the integration on DRR in UP curriculums (SQ4.2).

Respondents elaborated on their answers. One respondent from University D, who strongly agreed with integrating DRR with existing UP curriculums, motivated their answers by stating that preventing disasters starts in the planning phase:

> *I believe that preventing disaster starts at the planning stage. If we prevent developments in hazardous locations, we can reduce the risk of disasters*. (Respondent from University D)

This is supported by the motivation of a respondent from University H who stated that integration would result in resilient communities. DRR is fundamental to UP and cuts across all disciplines, according to a respondent from University E. A respondent from University J also reported that DRR should be a core component of both theory and practice in UP. Both global and local disasters are directly linked to the demise of environmental capacities, as stated by a respondent from University G. Respondents have demonstrated that climate change is a major factor in future UP and spatial planners should be relevant and responsive:

> *We are facing major climate change in the future and planning cannot be done in isolation of DRR measures*. (Respondent from University D)

> *DRR is absolutely critical to ensuring that spatial planning is relevant and responsive in the face of increased climate change disasters*. (Respondent from University F)

> *As mentioned, before we have reached the point of no return and are now pressured to ensure that we can build resilience against theses disasters as they are not going to stop is irreversible. We can only now begin to create new ways of being in an emergency city*. (Respondent from University C)

Another respondent from University E supported the notion of disaster occurring more frequently by stating that, "*disasters in the environment are a common phenomenon nowadays*". The increase of disasters has become inevitable and urban planners are being pressured to ensure resilient urban development. This cannot be achieved without DRR measures. Therefore, DRR and climate change adaptation should be included on URP curriculums, thus assisting in the betterment of planners to be proactive in planning projects:

> *Integrating disaster risk reduction and climate change adaptation through risk management is very important in the Urban and Regional Planning curriculum*. (Respondent from University G)

The motivation given by the respondents who agreed with DRR being included in UP curriculums were very similar to the respondents who strongly agreed. This was especially true in regard to DRR aiding UP in creating an urban infrastructure that is resilient to natural and man-made hazards. In their motivations below, respondents demonstrated how elements of DRR are necessary to reduce the effects of disasters:

> *Planning can play a role in mitigating the effects of both natural and man-made disasters, primarily through the role of space*. (Respondent from University A)

> *It is an important component given the decay in infrastructure in South Africa, as well as floods, droughts, fires, landslides etc*. (Respondent from University E)

The one respondent from University G, who expressed a neutral opinion, stated that integrating DRR with UP curriculums must first be weighed up against other curriculum priorities. The impacts of disasters will increase with the effects of climate change, environmental degradation, and the decay of urban infrastructure. Consequently, increasing the resilience of urban infrastructure against disasters starts in the beginning of the planning stage, including the training of future urban planners. This holistic approach will thus ensure the resilience of urban communities. UP and spatial planning should be responsive to the effects of climate change, and actions must be taken to mitigate disasters. These actions include integrating DRR with UP curriculums. The next

question asked whether respondents thought that their URP students would actually gain from integrating DRR in UP curriculums.

5.5.3 Benefits of the integration of DRR with UP curriculums? (SQ4.3)

Question 4.3 asked respondents whether their URP students would benefit from the integration of DRR in their curriculums. Of the 18 responses, 14 [77,7%; N = 14] directly answered yes to the question. The question asked respondents to elaborate on their answers. Two of the respondents (University D) agreed that spatial resilience and DRR are important aspects of URP, especially with the impact that climate change will have on UP and the future of the built environment. One respondent stated that UP is a practical subject and suggested that lecturers could include case studies and projects of events currently affecting South Africa in the curriculum, whilst another indicated that it would aid them in future professions:

> *Yes, UP is a practical subject, and we are currently living in a year affected by floods, fires, etc., so if this is included in the curriculum, lecturers can even give students projects or case studies of what is currently affecting the country*. (Respondent from University Other)

> *Yes, it would be beneficial to integrate DRR because every UP graduate is a potential decision-maker whose decisions are likely to impact many lives (positively or negatively depending on their knowledge)*. (Respondent from University B)

Students would only benefit from the integration, especially in their profession as urban planners as they will be equipped with knowledge and be able to make informed decisions.

> *They will have knowledge of the DRR processes and how to design resilient settlements*. (Respondent from University H)

> *Sustainable development cannot occur without DRR knowledge as it ensures urban resilience.* (Respondent from University G)

The respondent from University A repeated their statement on UP aiding in the mitigation of the effects of disasters. A respondent from University C also repeated their statement on the increasing pressure on urban planners on finding new ways to design and create emergency-resistant cities.

Some of the respondents motivated their answers by giving suggestions of how DRR should be integrated into the curriculum. One respondent from University F recommended a mainstreaming approach where DRR is integrated in various modules. According to a respondent from University

E, DRR should be included in both undergraduate and postgraduate courses due to it being such an important component of UP:

> *Yes, this should be included as part of UP courses, both in undergraduate and postgraduate studies. It is an important component of UP and should form a central component of certain courses, in particular courses concentrating on environmental planning and land use management*. (Respondent from University E)

One respondent from University G questioned whether DRR integration would be more appropriate within an environmental studies curriculum, rather than URP, even though there are some benefits. However, two other respondents stated that coming to an agreement with both environmental studies and disaster management would be beneficial (respondent from E), and that the prevention of disasters starts at the planning phase (respondent from University D).

It is clear that the respondents all agree that their students can only benefit from the integration of DRR in UP curriculums. Some of the respondents already made statements of when DRR should be included in the curriculums and in which modules. The next question looks at the opinion of all the respondents regarding the academic year at which DRR should be integrated.

5.5.4 Most appropriate academic year for DRR integration into the curriculums (SQ4.4)

In correlation with Question 2.2 earlier (see Section 5.3.2) and 2.3 (see Section 5.3.3) of the survey, Question 4.4 asked respondents to indicate the academic year – from first year to PhD studies – in which DRR should be included in URP modules and curriculums. The 18 respondents had the option of selecting more than one academic year. The majority of respondents (64,7%) indicated that DRR should be included at third-year level [N = 12] and honours [N = 11]. This was closely followed by the second-year level [N = 10] at 55,6%, the fourth-year level [N = 9], and master's year [N = 9] at 50%. The feedback indicated that the postgraduate diploma year [44,4%; N = 8], first year [27,8%; N = 5], and PhD year [16,7%; N = 3] were less appropriate for implementation of DRR. The most suitable academic year for DRR integration is illustrated in Figure 5-10 below.

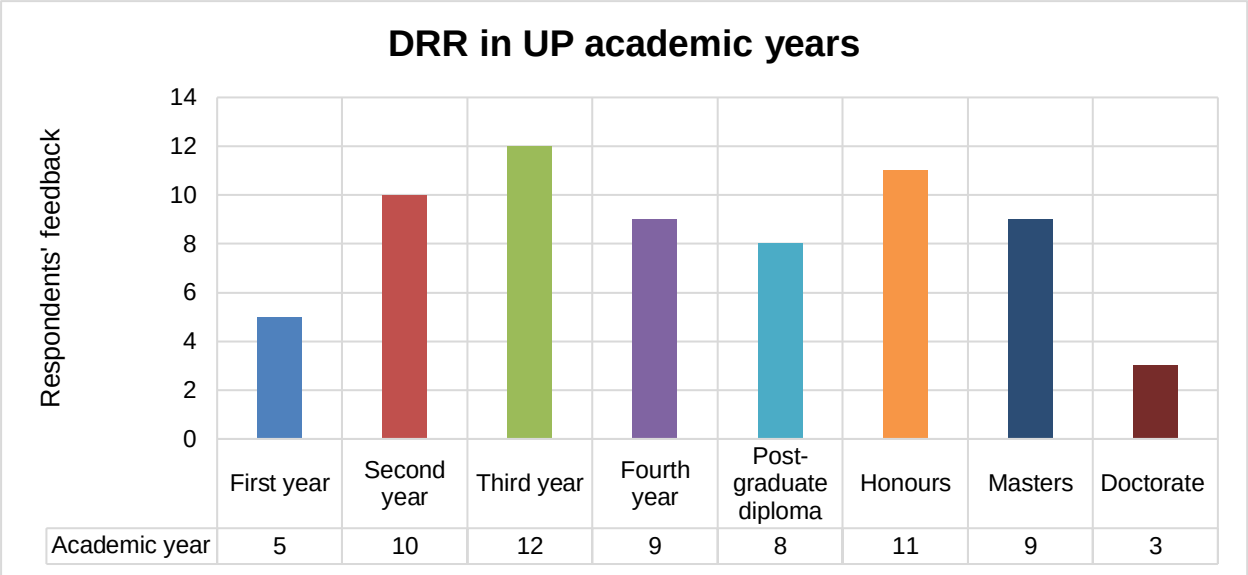


Figure 5-10: Lecturers' opinion on when DRR should be implemented in URP curriculums (SQ4.4).

The feedback to Question 2.3 (see section 5.3.3) indicated that respondents felt that DRR integration applied more to their postgraduate modules [44,4%] than to their undergraduate [27,7%] modules. However, 53% of the results indicated that the respondents selected undergraduate years (first, second, third, and fourth year), whereas 47% selected postgraduate academic years (postgraduate diploma, honours, master's, and doctorate). The following question further identifies and rates the number of modules that include elements of DRR.

5.5.5 Number of modules that included DRR elements (SQ4.5)

The participants were asked to rate the number of URP modules they were lecturing that included elements of DRR. The rating selection included *None*, 1-3, 4-6, *More than 6*, and *Other*. Of the 18 responses, 15 respondents [83,3%; N = 15] indicated that 1-3 of their modules include elements of DRR. Only one respondent [5,6%; N = 1] had more than six modules that included DRR elements. The remaining two respondents stated either that none of their modules include DRR elements [5,6%; N = 1], or selected *Other* [5,6%; N = 1]. Figure 5-11 below gives a graphic indication of the URP modules that include elements of DRR.

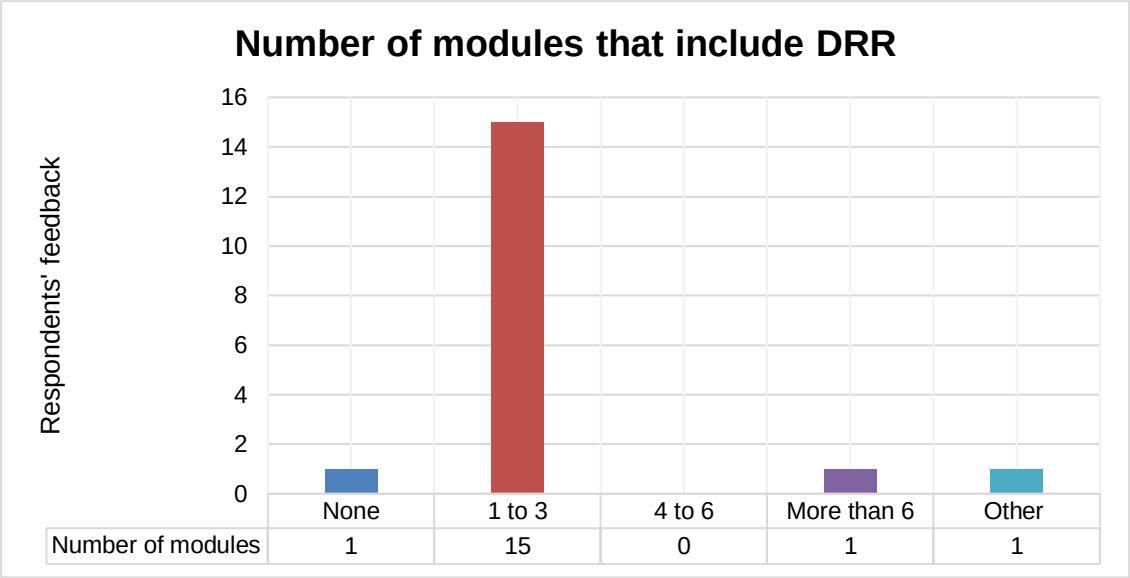


Figure 5-11: Number of modules that include elements of DRR (SQ4.5).

In addition to the number of subjects that included DRR elements, the respondents were asked to list the module or curriculum codes of the subjects where integration occur and to indicate the amount in terms of percentage, for example, SSBG 101: Sustainable and Resilient Urban Planning, 25%. Their answers are represented in Table 5-3 below.

Table 5-3: URP modules that include DRR at the various universities.

Number of modules	Integrated modules	% Of modules	HEI
1 to 3	Housing for planners Human Settlement Development Management	- 5% - 5%	University D
	Regional theory Land use Management	- 5% - 5%	University D
	Urban forms and function	- 20%	University I
	Metropolitan planning studio Urban infrastructure	*Information not provided*	University F
	Housing Implementation and management Estate development and management	*Information not provided*	University H
	Municipal Service Provision	- 25%	University A
	Housing development and policy studies	- 0.2%	University G

	Planning Law	- 0.1%	
	Planning sustainable cities and regions Planning theory and management	- 20-40% - 50%	University C
	Introduction to environmental planning and sustainability	*Information not provided*	University E
	Environmental Studies 1 Information Systems 2 Spatial resilience (CAD design, GIS spatial analysis)	- 56% - 50%	University G
	Introduction to Environmental Planning Contemporary Design & Environmental Issues in South Africa Planning, Environment and Sustainability as well as research topics	*Information not provided*	University G
	Planning, Environment and Sustainability Envi. Pl. and Sustainable Development	- 10%	University E
	Urban Risk Management	- 100%	University J
	Planning Specialisation 3 Environmental Planning 4	- 5% - 5%	University G
More than 6	Introduction to Settlement Form and Design Planning for Housing Services, Infrastructure and Transport Integrated Planning Project	- 20% - 40% - 50%	University E

The 17 respondents indicated a total of 29 URP modules that include some aspects of DRR. Of the 29 modules identified, 19 indicated the percentage of DRR included in the module. Two modules form University G had the lowest rating of 0,1-0,2% of DRR integration. Six modules from University D and University G had 5% integration and 10 modules from University A, University C, University E, University G and University I vary between 10-59% integration. University J had the highest rating percentage of DRR integration with a module 100% dedicated to DRR. The following question provides an indication of how many of the modules identified in Question 4.5 are theoretically and practically orientated.

5.5.6 Theoretical modules vs Practical modules (SQ4.6)

Question 4.6 of the survey asked respondents to indicate whether the modules where DRR and UP are integrated, are more theoretical or practical in nature. Thus, indicating the odds of whether DRR practically applied or only in theory. The results indicated that 37,5% of the respondents' [N = 6] modules are mainly theoretical, 18,8% practical [N = 3], and 43,8% of respondents [N = 7] stated that their modules are equally divided between theory and practical learning (as seen in Figure 5-12 below).

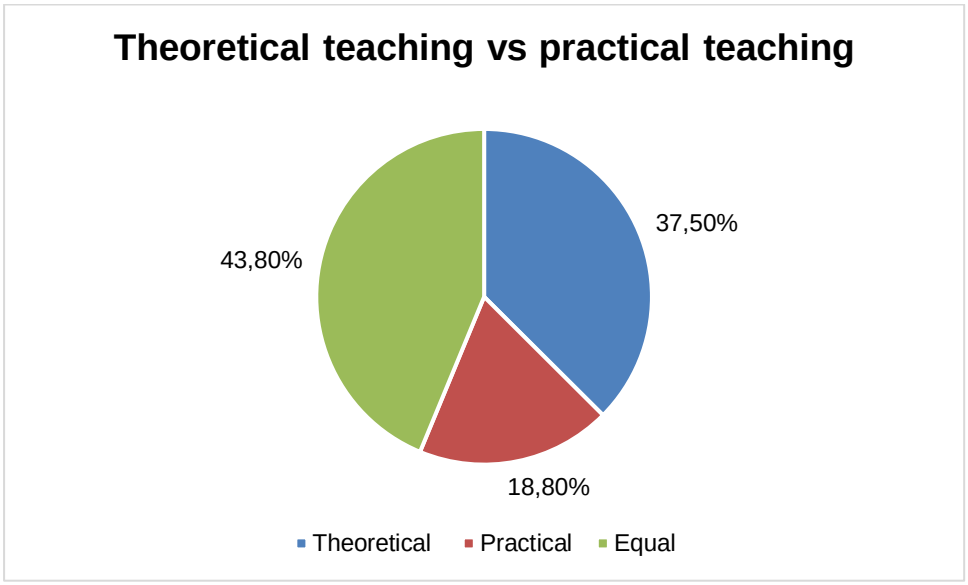


Figure 5-12: Theory-based modules vs practice-based modules (SQ4.6).

As illustrated in Figure 5-12 above, the majority of the modules taught by the respondents that involves DRR integration are mostly divided equally between theoretical and practice-based learning. Therefore, and in comparison with Question 4.5, after identifying the modules that currently contain aspects of DRR with the theoretical versus practical ratio of these modules, the next question identifies which modules, according to respondents, are best suited for DRR integration.

5.5.7 Best suited modules for DRR integration (SQ4.7)

Earlier in Question 4.5 (see Section 5.5.5.), the respondents were asked which UP modules are best suited for integrating DRR in their opinion. In that, Environmental Planning/Management/Studies were the modules mostly mentioned, 38,88% [N = 7] (University B, C, E, F, and G), followed by Sustainable Development [27,77%; N = 5] (University C, E, G and H), and Design Planning/Managing modules [22,22%; N = 4] (University E and I). Land-use Planning/Management, Settlement Planning, and Spatial Planning were also frequently

mentioned throughout respondents' answers [38,88%; N = 7] (University A, E, F and I). Other modules indicated by the respondents were: the Planning, Design and Management of Space and Infrastructure; Urban Infrastructure; Natural Systems; Spatial Planning at Metropolitan Scale; Policy-based Models; Planning Legislation; Transport Planning; Planning Design Information Systems; and Service Planning are also modules well suited to the integration of DRR. One respondent from University D stated that DRR should be included in most modules, as it is a crosscutting issue, and a respondent from University H stated that DRR should be derived equally in both practical and theoretical modules. The next section explores the importance of including practical DRR learning opportunities for URP students in their curriculums.

5.5.8 Practical DRR learning (SQ4.8)

The respondent from University Other remarked that "*UP is a practical subject*". In comparison with Question 4.6 (see Section 5.5.6), Question 4.8 of the survey asked the respondents whether more practical DRR learning opportunities should be included in URP curriculums and to motivate their answer. Eleven [64,7% N = 11] of the 17 participants stated that they agreed before elaborating on the reasons for their answers.

Reasons included that practical learning opportunities are often more effective (University D), especially in relation to spatial planning (University F) as it allows first-hand observations and knowledge of the subject (Universities E and H). According to the respondent from University J, URP is an applied science and therefore practical learning is critical throughout. Three respondents that demonstrated that both theory and practical learning should be applied evenly stated that:

> *Curricula should include both theoretical and practical leaning because theory needs to inform praxis. Practical learning is important as it affords students the opportunity to contextualise knowledge*. (Respondent from University B)

> *Theory and practical should be included in community engagement service-learning projects*. (Respondent from University G)

> *Yes, urban planning involves real-life situations and students must be exposed to both practical and theory*. (Respondent from University Other)

One respondent from University D highlighted the importance of being able to apply knowledge rather than just having it. A prime example of this is from a respondent from University G who is currently working on a project to allow students to apply their knowledge to real-life situations:

> *Yes, I am currently working on an interdisciplinary student project with the City of Cape Town, which focuses on the practical issues of localising SDG 11, and thus DRR*. (Respondent from University G)

These opportunities will aid students to better understand disasters and prevent disastrous situations from happening, as demonstrated in the comments from two respondents from University E, below:

> *Yes, students should be able to observe/study disasters and strategies for prevention, classroom studies do not always equip planners to respond effectively*. (Respondent from University E)

> *Yes, especially given the prevalence of disasters and how the cause and effects of disasters often relate to poor planning*. (Respondent from University E)

Even though many of the respondents did agree with the integration of DRR and practical learning opportunities, one respondent from University A did voice concern about the curriculum already being too full. A possible solution could be to create a standalone module in the curriculum solely focused on DRR and urban risk. The next question further explores this option by looking at whether DRR should be a subcomponent or a standalone module.

5.5.9 Sub-component vs Stand-alone module (SQ4.9)

With the aim of using these results for further recommendations, Question 4.9 of the survey asked respondents whether they thought that DRR should be part of the URP curriculum in the form of a subcomponent of a module, or a standalone module, and to motivate their answers as well. As a result, 56,3% [N = 9] of the 16 respondents indicated that DRR should be included as a subcomponent of another module, whereas 43,8% [N = 7] stated that DRR should be a standalone module in the curriculum (see Figure 5-13 below). One respondent from University C did not select either of the given options but stated in their reasoning that DRR is both a subcomponent and standalone module, as disasters are not standalone events.

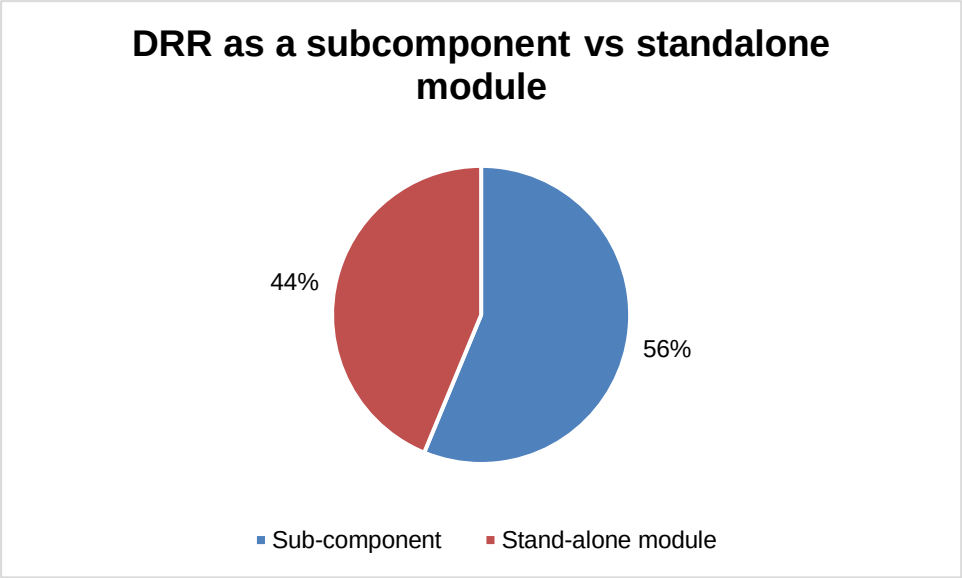


Figure 5-13: DRR as a subcomponent or a standalone module (SQ4.9).

Reasons for including DRR as a subcomponent included that DRR is better integrated with other relevant planning concepts (Universities D and F), as it cuts across all spatial planning contexts including environmental, economic, and legislative (University D). Another respondent answered that DRR is linked to other UP concepts, making it ideal to include as subcomponents:

> *It is entangled with a number of other UP concepts such as spatial planning, the environment, economies, legislation, sustainability, resilience, and to some extent, currently, technology/urban e-planning and digital innovations. No topic in planning can ever stand alone*. (Respondent from University G)

DRR could still be integrated in different modules across the board based on its reference to the course or its components at a given point in time (University E). This point is supported by respondents from Universities A and G who mentioned that it must be measured against the needs and considerations of the overall curriculum, as the curriculum is already full. This is supported by the respondent from University E who stated that:

> *It will depend on the focus of the planning programme. This option above is not a directive. A master's in environmental planning may need a standalone, but one that is general, and simply includes the subject*. (Respondent from University E)

The reasons as to why DRR should be included as a standalone module in the curriculum is motivated by the change in urban disaster severity and frequency:

Disaster has become more prevalent in recent times. It is a huge disservice if students aren't taught their implications for planning, and in particular looking at proactive instead of reactive response. (Respondent from University E)

We are living in an era prone to disasters and it is important that students be exposed to such concepts. (Respondent from Other University)

It should be a module on its own according to respondents from Universities B and J so detailed information/knowledge of DRR can be transferred to students. One respondent from University G mentioned that DRM should become a full-fledged mature discipline and that, perhaps, URP should be the discipline that takes it on. According to the respondents from University H, a platform can be created for incorporating all aspects of the subjects in the qualification. A respondent from University E says that more theoreticians and practitioners in the field are necessary.

Throughout this section, the respondents started to identify some of the challenges that may be associated with the integration of DRR in their curriculums. The next section aims to cast a light on the challenges foreseen by respondents.

5.6 Challenges of integrating DRR with UP (SQ5)

Respondents identified challenges in many of the questions requiring motivation. The aim of this last section of questions was to identify specific obstacles impeding integration of DRR with UP curriculums (see Research Questions 5.1 to 5.5 of the survey questionnaire). Additionally, these questions also aimed to highlight the best practices in integration or recommendations on improving integration. The first question looks at whether DRR is worth integrating in curriculums as a way to improve students in their professions. The second and third questions were designed to identify the current level of integration in universities and to explore if there is room to increase the integration of DRR in curriculums. Finally, this section asks the respondents to identify the challenges of DRR integration and to suggest any approach that could solve these issues and increase integration.

5.6.1 DRR integration aiding students' professional development (SQ5.1)

In an effort to understand the respondents' opinion on DRR integration and its benefits to students once they move into practice, Question 5.1 of the survey asked whether they agreed with the following statement: "*Integrating DRR in URP curriculums will help students and graduates in carrying out their duties in practice*". Of the 18 respondents, nine [50%; N = 9] strongly agreed with the statement, six respondents [38,9%; N = 6] agreed, and two respondents [11,1%; N = 2]

were neutral. None of the respondents disagreed or strongly disagreed with the statement as indicated by Figure 5-14 below.

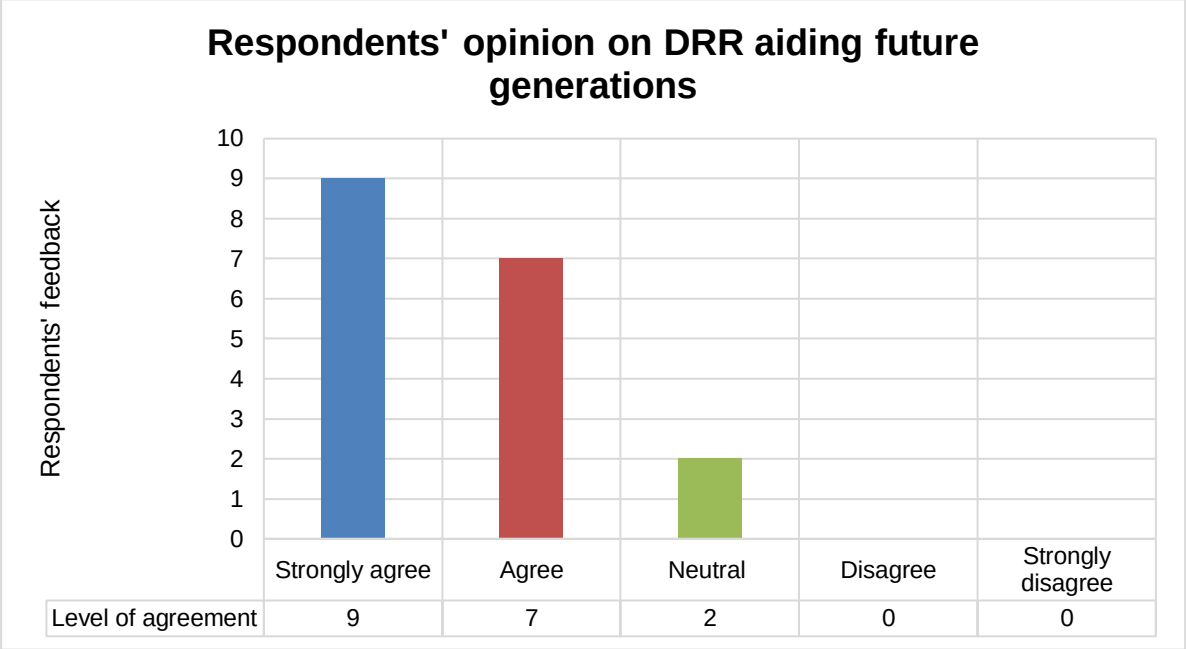


Figure 5-14: Lecturers' opinion of whether DRR integration will aid students in future professions (SQ5.1).

In an effort to understand respondents' reasoning for their feedback, they were asked to elaborate on their answers. A respondent who strongly agreed stated that too many practitioners are poorly equipped theoretically (University E). A respondent from University D also mentioned that practitioners must be equipped to face the onslaught of politicians in the execution of their professional duties. The one respondent from University C who selected the neutral option revealed that politics do indeed play a role in South Africa and that, if there is no political will, the need for integration will be irrelevant. A respondent from University G agreed that DRR integration into the URP curriculum would be beneficial as long as it remains related to UP.

One respondent stated that the floods and fires have become increasingly common and that UP should be and is constantly confronted with issues related to disaster risk. The response from Respondent G supports the notion that urban planners should be aware of the risks, hazards and vulnerabilities faced and that mitigation can reduce the overall risk. The respondents from Universities H and E had similar motivations:

> *Planning does not happen in the clouds but should be for people and needs on the ground. Recent disasters have confirmed the need for planners to understand how human*

behaviours and changes in the environment require a layered approach to planning and designing for resilience. (Respondents from University E)

Integrating disaster risk reduction is part of urban planning and students will be well equipped to face challenges in the work environment. (Respondents from University H)

The respondents from University D who strongly agreed demonstrated that integrating skills (especially DRR) that will aid students in their future professions is a crosscutting issue that can and should be solved. One respondent from University Other motivated their answer by referring to their own experience:

I am currently working with interns and feel that it is important that each university expose them to all the graduate attributes so that they are ready for the workplace. They should also be given project-based tasks/problem-based projects that will expose them to real-life situations. (Respondent from University Other)

It is evident that the majority of the respondents agree that DRR integration in UP curriculums can only be beneficial to students. The following section indicates the current level of integration in South African universities.

5.6.2 Level of integration at HEIs in South Africa (SQ5.2)

Question 5.2 was designed to compare the level of integration at various universities. The respondents were asked to indicate the level of DRR integration in URP curriculums at their institutions on a scale of *significant integration, sufficient integration, some integration, insufficient integration*, or *no integration*. None of the 17 respondents indicated that DRR was significantly integrated into modules at their institutions. Four respondents [23,5%] indicated that DRR is sufficiently integrated. These respondents are lecturers from University F [N = 1], G [N = 2] and J [N = 1] (see Section 5.2.3.). Eight respondents [47%] indicated that there is at least some DRR integration in URP curriculums. The majority of these respondents are lecturers from University E [N = 5] and the other half from University B [N = 1], D [N = 1] and I [N = 1]. However, four respondents [23%] demonstrated that there is insufficient integration, and one respondent [5,9%] that there is no DRR integration. The first four respondents are lecturers from University C [N = 1], D [N = 1] and G [N = 2], whereas the last respondent is from University Other [N = 1]. Figure 5-15 below indicates the respondents' feedback on the current level of DRR integration in HEIs.

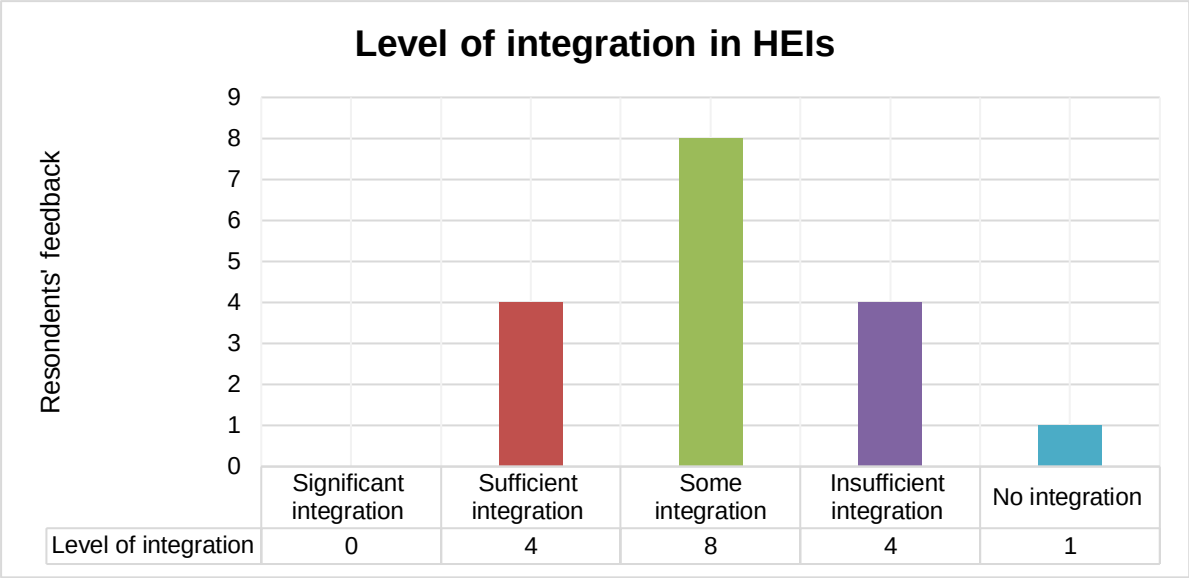


Figure 5-15: Level of DRR integration in URP curriculums (SQ5.2).

As indicated by the respondents, very few of the universities have sufficient level of integration with the majority of them only having some level of integration. The next section considers how HEIs can improve on this.

5.6.3 Room to increase integration in curriculums (SQ5.3)

Due to many curriculums often being compactly scheduled with other important core subjects, Question 5.3 of the survey asked respondents whether there is room in URP curriculums to include/increase DRR integration from their perspective. More than half of the respondents [50%, N = 9], indicated that there is room for DRR integration in their curriculums.

Some indicated that their curriculums may need to be revised in order to include DRR (Respondent from Other university); however, the entire institution must be on board (Respondent from University C). Many stated that integration is difficult due to lack of time:

> *Yes, there is always room for improvement, and there is always the limitation of time*. (Respondent from University E)

> *In principle yes, but in practice there is not enough time to adequately cover DRR in terms of course loads, timetabling etc*. (Respondent from University E)

> *To some extent, but there is so much to be taught and limited credits/time to teach everything*. (Respondent from University D)

However, one respondent from University B did argue that there is room because there are already environmental management-related modules in the curriculum at their institution. Thus, it is also a matter of prioritisation. This was also highlighted by the two respondents from University G:

> *As with every topic of planning, there is always room for inclusion. However, the curricula are already covering so many topics that the practicality becomes a difficulty. But there are ways around this, for example, lunchtime talks by specialists*. (Respondent from University G)

> *There is general awareness in the department of the importance of DRM, and course content is adjusted accordingly*. (Respondent from University G)

A lack of time in UP curriculums is demonstrated to be a major obstacle in the integration of DRR. Another aspect to consider includes the availability and distribution of credits. In other words, the courses will not be able to accommodate the credits assigned to the DRR module. It is important to know and understand the obstacles in the way of integrating DRR. The next section aims to do so.

5.6.4 Challenges faced with integrating DRR (SQ5.4)

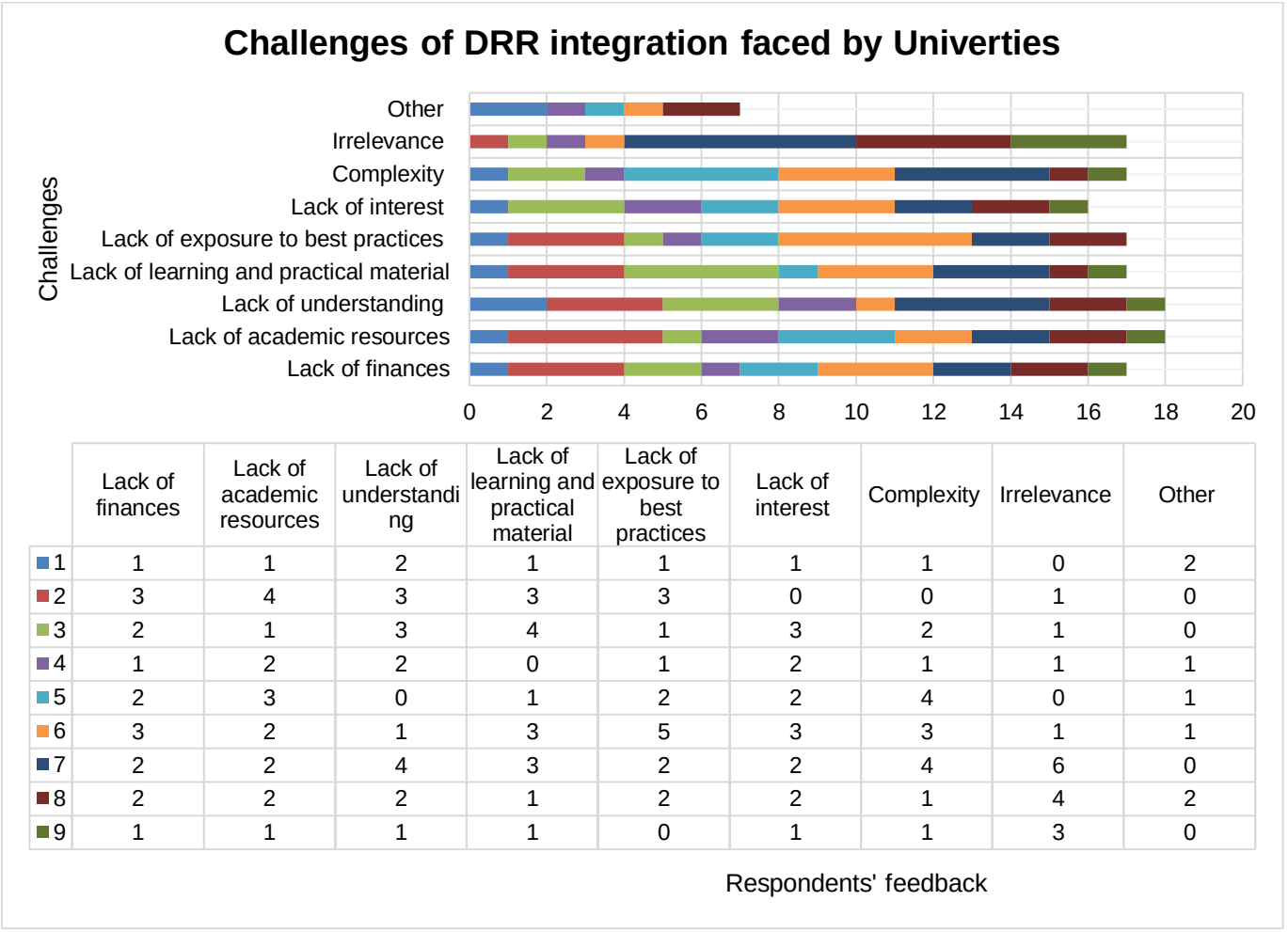
In order to create a holistic picture of the different challenges faced when integrating DRR in URP curriculums, respondents were presented with a list of nine challenges identified from literature. Question 5.4 of the survey asked respondents to rate each option from most to least challenging. The list consisted of 1) lack of finances, 2) lack of academic resources, 3) lack of understanding, 4) lack of learning and practical material, 5) lack of exposure to best practices, 6) lack of interest, 7) complexity of topic, 8) irrelevance, and 9) other. A lack of understanding (3) and other (9) were the two options that were ranked the most challenging. The respondents indicated that 'Other' included a lack of time in an already overfull curriculum as one of the most challenging aspects. Below are some of the respondents' motivations:

> *Time, expertise, and space within the curriculum*. (Respondent from University A)

> *Too much material to cover in the general planning curricula.* (Respondent from University E)

Secondary challenges included a lack of academic resources (2), and a lack of finance (1). The third most challenging option is a lack of learning and practical material (4), complexity of the topic (7) rated as the fourth most challenging, lack of exposure (5) as sixth, and irrelevance (8) rated

as the seventh most challenging. The respondents' ratings of the various challenges are indicated in Figure 5-16 below.



	Lack of finances	Lack of academic resources	Lack of understanding	Lack of learning and practical material	Lack of exposure to best practices	Lack of interest	Complexity	Irrelevance	Other
1	1	1	2	1	1	1	1	0	2
2	3	4	3	3	3	0	0	1	0
3	2	1	3	4	1	3	2	1	0
4	1	2	2	0	1	2	1	1	1
5	2	3	0	1	2	2	4	0	1
6	3	2	1	3	5	3	3	1	1
7	2	2	4	3	2	2	4	6	0
8	2	2	2	1	2	2	1	4	2
9	1	1	1	1	0	1	1	3	0

Figure 5-16: A representation of the various challenges faced when integrating DRR in URP curriculums (SQ5.4).

The respondents were asked to elaborate on the nature or extent of current challenges or challenges that were not identified that hamper the integration of DRR in URP curriculums in their institution. The lack of time and space to teach and include DRR in the modules and curriculums were mentioned by four of the respondents (Universities A, D (2), and E). Other challenges identified by the respondents that were not part of the line-up included field of specialisation:

> *Academics have their specific relatively small fields of specialisation that is difficult to shift as most have committed much of their energy to developing a footprint in that field*. (Respondent from University G)

A few of the other respondents elaborated on their challenges such as finances, understanding, and resources:

> *Most institutions are faced with financial issues due to students being unable to pay their fees, and they are running on a tight budget*. (Respondent from University H)

> *Budget remains the main constraint in bringing on board people with relevant skill sets. Some schools may well-integrate DRR due to resources at their disposal*. (Respondent from University E)

> *Unless faced with the reality it is sometimes difficult to conceptualise risks, hence the importance of practical exposure*. (Respondent from University D)

> *The ability to have access to practical projects that are campus specific*. (Respondent from University C)

> *In a practical sense, implementing DRM in projects could be a challenge*. (Respondent from University G)

A lack of space and time in the curriculum was consistently mentioned by the respondents throughout this research survey. The respondents also included that a lack of understanding and financial resources complicates efforts to integrate DRR in UP curriculums. In an effort to identify possible solutions for these challenges, the next question requested respondents' input regarding ways of increasing DRR integration.

5.6.5 Approaches to increase integration on curriculum level (SQ5.5)

In an effort to increase the value of recommendations, Question 5.5 of the survey requested that respondents recommend any procedures or steps that could increase the integration of DRR in URP curriculums. Some suggest that the modules and programmes should be revised (Respondents from Universities J and Other). It was also proposed that the content be embedded in all relevant modules (Respondents from Universities D and H) as well as other programmes and modules in other fields teaching elements related to DRR (Respondent from University I). One respondent from University A suggested introducing DRR as a theme in already existing modules:

> *Introduce it as a cross-cutting theme in settlement planning and design guidelines e.g., the CSIR 'Red Book*". (Respondent from University A)

Respondents from University E and G suggested introducing seminars in the department that raise awareness around the issue, or a series of workshops over a period of one academic year. Academics could start a conversation on how to embed DRR into existing subject envelopes and then receive guidance on how to implement it. It might be helpful to do this through the Heads of Planning Schools forum. Having experts on DRR convey their knowledge could be very beneficial:

> *Employing people with varied skills across disciplines and not just planning*. (Respondent from University E)

Others from Universities F and G suggested the use of practical examples to illustrate the importance of disaster and risk management e.g., incorporation into community engagement and service-learning projects and fieldtrips/exposure (Respondent from University D). More suggestions for including practical learning experience included:

> *Build capacity, develop collaboration with local and international universities to expose students to different experience*. (Respondent from University E)

> *Better management buy-in for practically creating projects relating to DRR*. (Respondent from University C)

Question 5.5 was the concluding question of the research survey. The next section discusses the overall results of data analysed and the impact it has on the study.

5.7 Additional comments

The participants had the option to leave any additional comments and recommendations at the end of the survey. A participant from University F mentioned the importance of this research topic. The respondents from University D and Other continued to elaborate on methods that could aid in increasing the integration of DRR in URP curriculums, stating that:

> *In the light of climate change, refresher and short learning courses should be presented on an ongoing basis to current practitioners*. (University D)

> *Lecturers must do industry visit/exposure and get to engage with different urban stakeholders involved in urban planning projects. This must also include Disaster Risk Management*. (University Other)

A participant from University H did mention that the questions in this research study were too long. The next section reflects on this as well as other challenges experienced during the course of data collection.

5.8 Discussion

This section discusses the overall results obtained through the course of this study and compares the data with other literature. This will give an overview of the overall integration level and position of DRR integration at HEIs in South Africa.

i. Section one: Demographics

In the first section, the demographics of the 18 respondents from the 11 different universities that participated in this research study, were demonstrated. The data indicates that the 66,7% of these respondents had obtained doctoral degrees and 33,3% had obtained their master's degrees. The majority of the respondents [N = 12] had more than 10 years' experience in lecturing at universities and specialised in a wide range of academic topics. In a study conducted by Chang *et al.* (2011), they found that lecturers with over six years of teaching experience are more "self-efficient" when it comes to course design, instructional strategy, and learning assessment. Lecturers with more experience are able to manage classrooms and initiate student engagement (Horvitz *et al.*, 2015).

Raento *et al.* (2020) stated that it could be beneficial to draw from the different fields of speciality within the discipline rather than merging two entire fields. In other words, the lecturers can use an interdisciplinary approach to integrate DRR into URP curriculums. Overall, the respondents who took part in the study are a diverse group of lecturers from all over South Africa who are qualified, experienced, and have their own specialised knowledge in relation to UP.

ii. Section two: Field of teaching

The second section looked at the respondents' field of teaching and disaster risk. At present, the respondents are lecturing 1-10 modules related to URP. Here, 83,3% of the respondents indicated that DRR is included in their existing lecturing responsibilities, even if it is a small or unspecific part. In a study conducted by Preston-Jones (2020), she found that some URP modules do cover elements of risk and climate change even though the concepts where not explicitly stated in the descriptions or titles. Hamin and Marcucci (2013) noted the appearance of concepts such as adaptation and mitigation in UP curriculums in the United States.

The Global Assessment Report on Disaster Risk Reduction of 2015 (Holloway, 2015) revealed a rising trend in degrees on disaster-related topics, especially on postgraduate level. However, the overall results from this study indicated that the majority of the inclusion of DRR in the UP modules was between 5%-70%. The respondents' reasons for including DRR in their modules ranged from disaster prevention, adhering to legislation, and enhancing urban and environmental planning. Topics related to DRR that have been included in modules are a collection of themes such as

water management, infrastructure, environment, disaster risk, legislation, and government. In a recent study by Nalla *et al.* (2022), it was revealed that topics such as ecology, climate change, disaster resilient infrastructure, sustainable development, and environmental studies have been combined with UP and included in modules and courses, even if it was on a small scale.

The majority of respondents' lecturing responsibilities that involve DRR applied to postgraduate students and courses; however, according to the feedback, undergraduate modules often have more material related to DRR. According to Taylor *et al.* (2021), the number of undergraduate programmes that are interdisciplinary are limited and are mostly at postgraduate level. This is concerning as there are few courses and curriculums that expose students to different perspectives and specialities before graduation. The majority of the respondents' lecturing responsibilities that involve DRR apply to postgraduate students and courses; however, according to the feedback, undergraduate modules often have more material related to DRR.

iii. Section three: Current knowledge level

In this section, respondents' current level of knowledge regarding the need to integrate DRR with existing UP curriculums was determined. According to March and Rijal (2015), interdisciplinary action within UP is encouraged; however, there is a need to increase skills development and increase knowledge to interlink DRR with UP. This is apparent in the results of this study, as 58,8% of the respondents had sufficient to detailed knowledge of the concepts of DRR, which implies that the remaining 41,2% are still in need of knowledge and understanding.

Ozkan *et al.* (2018) stated that more than one discipline is required when addressing real-life issues. HEIs provide opportunities for cross-discipline knowledge integration. UP that is aware of DRR is a step towards disaster prevention and disaster resilience (Nakabayashi, 1994). However, 88,8% of the respondents agreed that DRR is relevant to UP. The reasoning behind this is motivated by the responsibility of planners to design and create safe and resilient living spaces for communities. The need to create safer urban environments is supported by the rising vulnerability of urban areas due to unplanned urbanisation (Berse *et al.*, 2011). Sustainable development and adapting to climate change play major roles in increasing the resilience of infrastructure. DRR can also be linked with SPLUMA's development principles and provide long-term perspectives on how to mitigate the impact of disasters on urban infrastructure (Garschagen, 2016).

Policies and frameworks are important tools in the effort to reduce the effects of disasters on urban areas and mitigate hazards (Roth, 2011). Many of the respondents are aware of the international and national policies discussed in Chapter 3. However, respondents referred to

frameworks that were not included in the literature review e.g., SPLUMA (Spatial Planning and Land use Management Act 16 of 2013) and the National Environmental Act 107 of 1998. South Africa has impressive policies and legislation regarding DRR and UP, but implementation is severely lacking (Roth, 2011). Busayo and Kalumba (2020) argued that the expansion of urban areas occurs without the legal guidance urban frameworks.

iv. Section four: Curriculums

The fourth section aimed to review the overall integration of DRR in UP curriculums from the various HEIs according to the respondents. The respondents had a near 50/50 level of experience in integrating DRR, with eight respondents having extensive to acceptable experience, two with some experience, and eight with limited to no experience. This could be linked to the level of DRR knowledge of the respondents. In other words, experience is linked to knowledge and understanding. An important aspect of integrating disciplines includes expanding the knowledge base of lecturers before transitioning to the students (Perry, 2013). It is therefore crucial to first develop the knowledge and experience of DRR among lecturers before proceeding with curriculum integration.

However, 94,4% did agree that there is indeed a need to include DRR in UP curriculums with 77,7% stating that students can only benefit from it. Shandas and Brown (2016) mentioned that early exposure to different perspectives eases the transitions between two disciplines. URP curriculums need to reflect the current UP demands of planning practice in order to remain relevant (Roy *et al.*, 2017). This is especially important since, in recent years, UP has been linked to urban disaster risk, urban vulnerability and climate change.

The majority of respondents stated that DRR should be included in the curriculums and modules of URP students in their third year of their studies and the honours year of their postgraduate studies. Chatterjee *et al.* (2015), also recommended that concepts of disaster risk should be included in both undergraduate and postgraduate studies. When looking at literature from Chapter 4, undergraduate studies would include the foundation and core courses of teaching levels of DRR. Thus, allowing URP students to create a theoretical foundation on the concepts of DRR and then learning how to apply theory in practice. On a postgraduate level, URP students with an interest in DRR will therefore have the opportunity to select specialised topics, combining UP and disaster risk. Combining this with the generic, core and functional competencies of URP, students can apply their own UP knowledge and specialised abilities to tasks while keeping DRR in mind.

Integrated curricula encourages both task-based learning and contextual learning opportunities (Chimmalgi, 2019). According to the respondents, 83,3% of them had 1-3 modules that include

elements of DRR and 43,8% of these are equally divided between theoretical and practical learning. They also indicated that there should be more practical DRR learning opportunities for students.

Integrating concepts such as sustainability into curriculums allow students to address environmental issues in their courses (Wu & Shen, 2016). The respondents indicated that the modules best suited for the integration include modules related to environmental planning, sustainable development, and design. This corresponds with the study done by Roy *et al.* (2017), where they highlighted that, at a master's degree level, urban planning issues and DRR are usually linked by topics such as environmental planning, transport planning and housing, urban infrastructure, and urban service delivery.

Davidson and Lyth (2012) stated that students will be more capable of addressing complex disaster-related planning issues when concepts such as disaster risk and climate change adaptation are integrated with the core programmes of URP. The respondents were asked whether DRR should be a standalone module or a subcomponent in modules. Authors such as Wingate (2006) stated that standalone modules tend to become separate from the core concepts of UP, making it irrelevant to students. The results indicated that 56,3% agreed with DRR being a subcomponent and 43,8% agreed that is should be a standalone module. In the end, the best way to incorporate DRR in URP curriculums depends on the specific needs and resources of each induvial HEI.

v. Section five: Challenges

The last section identified the challenges that hamper the integration of DRR in UP curriculums. The respondents all indicated that students can only benefit from the integration in their future professions. Especially since curriculums should equip students with skills and knowledge to respond to increasingly complex urbanisation demands (Nalla *et al.*, 2022).

However, 23,5% of the universities have sufficient levels of DRR integration and 47% had some level of DRR integration. Only 50% of the respondents indicated that there is room to include DRR in their curriculums. The results indicated that a lack of time and space in the URP curriculums is one of the main challenges delaying the integration of DRR. This is supported by Thayaparan *et al.* (2014), who highlight that even though the importance of integrating DRR is being realised, the process is being slowed due to educational curricula issues.

Another major challenge hindering the integration of DRR in UP curriculums includes a lack of understanding of the subject, and lack of academic resources and finances. Chapter 2 also found

that a lack of DRR understanding among UP academics and urban planners reduces the process of integration. The shortage of qualified staff to effectively transfer DRR knowledge and to mainstream DRR in URP curriculums is a challenge faced by many HEIs (Nalla *et al.*, 2022).

The respondents suggested that, in order to reduce these major challenges, curriculums should be revised to allocate time for DRR. Other suggestions include organising workshops for both students and lecturers presented by DRR specialists. Thayaparan *et al.* (2014) mentioned that taking an informal (learning from experience) and non-formal (learning from communities) approach to provide lecturers and students with DRR knowledge and understanding allows HEIs to respond faster to the integration demands.

5.9 Conclusion

Chapter 5 aimed to evaluate the current level of DRR integration in URP curriculums in South Africa as well as identifying any challenges and best practices. This chapter indicated that HEIs that participated in this study have URP lecturers that are qualified and experienced in diverse specialties related to UP. In relation to the current level of DRR integration in URP curriculums, most of the integration is included in postgraduate studies due to the majority of HEIs only offering it at postgraduate level. The modules that include DRR as part of their material are mostly related to water management, infrastructure, and environmental planning. The majority of the respondents agreed with the importance of DRR integration, although only four of the 17 respondents indicated that their HEIs have sufficient integration. The challenges impeding the DRR integration in URP curriculums are related to a lack of space and time in the curriculum, as well as a lack of understanding of the subject. The respondents gave their own recommendations identifying ways to increase integration. Chapter 6 discusses further recommendations as well as concluding the overall results of this research study.

CHAPTER 6 CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

The growth of populations leads to increased urbanisation as people seek better opportunities, and urban disasters become more and more common. Due to the diverse nature of urban areas in terms of geographic location, infrastructure and inhabitants, the overall effect of disasters can be quite severe. The impact of these disasters can be mitigated and reduced with the assistance of urban planning. Mainstreaming Disaster Risk Reduction (DRR) with Urban Planning (UP) presents a possible solution to reduce or eliminate the effects of urban disaster. Using education to increase the level of integration of DRR with UP provides the opportunity to reduce disasters through a bottom-up approach by building a culture of prevention and resilience into the foundations of the UP discipline.

This study aimed to evaluate the current level of integration of DRR with UP at South African higher education institutions (HEIs) by looking at their Urban and Regional Planning (URP) curriculums. A literature review was conducted that extended over three chapters. Chapter 2 investigated the current urban risk profile of South Africa, as well as looking at the connection between DRR and UP. The second literature review chapter (Chapter 3) highlighted the global and South African legislative frameworks that support the integration between DRR and UP. Specifically, there was a focus on the role these frameworks envision for education institutions in terms of facilitating greater integration between DRR and UP. Chapter 4 highlighted the connection and the role of HEIs in increasing the integration between DRR and UP through the key functions and activities of an HEI that include teaching and learning, research, consultancy, and community engagement. Chapter 5 presented and discussed the results from the survey distributed to URP lectures at 11 HEIs.

This concluding chapter (Chapter 6) endeavours to summarise the key findings of the study and provide guidance for future research into the integration of DRR with UP at HEIs in South Africa. The discussion of the findings is framed through the lens of the six research objectives formulated for the study.

6.2 Key insight relating to formulated research objectives

The overarching aim of this research study was to evaluate the current levels of integration of DRR with UP at Urban and Regional Planning departments and curriculums at HEIs in South Africa. Consequently, six research objectives were formulated to assist with the achievement of

the overarching aim of the study. The following sections discuss the results for each of these objectives, starting with Chapter 1.

6.2.1 Research Objective 1: To investigate the increasing impact of disasters on urban areas. Globally and within the South African context

The study has established that urban areas are increasingly impacted by drought, fires, and floods. This is established in the discussion of the South African urban landscape in Chapter 2. For instance, it was shown that droughts have affected millions of people, especially those living in urban areas of the Western and Eastern Cape provinces from 2015 to 2019. Floods due to heavy rainfall have also been occurring more frequently, causing severe damage to infrastructure, particularly in highly populated provinces such as the Western Cape, Gauteng, and KwaZulu-Natal. An increase in more intense convection storms has been apparent since 2017, affecting cities such as Durban, Pretoria and Johannesburg. Wildfires and informal settlement fires in the Western Cape have caused utter devastation to the homes and livelihoods of citizens. Along with technological hazards such as transport-related accidents and industrial accidents, people living in urbanised or highly populated areas of South Africa have a higher risk of being affected by disasters triggered by drought, flooding, and fire. Table 2-1 in Chapter 2 indicates the number of disasters that have occurred in the nine provinces of South Africa between 2015 and 2021. The overall trend shown in the table is that disasters in South Africa are becoming increasingly urban according to the provinces most affected (i.e., Gauteng, KZN, and Western Cape).

It was also shown that the communities most at risk of exposure to hazards are those living in poverty and unplanned urban settlements and structures. Socio-economic conditions such as inequality and poverty deplete the country's coping capacity as people become more vulnerable to disasters. The diverse population of South Africa has been faced with various social inequalities that all contribute to the increasing level of vulnerability. Living in informal settlements automatically increases the level of exposure of communities to floods, fires, diseases, and pollution. Additionally, it was established that vulnerable populations are also affected by poor service delivery and have fewer resources at their disposal, which further diminishes their coping capacity. Another overarching problem that contributes to South Africa's overall disaster risk profile is the current rate of rural-urban migration that places significant pressure on existing infrastructure and the ability of the state to provide new infrastructure to cater for the needs of the community. This often leads to informal and overcrowded living spaces as people are forced to create and secure their own housing. Differentiating between formal and informal housing becomes difficult, as low-income housing often results in additional makeshift dwellings.

Those living in informal settlements in urban areas are confronted with harsh living conditions such as overcrowded living spaces and exposure to pollution. Disasters such as flooding, fires, and droughts are often enhanced by the effects of climate change. Climate change contributes to the underlying drivers that increase the vulnerability and exposure of urban areas and urban communities to disaster. In recent years, South Africa has been affected by the aftermath of cyclones, as indicated in Table 2-1 (Chapter 2), exposing the country's lack of extreme weather preparedness. The effect of El Niño also increases the level of food insecurity and water scarcity. Both these issues present major concerns for South Africa's growing cities.

Currently, most people living in urban areas are affected by urban disasters due the number of inhabitants. These people are interlinked due to their geographic location and their socio-economic status. Cities such as Cape Town, Pretoria, Johannesburg, and Durban are all affected by various urban disasters. Due to the effects of climate change, the frequency and variety of disasters will continue to present challenges to urban communities' lives, economies and infrastructure. South Africa has been experiencing an increase in urban disasters; however, it is still possible to reduce vulnerabilities and hazard exposure. By integrating DRR with urban design, strengthening the level of disaster preparedness, and increasing mitigation measures, urban areas can reduce their own risks before they escalate into disasters.

The next research objective aimed to prove the theoretical connection between DRR and UP integration.

6.2.2 Research Objective 2: To establish the theoretical underpinnings for the integration between UP and DRR

In Chapter 2, urban problems that often result or contribute to disasters can be traced to poor urban management and planning. These problems include a lack of public services, pollution, overpopulation, poverty, and unplanned urbanisation that often leads to the exposure of communities to environmental hazards. UP is a multi-dimensional discipline that involves spatial planning and the design of urban areas, as well as aspects of the economic, natural, physical, and social environment. Combined with geological location, UP can determine the shape of the strengths and weaknesses of an urban area in terms of disaster exposure. However, it was shown that UP can also be used as a tool to reduce the effects of disasters in urban areas when incorporating DRR techniques. Throughout the literature review of this study, various authors have recognised the connection between DRR and UP. A common thread that emerged from the theory was that, when urban planners are conscious of DRR, they can address urban vulnerabilities through infrastructure development, urban design, and land rearrangements. UP

assists in minimising the human-induced threats and exposure to natural hazards by regulating the long-term use of space.

It was also shown that urban planners can determine and address the vulnerability and exposure level of people in disaster-prone areas. Pre-establishing building standards, service allocation access, and building disaster-resilient infrastructures will ensure that the vulnerability of an urban area to disasters is regulated. Literature revealed three major benefits to integrating DRR with UP:

i. DRR and UP can mutually assist each other by reducing the vulnerabilities caused by unplanned urbanisation.

ii. DRR and UP both present unique technical and non-technical interventions and policy mechanisms that can assist in the development of safe and sustainable urban environments that can respond to disasters.

iii. The integration between DRR and UP will also relieve the economic effects of disasters on urban communities that often condemn the most vulnerable communities to a continual cycle of disaster exposure and loss.

DRR and UP have similar overarching objectives for improving the social protection and livelihood of communities whilst lessening their vulnerabilities. This is achieved by emphasising key reinforcing concepts such as resilience and sustainability in both policy environments. The emphasis on sustainable and risk-aware development will lead to urban areas that are resilient to the effects of disasters and climate change. At policy level, the mainstreaming of DRR integration with UP is seen as a more effective intervention than treating it as separate issues. By integrating these two fields at policy level, a sustainable and disaster-resilient built environment agenda can be put in place to guide the development, planning and construction of urban areas in South Africa. Even though the current level of integration between these two fields has been minimal thus far, it does not detract from the potential mutual benefit of their integration. However, this study identified four major factors standing in the way of the integration of DRR and UP. These included the following issues:

i. Lack of public understanding for the need to integrate DRR and UP;

ii. Taking the wrong approach to integrating DRR and UP;

iii. Lack of practical experience in integration of DRR and UP; and

iv. Lack of theoretical background on the integration between DRR and UP

These factors where included in the questionnaire used for the data collection part of this research study to identify whether they apply to South African HEIs as well.

6.2.3 Research Objective 3: To investigate the Integrational and National DRR policy prescription for the integration of DRR and UP

Chapter 3 presented the international and national policies that support the integration between DRR and UP. Some of the key international frameworks evaluated in Chapter 3, included:

i. The Yokohama Strategy and Plan of Action for a Safer World;

ii. Hyogo Framework for Action (HFA);

iii. The Sendai Framework for Disaster Risk Reduction (SFDRR);

iv. The New Urban Agenda; and

v. The Sustainable Development Goals

The first two frameworks emphasised that unplanned urbanisation exacerbates vulnerability to disasters. Both frameworks indicated how integrating disaster risk with planning could contribute to sustainable development if coping mechanisms were improved e.g., by strengthening the resilience of infrastructure against disasters. The Yokohama Strategy states that professionals involved with disasters and disaster risk should be educated in methods of disaster reduction. The HFA mentions the importance of DRR training and research and how it should be taught and included in education curriculums. The SFDRR is the latest framework that guides DRR on an international scale. It emphasises the need to address underlying disaster risk drivers, such as unplanned urbanisation and poor land-use management, to improve urban disaster resilience. It also reiterates a need to increase knowledge and awareness of DRR at all levels of society through education. Therefore, although not directly stated, this broad inference in the SFDRR supports efforts to enhance DRR and UP integration by including DRR in URP curriculums at HEIs. Thus, educating both UP students and UP professionals on the importance of DRR would ensure greater adherence to global DRR policy. The final two frameworks, the New Urban Agenda and the Sustainable Development Goals, are aligned with the SFDRR in striving towards sustainable development though DRR and UP integration. This includes using education to reduce urban vulnerability and increase urban resilience.

Three national DRR and UP policies also explored in Chapter 3 include:

i. The Disaster Management Act No. 57 of 2002;

ii. The National Disaster Management Framework; and

iii. The Integrated Urban Development Framework

South Africa's Disaster Management Act and National Disaster Management Framework aim to mainstream DRM across all sectors of society and provides guidelines on how to achieve this. Specifically, the Disaster Management Act (DMA) aims to create a resilient society by coordinating and integrating DRR activities with various specialised fields. Section 1(b) and 8(e) emphasise the need to educate both professionals and practitioners (such as urban planners) from various developmental fields in DRR. In addition, Section 7(2)(m) and 21 of the Act state that all relevant tertiary disciplines should have aspects of disaster risk management included in their curriculums, thereby providing a legislative mandate to integrate DRR into a field such as UP. The National Disaster Management Framework (NDMF) provides guidelines for the implementation of disaster management. The NDMF, like the DMA, highlights the importance of integrating DRR in educational programmes and curriculums. This includes modules and courses at HEIs such as URP. Subsequently, by being educated in DRR theory and practice, urban planners will be more conscious of disaster risk and the underlying factors of vulnerability associated with urban infrastructure and the planning of new urban areas. The Integrated Urban Development Framework (IUDF) emphasises that safe living spaces must be created for South Africans by using disaster risk information and monitoring mechanisms to inform urban planning endeavours. It further calls for the cooperation between government and HEIs to increase DRR training, with the goal of reducing the overall disaster vulnerability of society. All three national frameworks to some extent seem to advocate for the integration between DRR and UP. The education sector has a crucial role in all three the national policies to facilitate this integration between the two fields. The long-term outcome would be the development of more risk aware South African UP officials who would be more cognisant of disaster risks, and actively integrate disaster-resilient building concepts into their urban design.

6.2.4 Research Objective 4: To evaluate the current levels of integration of DRR with UP in URP Departments and curriculums within HEIs in South Africa

Chapter 4 focused on how the integration of DRR could be accomplished by including UP in all teaching, research, consultation, and community outreach endeavours of a university. By integrating DRR with UP curriculums, research, consultation, and community outreach, UP students are equipped with knowledge and experience to solve challenges related to disaster risk and UP. This holistic approach to training and learning allows for specialised urban risk reduction

skills to be developed. Importantly, students are taught to think critically and find practical ways of addressing vulnerability issues in urban settings, while also finding innovative structural and non-structural solutions that enhance adaptive capacity.

Another crucial trend that has emerged from literature is an increase in courses, globally, that integrate DRR and UP. In adhering to global trends, efforts should be made to ensure that the teaching and integration of DRR with UP modules should occur at various NQF levels to ensure UP students are gradually introduced to theory and the practical tools associated with DRR. Mainstreaming DRR in UP curriculums from graduate to postgraduate level will help to create a culture of prevention and resilience among urban planning professionals.

Despite the clear benefits of integrating DRR with UP curriculums, this integration is not happening to a sufficient extent at South African Universities. Consequently, Chapter 5 explored the current level of DRR integration in UP curriculums. The results were divided into five sections, namely demographics, field of teaching and disaster risk, current knowledge, curriculums, and challenges. The first section indicated that the lecturers teaching URP in South Africa are qualified, experienced, and specialised.

The field of teaching and disaster risk indicated that the majority of lecturers have 1-3 modules that include DRR concepts, even if it is indirect or on a small scale. This applies to both undergraduate and postgraduate modules. According to the results, DRR is mostly included in postgraduate courses, even though the undergraduate modules cover more material. These are modules that focus on disaster prevention, planning legislation, as well as urban and environmental planning. Topics that were identified in the data that is linked to DRR concepts include water management, infrastructure, environment, disaster risk, legislation, and government.

The section that focused on the current DRR knowledge level of the lecturers indicted that there is a need to improve the level of knowledge amongst UP lectures about the field of DRR. Especially since little over half of the respondents had adequate knowledge of DRR. The relevance of DRR to UP was undeniable, as the results indicated that 88,8% of the respondents agreed. The respondents motivated their responses by emphasising the responsibility of urban planners to create resilient and sustainable urban communities. The lecturers did have a notable level of awareness of the frameworks and policies mentioned in Chapter 3 regarding the integration of DRR and UP. Therefore, it could be said that UP lecturers working at South African HEIs have knowledge of DRR policy, but lack theoretical and practical knowledge.

The curriculum section gave an insight into the overall level of DRR integration in current UP curriculums. Only half of the lecturers had an acceptable level of experience of the integration of DRR in the curriculum. However, 94,4% agreed that there is indeed a need to include DRR in URP curriculums. Therefore, efforts should be made to provide training and capacity-building for lecturers to improve their experience and competency in integrating DRR into their curriculums.

The research data indicates that more respondents (53%) reported that DRR should be included in undergraduate modules (first to fourth year) rather than postgraduate modules (47%). This is a major blind spot, since most universities only offer integrated DRR and URP courses at postgraduate level. This means that professionals who do not go on to postgraduate studies receive minimal or zero exposure to the concept of DRR. The data collected also indicated that 56,3% of the respondents reported that DRR should be a sub-component rather than a stand-alone (43,8%) module. Although this situation would promote the mainstreaming of DRR across the UP discipline, it could also lead to a situation where DRR issues are only superficially dealt with an no specialised knowledge or skills are ever built. Since most of the respondents agreed that DRR is relevant to UP, they all stated that students can only benefit from it in their future professions (88,9%).

6.2.5 Research Objective 5: To identify integration gaps and best practice cases of integration of DRR in UP within URP curriculums in South African Universities

Chapter 5 identified the challenges faced by HEIs when trying to integrate DRR in curriculums. The final section of the questionnaire aimed to identify the challenges URP lecturers and HEIs face when integrating DRR in URP curriculums. This line of questioning was important as data showed that only 23,5% of the HEIs in South Africa currently believe they have sufficient DRR integration. Additionally, only 50% of respondents indicated that there is room to include DRR in URP curricula even though 94,4% previously indicated that there is indeed a need for integration. Throughout the data analysis process, it was evident that a lack of time and space in the curriculums is one of the major challenges faced by HEIs. The lack of time and space also means that there is no space in the curriculum for another subject, as there are no credits left to dedicate to the subject. A lack of understanding of the subject field also complicates integration efforts. The current dearth of knowledge on the subject field was confirmed by the data, with the majority of participants (58,8%) only having a sufficient level of knowledge of the field, whilst the remaining 41,2% had some to limited knowledge. Other challenges included a lack of academic resources and finances. These results are valuable when comparing it with the impending factors identified in the literature review (see section 6.2.1), especially since a lack of understanding of the subject and lack of academic resources were presented in both findings.

Best practice cases and recommendations that emerged from participants to reduce these challenges included potentially revising existing URP curriculums in order to allocate time and material on DRR or even introducing it as a dedicated sub-theme in existing modules. Seminars and workshops with guest speakers who specialise in DRR could also aid in increasing understanding amongst lecturers and students, while providing a possible solution for modules that cannot integrate additional credit-bearing subjects. Providing more practical learning experiences was also identified as a way to increase understanding and comprehension of DRR amongst UP students, especially when engaging with at-risk communities.

6.2.6 Research Objective 6: To make recommendations for furthering the integration of DRR and UP within URP curriculums in South African Universities

The final objective was to make recommendations for further integration based on the results of the research study which is discussed in Chapter 6. This section identified five themes throughout the study that lead to further recommendations. The recommendations are a combination of recommendations for further research and recommendations for further action to increase the integration of DRR and UP.

i. Educating and up-skilling URP lecturers

The data results indicated that more than half of the lectures had sufficient to detailed knowledge of the subject, although many still lacked understanding. A lack of DRR understanding was also revealed in the literature review, especially amongst UP professionals. Consequently, the first recommendation would be to educate URP lecturers on DRR theory, concepts, and practice. This would allow lecturers to have a better understanding of the subject and assist in furthering the integration of DRR and UP. For future study, the lecturers' understanding DRR could be compared to that of UP professionals in order to identify the effectiveness of the current URP curriculums to carry over DRR concepts into practice.

ii. Restructuring of existing URP curriculums

Allocating time and credits to include DRR in URP curriculums is an important requirement that emerged throughout the data analysis, especially since the results indicated that only half of the respondents have enough room for it in their modules. The second recommendation would be for HEIs and URP departments to revise and restructure their own curriculums in order to allocate enough time to incorporate DRR with UP modules, either as a crosscutting issue or a stand-alone module. Future research should therefore focus on identifying the optimal course structure,

content and time allocation for each higher learning institution in South Africa to ensure greater integration between DRR and UP.

iii. Government facilitation of integration between DRR and UP in South Africa

Literature has indicated that governments can assist in the effort to increase DRR integration in all sectors that are involved in development activities such as URP curriculums in HEIs. Future studies should investigate the role that the South African government could play in crafting or supporting in the integration of DRR with UP, especially in the higher education and training sector.

iv. Developing a detailed policy guideline

During the data analysis process, respondents identified 10 other frameworks that, according to them, supported the integration of DRR and UP. Thus, this study recommends for future studies to assist in developing a detailed policy guidelines that not only indicates all the legislative frameworks that advocate for the integration for DRR and UP at all levels, but also how their provisions can be included in any integrated DRR-UP curriculum developed at HEIs.

v. DRR education amongst practitioners

Lastly, it is recommended for further study that the current levels of knowledge and awareness of DRR amongst URP practitioners be explored, particularly to compare whether their knowledge is based on their HEI education or t practical experience they have gained since existing their HEI. This will give some indication of current training shortfalls amongst UP practioners, and whether capacity should be built in the UP sector through formal or informal training programmes.

6.3 Conclusions

In conclusion, it is becoming increasingly important to address South Africa's increasing risk of urban disaster. Underlying factors such as unplanned urbanisation, socio-economic inequality, and climate change all contribute to the increased diversity, frequency and intensity of these urban disasters in South Africa. Urgent action is therefore needed to ensure the effects of urban disasters are reduced. The incorporation of DRR in existing UP curriculums has shown great potential for informing more risk-aware urban design and the construction of disaster-resilient urban areas. National and international development frameworks have encouraged the integration of DRR with UP, with HEIs assuming a leading role in the integration process by mainstreaming DRR into the curriculums of key developmental study fields, such as URP.

HEIs have the potential to transfer DRR knowledge and skills to students, communities, professionals, and governments working in the URP space through all of their daily activities including teaching and learning, research, consultancy, and community outreach. However, as the results of this study suggest, various challenges still remain for South African HEIs to integrate DRR with the existing curriculums and activities. Specifically, UP academics currently only have a very limited exposure to and understanding of the theoretical and practical concepts of DRR, thereby hampering their ability to create a holistic understanding of the concept amongst their students. Current curriculum structures and credit allocations are also inhibiting efforts to introduce novel and important subject matters to students. Finally, financial constraints means that no additional staff members can be hired to drive the development of course material and teach DRR topics. These challenges will need to be addressed by developing additional skills and capacity for lecturers, reviewing existing curriculum compositions, and revisiting budget allocations. If these challenges can be addressed, HEIs in South Africa can start to produce UP curriculums to foster a culture of disaster-risk awareness and resilience amongst future UP professionals. In turn, this will contribute to safer and more resilient built environments for all South Africans.

BIBLIOGRAPHY

Abedin, M.A. & Shaw, R. 2015. The role of university networks in disaster risk reduction: Perspective from coastal Bangladesh. *International journal of disaster risk reduction*, 13:381-389.

Abunyewah, M., Gajendran, T. & Maund, K. 2018. Profiling informal settlements for disaster risks. *Procedia engineering*, 212:238-245.

Addison, P. & Oommen, T. 2020. Post-fire debris flow modeling analyses: case study of the post-Thomas Fire event in California. *Natural Hazards*, 100(1):329-343.

Adelekan, I., Johnson, C., Manda, M., Matyas, D., Mberu, B., Parnell, S., Pelling, M., Satterthwaite, D. & Vivekananda, J. 2015. Disaster risk and its reduction: An agenda for urban Africa. *International development planning review*, 37(1):33-43.

Ainembabazi, J.H., Rusike, J. & Keizire, B. 2018. *The 2015-16 El Niño-induced drought crisis in Southern Africa: What do we learn from historical data?*. Alliance for a Green Revolution in Africa (AGRA), (No. 2058-2018-5266). https://agra.org/wp-content/uploads/2020/08/AGRA-drought-crisis-in-Southern-Africa_v2-.pdf Date of access: 30 Aug. 2021.

Aitsi-Selmi, A., Egawa, S., Sasaki, H., Wannous, C. & Murray, V. 2015. The Sendai framework for disaster risk reduction: Renewing the global commitment to people's resilience, health, and well-being. *International journal of disaster risk science*, 6(2):164-176.

Albala-Bertrand, J.M. 2003. Urban disasters and globalization. In: Kreimer, A., Arnold, M. & Carlin, A., eds. *Building Safer Cities. The Future of Disaster Risk.* Washington, D.C.: The World Bank. pp.75-82.

Aldunate, R. Ochoa Delorenzi, S., Peña Mora, F. & Nussbaum Voehl, M. 2006. Robust Mobile Ad-Hoc Space for Collaboration to Support Disaster Relief Efforts Involving Critical Physical Infrastructure. *ASCE Journal of Computing in Civil Engineering*, 20(1):13-27.

Aleke, B.I. & Nhamo, G. 2016. Information and communication technology and climate change adaptation: Evidence from selected mining companies in South Africa. *Jàmbá: Journal of Disaster Risk Studies*, *8*(3), art. #250. doi:10.4102/jamba.v8i3.250

Alexander, D., Gaillard, J.C., Kelman, I., Marincioni, F., Penning-Rowsell, E., van Niekerk, D. & Vinnell, L.J. 2021. Academic publishing in disaster risk reduction: past, present, and future. *Disasters*, 45(1):5-18.

Amin, I.A.M. & Hashim, H.S. 2014. Disaster risk reduction in Malaysian urban planning. *Planning Malaysia*, 12(4):35-58.

Apronti, P.T., Osamu, S., Otsuki, K. & Kranjac-Berisavljevic, G. 2015. Education for disaster risk reduction (DRR): linking theory with practice in Ghana's basic schools. *Sustainability*, 7(7):9160-9186.

Ardito, L., Ferraris, A., Petruzzelli, A.M., Bresciani, S. & Del Giudice, M. 2019. The role of universities in the knowledge management of smart city projects. *Technological Forecasting and Social Change,* 142:312-321.

Arifin, S.R.M. 2018. Ethical considerations in qualitative study. *International Journal of Care Scholars*, 1(2):30-33.

Arndt, C., Davies, R. & Thurlow, J. 2018. *Urbanization, structural transformation, and rural-urban linkages in South Africa*. (SA-TIED working paper, WP/18/41). https://sa-tied.wider.unu.edu/sites/default/files/pdf/SATIED_WP41_Arndt_Davies_Thurlow_March_2019.pdf Date of access: 10 Jun. 2021.

Aspers, P. & Corte, U. 2019. What is qualitative in qualitative research. *Qualitative sociology*, 42(2):139-160.

Audefroy, J.F. 2011. Haiti: post-earthquake lessons learned from traditional construction. *Environment and Urbanization*, 23(2):447-462.

Bakari, S. & Ahmadi, A. 2018. Why is South Africa still a developing country? *International Academic Journal of EconomicsI,* 5(2):1-19.

Barton, H. & Tsourou, C. 2000. *Healthy urban planning*. 1st ed. New York, NY: Routledge. Available from Google books: https://books.google.co.za/books?hl=en&lr=&id=MaJRDbX_8-oC&oi=fnd&pg=PR12&dq=urban+planning&ots=5Zdub9ptc4&sig=f2aopZL_i1GPqScATjxJOxsn96E#v=onepage&q=urban%20planning&f=false Date of access: 20 Jun. 2021.

Basler, T.G. 2005. Community outreach partnerships. *Reference Services Review*, 33(1):31–37.

Batteate, C. 2006. Cal Poly's Symposium on Urban Disaster Risk Reduction and Regeneration Planning: An Overview. *Focus: Journal of the City and Regional Planning Department*, *3*(1):11-17.

Bayuo, B.B., Chaminade, C. & Göransson, B. 2020. Unpacking the role of universities in the emergence, development and impact of social innovations–A systematic review of the literature. *Technological Forecasting and Social Change*, 155, e120030. https://doi.org/10.1016/j.techfore.2020.120030

Bendimerad, F. 2003. Disaster risk reduction and sustainable development. In *World Bank Seminar on The Role of Local Governments in Reducing the Risk of Disasters, Held in Istanbul, Turkey*, 28:57-75.

Benson, C. & Twigg, J. 2004. *Measuring mitigation: methodologies for assessing natural hazard risks and the net benefits of mitigation*. Switzerland, Geneva. Prevention Consortium. http://lib.riskreductionafrica.org/bitstream/handle/123456789/663/4970.Measuring%20Mitigation.%20Methodologies%20for%20assessing%20natural%20hazard%20risks%20and%20the%20net%20benefits%20of%20mitigation%20A%20scoping%20study%20Main%20Report.pdf?sequence=1 Date of access: 26 Jun. 2021.

Berse, K.B., Bendimerad, F. & Asami, Y. 2011. Beyond geo-spatial technologies: promoting spatial thinking through local disaster risk management planning. *Procedia-Social and Behavioral Sciences*, 21:73-82.

Bhengu, L. 2021. Cape Town fire: govt ministers visit UCT, Table Mountain to determine extent of damage. *News24*, 24 Apr. https://www.news24.com/news24/southafrica/news/cape-town-fire-govt-ministers-visit-uct-table-mountain-to-determine-extent-of-damage-20210424 Date of access: 20 May. 2021.

Boeckmann, M., Roux, T., Robinson, M., Areal, A., Durusu, D., Wernecke, B., Manyuchi, A., Pham, M.D., Wang, C., Hetem, R. & Harden, L. 2019. Climate change and control of diarrhoeal diseases in South Africa: Priorities for action Connections between temperature and diarrhoeal disease. *SAMJ: South African Medical Journal*, 109(6):359-361.

Bölling, M. & Eriksson, Y. 2016. Collaboration with society: The future role of universities? Identifying challenges for evaluation. *Research evaluation*, 25(2):209-218.

Bopape, M.J.M., Sebego, E., Ndarana, T., Maseko, B., Netshilema, M., Gijben, M., Landman, S., Phaduli, E., Rambuwani, G., Van Hemert, L. & Mkhwanazi, M. 2021. Evaluating South

African Weather Service information on Idai tropical cyclone and KwaZulu-Natal flood events. *South African Journal of Science*, 117(3-4), art. #7911. doi:10.17159/sajs.2021/7911

Bosher, L. 2014. Built-in resilience through disaster risk reduction: operational issues. *Building Research & Information*, 42(2):240-254.

Bosher, L., Chmutina, K. & Von Meding, J. 2016. *Disaster risk reduction as a professional competency. A review of related training and education provision for built environment practitioners in the UK and Australia.* https://repository.lboro.ac.uk/articles/conference_contribution/Disaster_risk_reduction_as_a_professional_competency_A_review_of_related_training_and_education_provision_for_built_environment_practitioners_in_the_UK_and_Australia/9428807/files/17049821.pdf Date of access: 4 Apr. 2022.

Botai, C.M., Botai, J.O., Muchuru, S. & Ngwana, I. 2015. Hydrometeorological research in South Africa: A review. *Water*, 7(4):1580-1594.

Brandolini, P., Faccini, F., Paliaga, G. & Piana, P. 2018. Man-made landforms survey and mapping of an urban historical center in a coastal Mediterranean environment. *Geografia Fisica e Dinamica Quaternaria*, 41:23-34.

Brown, T., Leach, S., Wachter, B. & Gardunio, B. 2020. The extreme 2018 northern California fire season. *Bulletin of the American Meteorological Society*, 101(1):1-4. doi:10.1175/BAMSD-19-0233.1.

Bull-Kamanga, L., Diagne, K., Lavell, A., Leon, E., Lerise, F., MacGregor, H., … Satterthwaite, D. 2003. From everyday hazards to disasters: the accumulation of risk in urban areas. *Environment and Urbanization*, 15(1):193-204.

Burls, N.J., Blamey, R.C., Cash, B.A., Swenson, E.T., al Fahad, A., Bopape, M.J.M., Straus, D.M. & Reason, C.J. 2019. The Cape Town “Day Zero” drought and Hadley cell expansion. *Npj Climate and Atmospheric Science*, 2(27):1-8. doi:10.1038/s41612-019-0084-6

Busayo, E.T. & Kalumba, A.M. 2020. Coastal climate change adaptation and disaster risk reduction: a review of policy, programme and practice for sustainable planning outcomes. *Sustainability*, 12(16), art. #6450. doi:10.3390/su12166450

Castles, S. 2009. Development and migration--migration and development: what comes first? Global perspective and African experiences. *Theoria*, 56(121):1-31.

Celano, L. 2014. 6 Methods of data collection and analysis. *Monitoring, Evaluation, Accountability and Learning (MEAL), 1–30*. https://doi.org/10.1111/j.1096- 3642.1949.tb00873.x Date of access: 11 Nov. 2022.

Chalker-Scott, L. & Tinnemore, R. 2009. Is community-based sustainability education sustainable? A general overview of organizational sustainability in outreach education. *Journal of Cleaner Production*, 17(12):1132-1137.

Chang, T.S., Lin, H.H. & Song, M.M. 2011. University faculty members' perceptions of their teaching efficacy. *Innovations in Education and Teaching International*, 48(1):49-60.

Chang, Y., Wilkinson, S., Potangaroa, R. & Seville, E. 2012. Managing resources in disaster recovery projects. *Engineering, Construction and Architectural Management*, 19(5):557-580.

Chapungu, L. 2020. Mitigating the Impact of Cyclone Disasters: Lessons from Cyclone Idai. *Policy briefing: climate change and migration.* https://media.africaportal.org/documents/Chapungu_-_Final.pdf Date of access: 14 Jun. 2021.

Chatterjee, R., Shiwaku, K., Das Gupta, R., Nakano, G. & Shaw, R. 2015. Bangkok to Sendai and beyond: Implications for disaster risk reduction in Asia. *International Journal of Disaster Risk Science*, 6(2):177-188.

Chen, Y.F. & Adefila, A. 2020. Enhancing school safety through university engagement in DRR education. *International journal of disaster risk reduction*, 44. e101386. https://dx.doi.org/10.1016/j.ijdrr.2019.101386

Chimmalgi, M. 2019. Interactive lecture in the dissection hall: transforming passive lecture into a dynamic learning experience. *Anatomical Sciences Education*, 12(2):191-199.

Chmutina, K., Ganor, T. & Bosher, L. 2014. Role of urban design and planning in disaster risk reduction. *Proceedings of the Institution of Civil Engineers-Urban Design and Planning*, 167(3):125-135.

Coetzee, C. & Van Niekerk, D. 2013. Towards a disaster risk assessment methodology for communities underlain by dolomite. *Disaster prevention and management*, 22(4):351-365.

COGTA (The Ministry of Cooperative Governance and Traditional Affairs). 2019, 2 Dec. *Minister Nkosazana Dlamini Zuma commemorates 2019 International Day for Disaster Risk Reduction, 6 Dec*. https://www.gov.za/speeches/south-africa-celebrates-2019-international-day-disaster-risk-reduction-2-dec-2019-0000 Date of access: 31 Mar. 2022.

COGTA (The Ministry of Cooperative Governance and Traditional Affairs). 2016. *Integrated urban development framework*. https://www.africancentreforcities.net/wp-content/uploads/2017/05/IUDF-2016_WEB-min.pdf Date of access: 23 Mar. 2022.

Combs, M.A., Kache, P.A., VanAcker, M.C., Gregory, N., Plimpton, L.D., Tufts, D.M., Fernandez, M.P. & Diuk-Wasser, M.A. 2022. Socio-ecological drivers of multiple zoonotic hazards in highly urbanized cities. *Global change biology*, 28(5):1705-1724.

Cook, N. 2019. South Africa: Current Issues, Economy, and US Relations. *Congressional Research Services*. https://fas.org/sgp/crs/row/R45687.pdf Date accessed: 13 Aug. 2021.

CRED (Centre for Research on the Epidemiology of Disasters). 2015a. *The human cost of weather related disasters 1995–2015*. https://www.unisdr.org/files/46796_cop21weatherdisastersreport2015.pdf Date of access: 15 Jun. 2021

CRED (Centre for Research on the Epidemiology of Disasters). 2015b. *The Human Cost of Natural Disasters: A Global Perspective*. http://repo.floodalliance.net/jspui/bitstream/44111/1165/1/The%20Human%20Cost%20Of%20Natural%20Disasters%20A%20global%20perspective.pdf Date of access: 15 Jun. 2021.

CRED (Centre for Research on the Epidemiology) & UNDRR (UN Office for Disaster Risk Reduction). 2021. *2020: The non-COVID year in Disasters.* https://emdat.be/sites/default/files/adsr_2020.pdf Date of access: 15 May. 2021.

CRED (Centre for Research on the Epidemiology). 2021. Date of access: 20 Nov. 2021.

Creswell, J.W. & Creswell, J.D. 2018. *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications.

Creswell, J.W. & Plano Clark, V.L. 2011. Choosing a mixed methods design. *Designing and conducting mixed methods research*, 2:53-106.

Czarniawska, B. & Mazza, C. 2013. Consulting university: A reflection from inside. *Financial Accountability & Management*, 29(2):124-139.

Danielak, S. 2020. Disaster management models need adjusting; a case study in South Africa explains why. *The Conversation.* 25 Aug. https://theconversation.com/disaster-management-models-need-adjusting-a-case-study-in-south-africa-explains-why-144296 Date of access: 8 Mar. 2021.

Danielak, S. 2022. Risk, vulnerability, and pragmatic inevitability: the conflict–disaster nexus and urban governance in Johannesburg, South Africa. *Disasters*, 46(1):271-295.

Davidson, J. & Lyth, A. 2012. Education for Climate Change Adaptation-Enhancing the Contemporary Relevant of Planning Education for a Range of Wicked Problems. *Journal for Education in the Built Environment*, 7(2):63-83.

Davis, I. 2000. Cities of Chaos. In Parasuraman, S. & Unnikrishnan, P. V. eds. *India Disasters Report II: Redefining Disasters*. London: Oxford University Press. pp. 77-80.

DCES (Developmental Capable and Ethical State) & HSRC (Human Science Research Council). 2020. *From Street Protest to the Courts: Active citizenry and lessons from the Makana case study*. (Grant number: 03757). https://repository.hsrc.ac.za/bitstream/handle/20.500.11910/15368/11435.pdf?sequence=1&isAllowed=y Date of access: 30 Mar. 2022.

De Wet, T., Mathee, A. & Barnes, B. 2001. Anthropology and epidemiology: a case study of health and environment in Alexandra, Johannesburg. *Africanus*, 31(1):75-106.

Didham, R.J. & Ofei-Manu, P. 2020. Adaptive capacity as an educational goal to advance policy for integrating DRR into quality education for sustainable development. *International Journal of Disaster Risk Reduction*, 47, e101631. https://doi.org/10.1016/j.ijdrr.2020.101631

Dilley, M. Chen, R. S., Deichmann, U., Lerner-Lam, A. L., Arnold, M., Agwe, J., Buys, P., Kjevstad, O., Lyon, B. & Yetman, G. 2005. *Natural disaster hotspots: a global risk analysis*. 5th ed. Washington, D.C.: World Bank Publications. https://documents.worldbank.org/en/publication/documents-reports/documentdetail/621711468175150317/natural-disaster-hotspots-a-global-risk-analysis Date of access: 16 Jun. 2021.

Dillon, L., Neo, L.S. & Freilich, J.D. 2020. A comparison of ISIS foreign fighters and supporters social media posts: an exploratory mixed-method content analysis. *Behavioral sciences of terrorism and political aggression*, 12(4):268-291.

Djalante, R., Bisri, M., Fernandez, G., Imai, N., Saito, O. & Okazaki, K. 2021. Building Local Resilience Platforms for Disaster Risk Reduction. *United Nations University: Institute for the Advanced Study of Sustainability*. http://collections.unu.edu/view/UNU:8008 Date of access: 19 Jan. 2022.

Donaldson, R. 2001. *A model for South African urban development in the 21st century*. Conference paper at the 20th South African transport conference, South Africa, 16-20 July 2001. http://www.stellenboschheritage.co.za/wp-content/uploads/The-model-of-urban-development-2.pdf Date of access; 23 Mar. 2022.

Drivdal, L. 2016. Flooding in Cape Town's informal settlements: Conditions for community leaders to work towards adaptation. *South African Geographical Journal= Suid-Afrikaanse Geografiese Tydskrif*, 98(1):21-36.

Drysdale, R.E., Moshabela, M. & Bob, U. 2019. Adapting the Coping Strategies Index to measure food insecurity in the rural district of iLembe, South Africa. *Food, Culture & Society*, 22(1):95-110.

Dube, K., Nhamo, G. & Chikodzi, D. 2021. Flooding trends and their impacts on coastal communities of Western Cape Province, South Africa. *GeoJournal*. https://doi.org/10.1007/s10708-021-10460-z

Dykes, K. 2004. New urban social movements in Cape Town and Johannesburg. *Urban Forum*, 15(2):162-179.

Dzvimbo, M.A., Mashizha, T.M., Zhanda, K. & Mawonde, A. 2022. Promoting sustainable development goals: Role of higher education institutions in climate and disaster management in Zimbabwe. *Jàmbá: Journal of Disaster Risk Studies*, 14(1), a1206. https://doi.org/10.4102/jamba.v14i1.1206

EM-DAT (Emergency Events Database). 2021. EM-DAT: *Disasters of the week.* [Dataset]. https://www.emdat.be/ Date of access: 15 Jun. 2021.

Enia, J. 2020. Is there an international disaster risk reduction regime? Does it matter?. *Progress in Disaster Science*, 7, e100098. http://dx.doi.org/10.1016/j.pdisas.2020.100098

Etinay, N., Egbu, C. & Murray, V. 2018. Building urban resilience for disaster risk management and disaster risk reduction. *Procedia engineering*, 212:575-582.

Feld, M.M. 1998. Community outreach partnership centers: Forging new relationships between university and community: Introduction. *Journal of Planning Education and Research*, 17(4):285-290.

Feofilovs, M. & Romagnoli, F. 2020. Assessment of Urban Resilience to Natural Disasters with a System Dynamics Tool: Case Study of Latvian Municipality. *Environmental & Climate Technologies*, 24(2):249-264.

Filkov, A.I., Ngo, T., Matthews, S., Telfer, S. & Penman, T.D. 2020. Impact of Australia's catastrophic 2019/20 bushfire season on communities and environment. Retrospective analysis and current trends. *Journal of Safety Science and Resilience*, *1*(1):44-56.

Fitchett, J.M., Hoogendoorn, G. & Swemmer, A.M. 2016. Economic costs of the 2012 floods on tourism in the Mopani District Municipality, South Africa. *Transactions of the Royal Society of South Africa*, 71(2):187-194.

Fuentealba, R., Verrest, H. & Gupta, J. 2020. Planning for Exclusion: The Politics of Urban Disaster Governance. *Politics & Governance*, 8(4):244-255.

Gabbert, B. 2021. Wildfire damages structures at University of Cape Town in South Africa. *Wildfire Today,* 18 Apr. https://wildfiretoday.com/tag/south-africa/ Date of access: 20 May. 2021.

Gabor, M.R. 2010. Descriptive methods of data analysis for marketing data: theoretical and practical considerations. *Management & Marketing Challenges for Knowledge Society*, 5(3):119-134.

Garenne, M. 2010. Urbanisation and child health in resource poor settings with special reference to under-five mortality in Africa. *Archives of Disease in Childhood*, 95(6):464-468.

Garschagen, M. 2016. Decentralizing urban disaster risk management in a centralized system? Agendas, actors and contentions in Vietnam. *Habitat International*, 52:43-49.

Gibson, L., Adeleke, A., Hadden, R. & Rush, D. 2021. Spatial metrics from LiDAR roof mapping for fire spread risk assessment of informal settlements in Cape Town, South Africa. *Fire Safety Journal*, 120, e103053. https://doi.org/10.1016/j.firesaf.2020.103053

Gibson, L., Engelbrecht, J. & Rush, D. 2019. Detecting historic informal settlement fires with Sentinel 1 and 2 satellite data-Two case studies in Cape Town. *Fire Safety Journal*, 108, e102828. https://doi.org/10.1016/j.firesaf.2019.102828

Glasow, P.A. 2005. Fundamentals of survey research methodology. http://www.uky.edu/~kdbrad2/EPE619/Handouts/SurveyResearchReading.pdf Date of access; 16 Mar. 2021.

Golafshani, N. 2003. Understanding reliability and validity in qualitative research. *The qualitative report*, 8(4):597-607.

Goldbaum, C. & de Greef, K. 2021. Wildfire deals hard blow to DSouth Africa's archieves. *The New York Times,* 19 Apr. https://www.nytimes.com/2021/04/19/world/africa/cape-town-table-mountain-fire.html#:~:text=JOHANNESBURG%20%E2%80%94%20Firefighters%20in%20Cape%20Town,archives%20of%20Southern%20African%20history Date of access: 20 May. 2021.

Goodman, L.A. 1961. The annals of mathematical statistics. *Institute of Mathematical Statistics*, 32(1):148-170.

Gonzalez-Mathiesen, C., Ruane, S. & March, A. 2021. Integrating wildfire risk management and spatial planning–A historical review of two Australian planning systems. *International Journal of Disaster Risk Reduction*, 53, art.#101984. doi:10.1016/j.ijdrr.2020.101984

Gordon, T., Booysen, F. & Mbonigaba, J. 2020. Socio-economic inequalities in the multiple dimensions of access to healthcare: the case of South Africa. *BMC Public Health*, 20(1):1-13.

Greiving, S., Fleischhauer, M. & Lückenkötter, J. 2006. A methodology for an integrated risk assessment of spatially relevant hazards. *Journal of environmental planning and management*, 49(1):1-19.

Gunter, H.M. & Mills, C. 2017. *Consultants and consultancy: The case of education*. Switzerland: Springer International Publishing.

Hall, P. & Tewdwr-Jones, M. 2019. *Urban and regional planning*. 6th ed. London: Routledge.

Hall, P. 2014. *Cities of tomorrow: An intellectual history of urban planning and design since 1880*. John Wiley & Sons.

Hamidi, A.R., Zeng, Z. & Khan, M.A. 2020. Household vulnerability to floods and cyclones in Khyber Pakhtunkhwa, Pakistan. *International journal of disaster risk reduction*, 46, e101496. https://doi.org/10.1016/j.ijdrr.2020.101496

Hamin, E. & Marcucci, D., 2013. Mainstreaming climate in the classroom: Teaching climate change planning. *Planning Practice & Research*, 28(4):470-488.

Hamnett, S. 1999. 50 years of planning education in Australia: The first planning courses. *Australian Planner*, *36*(1):5-6.

Heath G.J. & Constantinou S. 2015. Sinkholes and Land Use Regulation in South Africa. In: Lollino G., Manconi A., Guzzetti F., Culshaw M., Bobrowsky P. & Luino F., eds. *Engineering Geology for Society and Territory*. Springer: Cham, pp. 503-506.

Heyns, A.M., du Plessis, W., Curtin, K.M., Kosch, M. & Hough, G. 2021. Decision support for the selection of optimal tower site locations for early-warning wildfire detection systems in South Africa. *International Transactions in Operational Research*, *28*(5):2299-2333.

Hicks, D. 2012. Performance-based university research funding systems. *Research policy*, 41(2):251-261.

Hobbs, J.M., Merry, S.L., Thew, M.T., Motloch, C.G. & Bennett, R.G., University consulting services. 1968. *University consulting services. Physics Bulletin,* 19(3):81–82.

Holloway, A. 2015. Strategic mobilisation of higher education institutions in disaster risk reduction capacity building: Experience of Periperi U. *Global Assessment Report on Disaster Risk Reduction*, 49-72.

Horvitz, B.S., Beach, A.L., Anderson, M.L. & Xia, J. 2015. Examination of faculty self-efficacy related to online teaching. *Innovative Higher Education*, 40(4):305-316.

Ibem, E.O. 2011. Challenges of disaster vulnerability reduction in Lagos Megacity Area, Nigeria. *Disaster Prevention and Management: An International Journal*, 20(1):27-40.

IDNDR (International Decade for Natural Disaster Reduction). 1994. *Yokohama strategy and plan of action for a safer world: Guidelines for natural disaster prevention, preparedness and mitigation*. https://digitallibrary.un.org/record/161609?ln=en Date of access: 21 Apr. 2022.

IFRC (International Federation of Red Cross and Red Crescent Societies). 2012. *Analysis of legislation related to disaster risk reduction in South Africa*. https://www.ifrc.org/PageFiles/86599/1213900-IDRL_Analysis_South%20Africa-EN-LR.pdf Date of access; 9 Jun. 2021.

IFRC (International Federation of Red Cross and Red Crescent Societies) 2021. *Emergency Plan of Action (EPoA): South Africa: Tropical Storm Eloise.* https://reliefweb.int/sites/reliefweb.int/files/resources/MDRZA009do.pdf Date of access; 17 Aug 2021.

IUDF (Integrated Urban Development Framework). 2022. *About IUDF*. https://iudf.co.za/ Date of access: 23 Mar. 2022.

Izumi, T., Shaw, R., Djalante, R., Ishiwatari, M. & Komino, T. 2019. Disaster risk reduction and innovations. *Progress in Disaster Science*, 2, e.100033. http://dx.doi.org/10.1016/j.pdisas.2019.100033

Jamshed, A., Birkmann, J., Rana, I.A. & McMillan, J.M. 2020. The relevance of city size to the vulnerability of surrounding rural areas: an empirical study of flooding in Pakistan. *International Journal of Disaster Risk Reduction*, 48, e101601. https://doi.org/10.1016/j.ijdrr.2020.101601

Jordaan, A.J., Sakulski, D. & Jordaan, A.D. 2013. Interdisciplinary drought risk assessment for agriculture: The case of communal farmers in the Northern Cape Province, South Africa. *South African Journal of Agricultural Extension*, 41:44-58.

Kahanji, C., Walls, R.S. & Cicione, A. 2019. Fire spread analysis for the 2017 Imizamo Yethu informal settlement conflagration in South Africa. *International journal of disaster risk reduction*, 39, e101146. https://doi.org/10.1016/j.ijdrr.2019.101146

Kapust, R. & Seltzer, D. 1996. Fraunhofer Gesellschaft zur Forderung der Angewandten Forschung. *Frequency analysis method*. U.S. Patent: 5 583 784.

Kawasaki, A. & Rhyner, J. 2018. Investing in disaster risk reduction for resilience: roles of science, technology, and education. *Journal of Disaster Research*, 13(7):1181-1186.

Khan, A.N. & Ahmed, K. 2011. Need and importance of DRR education in the context of Pakistan. *Asian Journal of Environment and Disaster Management*, 3(4):425-435.

Kita, S.M. 2017. Urban vulnerability, disaster risk reduction and resettlement in Mzuzu city, Malawi. *International journal of disaster risk reduction*, 22:158-166.

Kitagawa, K. 2021. Disaster risk reduction activities as learning. *Natural hazards*, 105(3):3099-3118.

Kothari, C.R. 2004. *Research methodology: methods and techniques*. 2nd ed. New Delhi: New Age International.

Kraaij, T., Baard, J.A., Arndt, J., Vhengani, L. & Van Wilgen, B.W. 2018. An assessment of climate, weather, and fuel factors influencing a large, destructive wildfire in the Knysna region, South Africa. *Fire Ecology*, *14*(4). https://doi.org/10.1186/s42408-018-0001-0

Kumpoh, A.A.Z.A., Sulaiman, E.A. & Le Ha, P. 2021. Insights into Bruneian students' transformative mobility experiences from their community outreach activities in Vietnam. *Research in Comparative and International Education*, 16(3):228-251.

Lakhraj-Govender, R. & Grab, S.W. 2019. Assessing the impact of El Niño–Southern Oscillation on South African temperatures during austral summer. *International Journal of Climatology*, 39(1):143-156.

Lall, S.V. & Deichmann, U. 2012. Density and disasters: economics of urban hazard risk. *The World Bank Research Observer*, 27(1):74-105.

Landau, L.B., Segatti, A. & Misago, J.P. 2011. *Governing migration and urbanisation in South African municipalities: developing approaches to counter poverty and social fragmentation*. South Africa Local Government Association (SALGA). http://www.migration.org.za/wp-content/uploads/2017/08/Governing-Migration-Urbanisation-in-South-African-Municipalities-Developing-Approaches-to-Counter-Poverty-and-Social-Fragmentation-1.pdf Date of access: 10 Aug. 2021.

Lankao, P.R. & Qin, H. 2011. Conceptualizing urban vulnerability to global climate and environmental change. *Current opinion in environmental sustainability*, 3(3):142-149.

León, J. & March, A. 2017. Taking responsibility for 'shared responsibility': urban planning for disaster risk reduction across different phases. Examining bushfire evacuation in Victoria, Australia. *International Planning Studies*, 22(3):289-304.

Lewis, D. & Mioch, J. 2005. Urban Vulnerability and Good Governance 1. *Journal of contingencies and crisis management*, 13(2):50-53.

Li, X., Song, K. & Liu, G. 2020. Wetland Fire Scar Monitoring and Its Response to Changes of the Pantanal Wetland. *Sensors*, *20*(15), art. #4268. doi:10.3390/s20154268

Lichfield, N., Kettle, P. & Whitbread, M. 2016. *Evaluation in the Planning Process: The Urban and Regional Planning Series,* 10th ed. Oxford: Pergamon Press. Available from Google books: https://books.google.co.za/books?hl=en&lr=&id=rAFPDAAAQBAJ&oi=fnd&pg=PP1&dq=Evaluation+in+the+Planning+Process:+The+Urban+and+Regional+&ots=KXxF_C1Qz7&sig=U3Hf5jVe2wxLx_5V2iTzgJ4Kazo#v=onepage&q=Evaluation%20in%20the%20Planning%20Process%3A%20The%20Urban%20and%20Regional&f=false Date of access: 22 Jun. 2021.

Lucky, E.O.I. & Yusoff, N.B.M. 2015. Evidence on teaching qualifications, characteristics, competence and lecturer performance in higher institutions in Nigeria. *International Journal of Management in Education*, 9(2):129-150.

Lunenburg, F.C. 2011. Theorizing about curriculum: Conceptions and definitions. *International journal of scholarly academic intellectual diversity*, 13(1):1-6.

MacDonald, S. & Headlam, N. 2008. *Research Methods Handbook: Introductory guide to research methods for social research*. Centre for Local Economic Strategies.

Maharaj, B. 2020. South African Urban Planning in the Twentieth and Twenty-First Centuries-Continuities between the Apartheid and Democratic era?. In: Thakur, R.R., Dutt, A.K., Thakur, S.K. & Pomeroy, G.M., eds. *Urban and Regional Planning and Development*. Springer: Cham, pp 101-112.

Makhafola, G. 2021. 8 Dead, five missing in devastating Mpumalanga floods. *News24,* 07 Feb. https://www.news24.com/news24/southafrica/news/8-dead-five-missing-in-devastating-mpumalanga-floods-20210207 Date of access: 20 May. 2021.

Malalgoda, C., Amaratunga, D. & Haigh, R. 2013. Creating a disaster resilient built environment in urban cities: The role of local governments in Sri Lanka. *International Journal of Disaster Resilience in the Built Environment*, 4(1):72-94.

Manyena, S.B., Mavhura, E., Muzenda, C. & Mabaso, E. 2013. Disaster risk reduction legislations: Is there a move from events to processes?. *Global environmental change*, 23(6):1786-1794.

March, A. & Kornakova, M. eds., 2017. *Urban planning for disaster recovery*. 1st ed. Butterworth-Heinemann. Available from eScholarship: https://escholarship.org/content/qt3zv5q8n2/qt3zv5q8n2.pdf Date of access: 10 Jun. 2021.

March, A. & Leon, J. 2013. *Urban planning for disaster risk reduction: Establishing 2nd wave criteria*. Paper delivered at the SOAC (State of Australian Cities) 2013 Conference, Sydney, NSW. https://soacconference.com.au/2013-conference/wp-content/uploads/2013/12/March-Environment.pdf Date of access: 25 Jun. 2021.

March, A. & Rijal, Y. 2015. Interdisciplinary action in urban planning and building for bushfire: The Victorian case. *Australian Journal of Emergency Management, The*, 30(4):11-16.

Markhvida, M., Walsh, B., Hallegatte, S. & Baker, J. 2020. Quantification of disaster impacts through household well-being losses. *Nature Sustainability*, 3(7):538-547.

Martinez, R. & Masron, I.N. 2020. Jakarta: A city of cities. *Cities*, 106, e102868. https://doi.org/10.1016/j.cities.2020.102868

Masiangoako, T., Khunou, K. & Potter, A. 2022. Fighting for water in South Africa: public participation, water rights claiming and strengthening governance. *H2Open Journal*, 5(1):97-113.

Mathivha, F., Tshipala, N. & Nkuna, Z. 2017. The relationship between drought and tourist arrivals: A case study of Kruger National Park, South Africa. *Jàmbá: Journal of Disaster Risk Studies*, 9(1):1-8.

Matsuoka, Y., Sharma, A. & Shaw, R. 2009. Hyogo framework for action and urban risk reduction in Asia. In Shaw, R., Srinivas, H. & Sharma, A. eds. *Urban risk reduction: An Asian perspective*. Emerald Group Publishing. pp. 77-104.

Matsuura, S. & Razak, K.A. 2019. Exploring transdisciplinary approaches to facilitate disaster risk reduction. *Disaster Prevention and Management: An International Journal*, 28(6):817-830.

Mawasha, T.S. & Britz, W. 2021. Hydrological Impacts of Land Use-Land Cover Change on Urban Flood Hazard: A Case Study of Jukskei River in Alexandra Township, Johannesburg. *South African Journal of Geomatics*, 10(2):139-162.

McPeake, J., Bateson, M. & O'Neill, A. 2014. Electronic surveys: how to maximise success. *Nurse researcher*, 21(3):24-26.

Meyer, M.A., Hendricks, M., Newman, G.D., Masterson, J.H., Cooper, J.T., Sansom, G., Gharaibeh, N., Horney, J., Berke, P., van Zandt, S. & Cousins, T. 2018. Participatory action research: Tools for disaster resilience education. *International journal of disaster resilience in the built environment*, 9(4-5):402-419.

Miao, S., Chen, F., Li, Q. & Fan, S. 2011. Impacts of urban processes and urbanization on summer precipitation: A case study of heavy rainfall in Beijing on 1 August 2006. *Journal of Applied Meteorology and Climatology*, 50(4):806-825.

Minister for Provincial and Local Government (South Africa). 2005. Disaster Management Act, 2002 (Act no. 57 of 2002). (Notice 654). Government Gazette, 27534, 29 April.

Mofazali, A.S. & Jahangiri, K. 2018. Towards a customized foresight model on “disaster risk management” in developing countries. *Foresight*, 20(5):467-487.

Musakwa, W. & Van Niekerk, A. 2013. Implications of land use change for the sustainability of urban areas: A case study of Stellenbosch, South Africa. *Cities*, 32:143-156.

Musavengane, R., Siakwah, P. & Leonard, L. 2020. The nexus between tourism and urban risk: Towards inclusive, safe, resilient and sustainable outdoor tourism in African cities. *Journal of Outdoor Recreation and Tourism*, 29, e100254. https://doi.org/10.1016/j.jort.2019.100254

Musungu, K., Motala, S. & Smit, J. 2012. Using multi-criteria evaluation and GIS for flood risk analysis in informal settlements of Cape Town: the case of Graveyard Pond. *South African Journal of Geomatics*, 1(1):92-108.

Musyoki, A., Murungweni, F.M. & Thifhulufhelwi, R. 2016. The impact of and responses to flooding in Thulamela Municipality, Limpopo Province, South Africa. *Jàmbá: Journal of Disaster Risk Studies*, 8(2), art. #166. doi:10.4102/jamba.v8i2.166

Mutasa, S. & Munsaka, E. 2019. Botswana and international policies on the inclusion of disaster risk reduction in the school curriculum: Exploring the missing link. *International Journal of Disaster Risk Reduction*, 40, e.101271. https://doi.org/10.1016/j.ijdrr.2019.101271 bb

Nakabayashi, I. 1994. Urban planning based on disaster risk assessment. In *Disaster Management in Metropolitan Areas for the 21st Century, Proceedings of the IDNDR Aichi/Nagoya International Conference*, 225-239.

Nalla, V., Johnson, C., Ranjit, N., Sen, G., Peddibhotla, A., Anand, M.C., Bhatia, N. & Bazaz, A.B. 2022. Considering curriculum, content, and delivery for adaptive pathways: higher education and disaster resilient infrastructure in the Indian urban context. *Sustainable and Resilient Infrastructure*, 1-14. doi: 10.1080/23789689.2022.2134645

Nampala, P. M., Kityo, R. & Adipala, E. 2016. Differentiated Community Engagement Approaches but same mission: University Outreach programs in Africa. *African Journal of Rural Development*, 1(3):i-v.

Narasimharao, B.P. 2009. Knowledge economy and knowledge society—Role of university outreach programmes in India. *Science, Technology and Society*, 14(1):119-151.

Navitas, P. 2014. Improving resilience against urban fire hazards through environmental design in dense urban areas in Surabaya, Indonesia. *Procedia-Social and Behavioral Sciences*, *135*:178-183.

NDMC (National disaster Management Centre of South Africa). 2016. *South African Vulnerability Profile*. http://www.ndmc.gov.za/Pages/saprofile.aspx Date of access: 9 Jun. 2021

Ng, Q.X., De Deyn, M.L.Z.Q., Loke, W. & Yeo, W.S. 2020. Yemen's Cholera epidemic is a one health issue. *Journal of Preventive Medicine and Public Health*, 53(4):289-292.

Nifa, F.A.A., Lin, C.K., Rani, W.N.M.W.M. & Wei, O.J. 2018. A study on awareness of disaster risk reduction (DRR) among university students. The case of PETRONAS residential hall students. In *AIP Conference Proceedings* (2016, No. 1, pp. 020005). AIP Publishing LLC. https://doi.org/10.1063/1.5055407

Niknejad, N., Ab Razak Che Hussin & Amiri, I.S. 2019. *The Impact of Service Oriented Architecture Adoption on Organizations*. Springer International Publishing.

Nkosi, V., Haman, T., Naicker, N. & Mathee, A. 2019. Overcrowding and health in two impoverished suburbs of Johannesburg, South Africa. *BMC public health*, *19*(1), e1358. https://doi.org/10.1186/s12889-019-7665-5

Norris, F.H., 2002. Disasters in urban context. *Journal of urban health*, 79(3):308-314.

Oe, H. & Yamaoka, Y. 2021, November. A discussion of damage mitigation of natural disasters: How to increase citizens' preparedness. In *2021 Third International Sustainability and Resilience Conference: Climate Change*, pp.18-22.

OECD (Organisation for Economic Co-operation and Development). 2021. *South Africa: Tourism in the economy.* OECD Tourism Trends and Policies 2020. https://www.oecd-ilibrary.org/sites/01ad4412-en/index.html?itemId=/content/component/01ad4412-en Date of access: 15 Jun. 2021.

OECD (Organisation for Economic Co-operation and Development). 2020. *OECD Regions and Cities at a Glance 2020*. OECD Publishing, Paris. https://www.oecd-ilibrary.org/urban-rural-and-regional-development/oecd-regions-and-cities-at-a-glance-2020_959d5ba0-en Date of access: 16 May. 2021.

Olowu, D. 2010. The Hyogo Framework for Action and its implications for disaster management and reduction in Africa. *JAMBA: Journal of Disaster Risk Studies*, 3(1):303-320.

Olson, R.S., Emel Ganapati, N., Gawronski, V.T., Olson, R.A., Salna, E. & Pablo Sarmiento, J. 2020. From disaster risk reduction to policy studies: bridging research communities. *Natural hazards review*, 21(2), art. #04020014. doi:10.1061/(asce)nh.1527-6996.0000365

Onwuegbuzie, A.J. & Collins, K.M. 2007. A typology of mixed methods sampling designs in social science research. *Qualitative Report*, 12(2):281-316.

Oosthuizen, A.C. & Richardson, S. 2011. *Sinkholes and subsidence in South Africa*. (Council for Geoscience report no: 2011-0010). https://www.my-community.com/static/documents/KRO57LbGDRT-Subsidence_in_South_Africa.pdf Date of access: 18 May. 2021.

Oosthuizen, A.C. & Van Rooy, J.L. 2015. Hazard of sinkhole formation in the Centurion CBD using the Simplified Method of Scenario Supposition. *Journal of the South African Institution of civil engineering*, 57(2):69-75.

Orimoloye, I.R., Zhou, L. & M Kalumba, A.M. 2021. Drought disaster risk adaptation through ecosystem services-based solutions: way forward for South Africa. *Sustainability*, 13(8), e4132. https://doi.org/10.3390/su13084132

O'Donnell, E.C. & Thorne, C.R. 2020. Drivers of future urban flood risk. *Philosophical Transactions of the Royal Society A*, 378(2168), e.20190216. https://doi.org/10.1098/rsta.2019.0216

OHCA (United Nations Office for the Coordination of Humanitarian Affairs). 2022. *South Africa: Floods and landslides – Apr 2022.* https://reliefweb.int/disaster/fl-2022-000201-zaf Date of access: 3 Jun. 2022.

Ozkan, D.S., McNair, L. & Bairaktarova, D. 2018. Avenues toward Interdisciplinarity in the Classroom. In *2018 IEEE Frontiers in Education Conference,* 1-5.

Padgham, J., Jabbour, J. & Dietrich, K. 2015. Managing change and building resilience: A multi-stressor analysis of urban and peri-urban agriculture in Africa and Asia. *Urban Climate*, 12:183-204.

Pairama, J. & Le Dé, L. 2018. Remittances for disaster risk management: Perspectives from Pacific Island migrants living in New Zealand. *International Journal of Disaster Risk Science*, 9(3):331-343.

Parajuli, R.R. 2020. Citizen Disaster Science Education for effective disaster risk reduction in developing countries. *Geoenvironmental Disasters*, *7*(1). https://doi.org/10.1186/s40677-020-00150-2

Parvin, G.A., Ahsan, S.M. & Shaw, R. 2013. Urban risk reduction approaches in Bangladesh. In Shaw, R., Mallick, F. & Islam, A. eds. *Disaster risk reduction approaches in Bangladesh*. Springer, Tokyo: Springer. pp.235-257.

Patel, R.K., Kermanshachi, S. & Jahan Nipa, T. 2020. Establishment of a Framework to Measure Disaster Preparedness: Development of Strategies to Enhance Disaster Preparedness Activities. In: Skibniewski, M.J. & Hajdu, M., eds. *Creative Construction e-Conference 2020*. Budapest University of Technology and Economics. pp. 22-30.

Paz, S. 2019. The cholera epidemic in Yemen-how did it start? The role of El Niño conditions followed by regional winds. *Environmental research*, 176, e108571. https://doi.org/10.1016/j.envres.2019.108571

Peake, W.O. & Potter, P.W. 2022. University Strategy, Accreditation Standards, and the Applied Education Mission: Using the Student Consulting to Build Bridges. *Small Business Institute Journal*, 18(1):10-22.

Pelling, M. & Wisner, B. 2008. *Disaster risk reduction: Cases from urban Africa*, 1st ed. New York, NY: Routledge. Available from Google Book: https://books.google.co.za/books?hl=en&lr=&id=zrgeBAAAQBAJ&oi=fnd&pg=PP1&dq=Disaster+risk+reduction:+Cases+from+urban+Africa&ots=f00pjW7HUF&sig=6PA5d1WoGNlDusWC0upKPFYzpHI#v=onepage&q=Disaster%20risk%20reduction%3A%20Cases%20from%20urban%20Africa&f=false Date of accessed: 17 Jun. 2021.

Pelling, M. 2003. Disaster risk and development planning: the case for integration. *International Development Planning Review*, *25*(4):1-9.

Pelling, M., Maskrey, A., Ruiz, P., Hall, P., Peduzzi, P., Dao, Q.H., Mouton, F., Herold, C. & Kluser, S., 2004. *Reducing disaster risk: a challenge for development*. New York: United Nations (32).

Pereira, R.M.S., Wanderley, H.S. & Delgado, R.C. 2022. Homogeneous regions for rainfall distribution in the city of Rio de Janeiro associated with the risk of natural disasters. *Natural Hazards*, 111(1):333-351.

Perkmann, M. & Walsh, K. 2008. Engaging the scholar: Three types of academic consulting and their impact on universities and industry. *Research policy*, *37*(10):1884-1891.

Perrow, C. 2008. Disasters Evermore?: Reducing Our Vulnerabilities to Natural, Industrial, and Terrorist Disasters. *Social Research: An International Quarterly*, 75(3):733-752.

Perry, R.K. 2013. A Case for Sustainability Pedagogical Content Knowledge in Multicultural Teacher Education. *Multicultural Education*, 21(1):46-51.

Pervin, I.A., Rahman, S.M.M., Nepal, M., Haque, A.K.E., Karim, H. & Dhakal, G. 2020. Adapting to urban flooding: a case of two cities in South Asia. *Water Policy*, 22(S1):162-188.

Pharoah, R. 2012. Fire risk in informal settlements in Cape Town, South Africa. In: Pelling, M. & Wisner, B. eds. *Disaster Risk Reduction*. London: Routledge. pp. 121-142.

Poxon, J. 2001. Shaping the planning profession of the future: the role of planning education. *Environment and Planning B: Planning and Design,* 28(4): 563-580.

Preston-Jones, A. 2020. The Importance of Climate Change Education in Urban Planning: A Review of Planning Courses at UK Universities. *Climate Change, Hazards and Adaptation Options*, 1045-1067. https://doi.org/10.1007/978-3-030- 37425-9_54

Quesada-Román, A., Villalobos-Portilla, E. & Campos-Durán, D, 2021. Hydrometeorological disasters in urban areas of Costa Rica, Central America. *Environmental Hazards*, 20(3):264-278.

Raento, P. 2020. Interdisciplinarity. *International encyclopaedia of human geography*, 7(2):357-363.

Rambau, T.S., Beukes, L.D. & Fraser, W. 2012. Disaster Risk Reduction through school learners' awareness and preparedness. *Jàmbá: Journal of Disaster Risk Studies*, 4(1):1-11.

Reimers, F.M., eds. 2021. *Education and Climate Change: The Role of Universities*. Cham: Springer.

Rentocchini, F., D'Este, P., Manjarrés-Henríquez, L. & Grimaldi, R. 2014. The relationship between academic consulting and research performance: Evidence from five Spanish universities. *International Journal of Industrial Organization*, 32:70-83.

Rhodes, B. & McKenzie, T. 2018. To what extent does socio-economic status still affect household access to water and sanitation services in South Africa?. *Journal of Economic and Financial Sciences*, 11(1), e173. http://dx.doi.org/10.4102/jef. v11i1.173

Richmond, A., Myers, I. & Namuli, H. 2018. Urban informality and vulnerability: A case study in Kampala, Uganda. *Urban science*, *2*(1), e22. https://doi.org/10.3390/urbansci2010022

Rivera, C. & Wamsler, C. 2014. Integrating climate change adaptation, disaster risk reduction and urban planning: A review of Nicaraguan policies and regulations. *International Journal of Disaster Risk Reduction*, 7:78-90.

Rogers, A. 2014. The classroom and the everyday: The importance of informal learning for formal learning. *Investigar em educação*, *2*(1).

Rogerson, C.M. 2016. Climate change, tourism and local economic development in South Africa. *Local Economy*, 31(1-2):322-331.

Ross, J.A. 2006. The reliability, validity, and utility of self-assessment. *Practical Assessment, Research, and Evaluation*, 11(10). https://doi.org/10.7275/9wph-vv65

Roth, A.S. & Becker, P. 2011. Challenges to disaster risk reduction: a study of stakeholders' perspectives in Imizamo Yethu, South Africa. *Jàmbá: Journal of disaster risk studies*, 3(2):443-452.

Roy, A.K., Kaliyath, A. & Ghosh, D. 2017. Exploring Curriculum for Integration of Disaster Risk Reduction and Climate Change: The Case of Planning Schools in India. *14 International Congress of Asian Planning Schools Association held at the Tsinghua University, Beijing, China during 12-14 October 2017*. https://www.researchgate.net/profile/Anil-Roy-8/publication/320685711_Exploring_Urban_Planning_Curriculum_for_Integration_of_Disaster_Risk_Reduction_and_Climate_Change_The_Case_of_Indian_Planning_Schools/links/59f44900aca272607e29309f/Exploring-Urban-Planning-Curriculum-for-Integration-of-Disaster-Risk-Reduction-and-Climate-Change-The-Case-of-Indian-Planning-Schools.pdf Date of access: 27 Oct. 2022.

RSA (Republic of South Africa), 2005. *National Disaster Management Framework*. Government Printers, Pretoria. https://www.preventionweb.net/publication/south-africa-national-disaster-management-framework-2005 Date of access; 28 Apr. 2022.

Rumbach, A. 2016. Decentralization and small cities: Towards more effective urban disaster governance?. *Habitat International*, 52:35-42.

SACPLAN (The South African Council for Planners). 2022. Accredited planning programs & planning schools. *Planning schools*. https://sacplan.org.za/planning-education/ Date of access: 13 Jan. 2022.

Sadiq, A.A. & Weible, C.M. 2010. Obstacles and disaster risk reduction: Survey of Memphis organizations. *Natural Hazard Review,*11(3):110-117.

Sagar, K. 2017. Integrating Disaster Risk Reduction and Urban Planning: Evidence from Class III City-Rajgir, India. *International Journal of Advance Research and Innovative Ideas In Education*, 3(1):237-253.

Salami, R.O., Giggins, H. & Von Meding, J.K. 2017. Urban settlements' vulnerability to flood risks in African cities: A conceptual framework. *Jàmbá: Journal of Disaster Risk Studies*, *9*(1), e370. https://doi.org/10.4102/jamba.v9i1.370

Sanderson, D. 2000. Cities, disasters and livelihoods. *Environment and Urbanization*, 12(2):93-102.

SARUA (Southern African Regional Universities Association). 2014. *Climate change counts: South Africa country report*. https://cdkn.org/wp-content/uploads/2014/06/SARUA-Climate-Change-Vol1No1-KCPF.pdf Date of access; 16 Jun. 2021.

Schmude, J., Zavareh, S., Schwaiger, K.M. & Karl, M. 2018. Micro-level assessment of regional and local disaster impacts in tourist destinations. *Tourism Geographies*, 20(2):290-308.

Sedlacek, S. 2013. The role of universities in fostering sustainable development at the regional level. *Journal of cleaner production*, 48:74-84.

Seifi, B., Seyedin, H. & Ghanizadeh, G. 2019. The role of academic partnership in disaster risk management: a systematic review. *Disaster medicine and public health preparedness*, 13(5-6):1047-1058.

Selby, D. & Kagawa, F. 2012. *Disaster risk reduction in school curricula: case studies from thirty countries.* (United Nations Educational, Scientific and Cultural Organisation) http://repositorio.minedu.gob.pe/bitstream/handle/20.500.12799/4189/Disaster%20Risk%20Reduction%20in%20School%20Curricula.pdf?sequence=1&isAllowed=y Date of access: 15 Mar. 2021.

Shandas, V. & Brown, S.E. 2016. An empirical assessment of interdisciplinarity: Perspectives from graduate students and program administrators. *Innovative Higher Education*, 41(5):411-423.

Sharma, S. 2019. *Descriptive statistics and factorial design.* Paris: Horizons University. (Thesis - PhD). https://www.researchgate.net/publication/333220496_Determining_What_Statistics_to_Use date of access: 27 Mar. 2021.

Shaw, R., Mallick, F. & Takeuchi, Y. 2011. Essentials of higher education in disaster risk reduction: Prospects and challenges. In: Shaw, R., Shiwaku, K. & Takeuchi, Y., eds. *Disaster Education (Community Environment and Disaster Risk Magagement)*. Bingley: Emerald Group Publishing. pp.95-113.

Shugan, S.M. 2004. Consulting, research, and consulting research. *Marketing Science*, 23(2):173-179.

Sihlongonyane, M.F. 2018. The generation of competencies and standards for planning in South Africa: Differing views. *Town and Regional Planning*, 72:70-83.

Sitas, N., Reyers, B., Cundill, G., Prozesky, H.E., Nel, J.L. & Esler, K.J. 2016. Fostering collaboration for knowledge and action in disaster management in South Africa. *Current Opinion in Environmental Sustainability*, 19:94-102.

Snyder, H., 2019. Literature review as a research methodology: An overview and guidelines. *Journal of business research*, *104*, pp.333-339.

Sousa, P.M., Blamey, R.C., Reason, C.J., Ramos, A.M. & Trigo, R.M. 2018. The 'Day Zero'Cape Town drought and the poleward migration of moisture corridors. *Environmental Research Letters*, 13(12), e124025. https://doi.org/10.1088/1748-9326/aaebc7

South Africa (Republic). 2002. Disaster Management Act No. 57 of 2002. Pretoria: Government Printer.

Stanganelli, M. 2008. A new pattern of risk management: The Hyogo Framework for Action and Italian practise. *Socio-economic planning sciences*, 42(2):92-111.

Stats SA (Statistics South Africa). 2006. *Migration and urbanisation in South Africa*. (Report no. 03-04-02). http://www.statssa.gov.za/publications/Report-03-04-02/Report-03-04-02.pdf Date of access: 06 Jun. 2021.

Stats SA (Statistics South Africa). 2020. *2020 Mid-year population estimates.* - http://www.statssa.gov.za/?p=13453 Date of access: 1 Jun. 2021.

Stats SA (Statistics South Africa). 2021a. *Media Release: Quarterly Labour Force Survey (QLFS) – Q1:2021.* https://www.statssa.gov.za/publications/P0211/Media%20release%20QLFS%20Q1%202021.pdf Date of access: 10 Aug. 2021.

Stats SA (Statistics South Africa). 2021b. *SA tourism industry struggles amidst COVID-19.* (Report no. 03-51-02) http://www.statssa.gov.za/?p=14281 Date of access; 15 Jun. 2021.

Steenkamp, L. & Winkler, T. 2014. Linking spatial planning and land use management in the City of Cape Town: The case of the package of plans. *Urban forum*, 25(3):335-353.

Sternberg, T. & Batbuyan, B. 2013. Integrating the Hyogo Framework into Mongolia's disaster risk reduction (DRR) policy and management. *International Journal of Disaster Risk Reduction*, 5:1-9. doi:10.1016/j.ijdrr.2013.05.003

Strydom, S. & Savage, M.J. 2017. Potential impacts of climate change on wildfire dynamics in the midlands of KwaZulu-Natal, South Africa. *Climatic Change*, 143:385-397.

Sutanta, H., Rajabifard, A. & Bishop, I.D. 2010. Integrating spatial planning and disaster risk reduction at the local level in the context of spatially enabled government. *Spatially enabling society: Research, emerging trends and critical assessment*, 1:56-68.

Sutherland, M.A., Amar, A.F. & Laughon, K. 2013. Who sends the email? Using electronic surveys in violence research. *Western journal of emergency medicine*, 14(4):363–369.

Suzigan, W. & Albuquerque, E.D.M. 2011. The underestimated role of universities for the Brazilian system of innovation. *Brazilian Journal of Political Economy*, 31:3-30.

Swain, M.C. 2019. *How has environmental violence been experienced during the Cape Town water crisis using the Newlands Spring as a case-study*. Cape Town: University of Cape Town. (Minor Dissertation - MSc).

Tacoli, C., McGranahan, G. & Satterthwaite, D. 2015. *Urbanisation, rural-urban migration and urban poverty*. (IIED working paper, WP/15). https://pubs.iied.org/sites/default/files/pdfs/migrate/10725IIED.pdf Date of access: 3 Mar. 2022.

Taş, M., Taş, N., Durak, S. & Atanur, G. 2013. Flood disaster vulnerability in informal settlements in Bursa, Turkey. *Environment and Urbanization*, 25(2):443-463.

Taylor, J., Jokela, S., Laine, M., Rajaniemi, J., Jokinen, P., Häikiö, L. & Lönnqvist, A. 2021. Learning and Teaching Interdisciplinary Skills in Sustainable Urban Development—The Case of Tampere University, Finland. *Sustainability*, 13(3), e1180. https://doi.org/10.3390/su13031180

Taylor, N., 1998. *Urban planning theory since 1945*. Sage.

Taylor, S. & Yu, D. 2009. *The importance of socio-economic status in determining educational achievement in South Africa*. (Stellenbosch Economic working paper, WP/01/09). https://www.ekon.sun.ac.za/wpapers/2009/wp012009/wp-01-2009.pdf 13 Aug. 2021.

Tearfund. 2005. *Mainstreaming disaster risk reduction: a tool for development organizations*. http://lib.riskreductionafrica.org/bitstream/handle/123456789/917/Mainstreaming%20disaster%20risk%20reduction.a%20tool%20for%20development%20organisations.pdf?sequence=1 Date of access: 29 Jun. 2021.

Tedim, F., Leone, V., Amraoui, M., Bouillon, C., Coughlan, M.R., Delogu, G.M., Fernandes, P.M., Ferreira, C., McCaffrey, S., McGee, T.K. & Parente, J. 2018. Defining extreme wildfire events: difficulties, challenges, and impacts. *Fire*, 1(9). doi:10.3390/fire1010009

Tenza, M. 2020. The effects of violent strikes on the economy of a developing country: a case of South Africa. *Obiter*, 41(3):519-537.

Thayaparan, M., Malalgoda, C., Keraminiyage, K. & Amaratunga, D. 2014. Disaster management education through higher education–industry collaboration in the built environment. *Procedia Economics and Finance*, 18:651-658.

Thayaparan, M., Siriwardena, M., Malalgoda, C.I., Amaratunga, D., Lill, I. & Kaklauskas, A. 2015. Enhancing post-disaster reconstruction capacity through lifelong learning in higher education. *Disaster Prevention and Management*, 24(3):338-354.

Thiruppugazh, V. 2008. Urban vulnerability reduction: regulations and beyond. (ASARC working paper, WP/07/05). https://cama.crawford.anu.edu.au/acde/asarc/pdf/papers/2007/WP2007_08.pdf Date of access: 3 Mar. 2022.

Thorpe, L.E., Assari, S., Deppen, S., Glied, S., Lurie, N., Mauer, M.P., Mays, V.M. and Trapido, E., 2015. The role of epidemiology in disaster response policy development. *Annals of epidemiology*, *25*(5), pp.377-386.

Tingsanchali, T. 2012. Urban flood disaster management. *Procedia engineering*, 32:25-37.

Toombs, W.E. & Tierney, W.G. 1993. Curriculum definitions and reference points. *Journal of curriculum and supervision*, 8(3):175-95.

Totaforti, S. 2020. Urban Planning in Post-Apartheid South African Cities: The Case of Johannesburg. *Open Journal of Political Science*, 10(3):507-520.

Tozier de la Poterie, A. & Baudoin, M.A. 2015. From Yokohama to Sendai: Approaches to participation in international disaster risk reduction frameworks. *International Journal of Disaster Risk Science*, 6(2):128-139.

Trippl, M., Sinozic, T. & Lawton Smith, H. 2015. The role of universities in regional development: Conceptual models and policy institutions in the UK, Sweden and Austria. *European Planning Studies*, 23(9):1722-1740.

Twigg, J. 2004. *Disaster risk reduction: mitigation and preparedness in development and emergency programming*. Overseas Development Institute (ODI). http://lib.riskreductionafrica.org/bitstream/handle/123456789/1453/good%20practice%20review%20disaster%20risk%20reduction%20number%209%20march%20200.pdf?sequence=1 Date of access: 04 Jan 2022.

Twigg, J. 2015. *Disaster risk reduction.* London: HPN. http://bvpad.indeci.gob.pe/doc/pdf/esp/doc2601/doc2601-contenido.pdf Date of access: 23 Sep. 2021.

UN (United Nations). 2016. *Sustainable development goals*. https://sustainabledevelopment.un.org/content/documents/21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf Date of access; 16 Aug. 2021.

UN (United Nations). 2018a*. Handbook on the Least Developed Country Category: Inclusion, Graduation and Special Support Measures.* https://www.un.org/development/desa/dpad/wp-content/uploads/sites/45/2018CDPhandbook.pdf Date of access: 10 Aug. 2021.

UN (United Nations). 2018b. *Make cities and human settlements inclusive, safe, resilient and sustainable*.

https://wedocs.unep.org/bitstream/handle/20.500.11822/25763/SDG11_Brief.pdf?sequence=1&isAllowed=y Date of access: 16 Sep. 2021.

UN (United Nations). 2020. *World Economic Situation Prospects 2020.* https://www.un.org/development/desa/dpad/wp-content/uploads/sites/45/WESP2020_FullReport.pdf Date of access: 22 Jun. 2021.

UNCTAD (United Nations Conference on Trade and Development) 2021. *Handbook of statistics*. https://unctad.org/system/files/official-document/tdstat46_en.pdf Date of access: 26 Feb. 2022.

UNDP (United Nations Development Programme). 2010. *Urban Risk Management*. https://www.undp.org/content/dam/undp/library/crisis%20prevention/disaster/6Disaster%20Risk%20Reduction%20-%20Urban%20Risk%20Management.pdf Date of Access: 17 Aug. 2021.

UNDP (United Nations Development Programme). 2021. *Graduation of African Least Developed Countries*. Date of access: 31 May. 2021.

UNDRR (United Nations Office for Disaster Risk Reduction). 2021a. *Terminology*. https://www.undrr.org/terminology Date of access: 31 May. 2021.

UNDRR (United Nations Office for Disaster Risk Reduction). 2021b. What is the Sendai framework for disaster risk reduction? https://www.undrr.org/implementing-sendai-framework/what-sendai-framework Date of access, 13 Sep, 2021.

UN-Habitat (United Nations Human Settlement Programme). 2016a. Sustainable development goal 11: make cities and human settlements inclusive, safe, resilient and suitable. https://www.local2030.org/library/60/SDG-Goal-11-Monitoring-Framework-A-guide-to-assist-national-and-local-governments-to-monitor-and-report-on-SDG-goal-11-indicators.pdf Date of access: 16 Sep. 2021.

UN-Habitat (United Nations Human Settlement Programme). 2016b. *New Urban Agenda*. https://unhabitat.org/about-us/new-urban-agenda Date of access: 17 Sept. 2021.

UNISDR (United Nations International Strategy for Disaster Reduction). 2015a. *Making Development Sustainable: The Future of Disaster Risk Management. Global Assessment Report on Disaster Risk Reduction.* https://www.preventionweb.net/english/hyogo/gar/2015/en/gar-pdf/GAR2015_EN.pdf Date of access: 16 Aug. 2021.

UNISDR (United Nations International Strategy for Disaster Reduction). 2015b. *Sendai framework for disaster risk reduction 2015-2030*. https://www.preventionweb.net/files/43291_sendaiframeworkfordrren.pdf Date of access: 31 Mar. 2022.

UNISDR (United Nations International Strategy for Disaster Reduction). 2005. *Hyogo Framework for Action 2005-2015: Building the Resilience of nations and Communities to Disasters*. https://www.unisdr.org/files/1037_hyogoframeworkforactionenglish.pdf Date of access: 31 Mar. 2022.

van Niekerk, D. 2007. Disaster risk reduction, disaster risk management and disaster management: Academic rhetoric or practical reality?. *Disaster Management: South Africa*, 4(1):1-9.

van Niekerk, D., Coetzee, C. & Nemakonde, L. 2020. Implementing the Sendai Framework in Africa: Progress Against the Targets (2015–2018). *International Journal of Disaster Risk Science*, 11(2):179-189.

van Niekerk, D., Wentink, G.J. & Shoroma, L.B. 2018. Natural Hazards Governance in South Africa. In *Oxford Research Encyclopaedia of Natural Hazard Science*. https://oxfordre.com/view/10.1093/acrefore/9780199389407.001.0001/acrefore-9780199389407-e-246 Date of access: 16 Aug. 2021.

Velasco, M., Russo, B. & Martínez-Gomariz, E. 2020. Integrated Assessment of Climate Change Impacts and Urban Resilience: From Climate and Hydrological Hazards to Risk Analysis and Measures. *Sustainability*, *12*(16), e6430. https://doi.org/10.3390/su12166430

Vermaak, J. & Van Niekerk, D. 2004. Disaster risk reduction initiatives in South Africa. *Development Southern Africa*, 21(3):555-574.

Vogel, C. & Olivier, D. 2019. Re-imagining the potential of effective drought responses in South Africa. *Regional Environmental Change*, 19(6):1561-1570.

Vorhies, D. 2012. The economics of investing in disaster risk reduction. (UNISDR Working paper) https://www.preventionweb.net/files/32357_drreconomicsworkingpaperfinal3.pdf Date of access: 18 Aug. 2021.

Wagner, S.M. 2012. Partners for business-to-business service innovation. *IEEE Transactions on Engineering Management*, 60(1):113-123.

Walls, R.S. & Zweig, P. 2017. Towards sustainable slums: understanding fire engineering in informal settlements. In Y. Bahei-El-Din & M. Hassan, eds*. Advanced Technologies for Sustainable Systems.* Cairo: Springer. pp. 93–98.

Walls, R.S., Eksteen, R., Kahanji, C. & Cicione, A. 2019. Appraisal of fire safety interventions and strategies for informal settlements in South Africa. *Disaster Prevention and Management: An International Journal,* 28(3):343-358.

Wamsler, C. 2004. Managing urban risk: perceptions of housing and planning as a tool for reducing disaster risk. *Global Built Environment Review*, 4(2):11-28.

Wamsler, C. 2006. Mainstreaming risk reduction in urban planning and housing: a challenge for international aid organisations. *Disasters*, 30(2):151-177.

Wamsler, C., Brink, E. & Rivera, C. 2013. Planning for climate change in urban areas: from theory to practice. *Journal of Cleaner Production*, 50:68-81.

Wang, S.S.Y., Kim, H., Coumou, D., Yoon, J.H., Zhao, L. & Gillies, R.R. 2019. Consecutive extreme flooding and heat wave in Japan: Are they becoming a norm?. *Atmospheric Science Letters,* 20(10), e933. doi:10.1002/asl.933

Wang, X. & vom Hofe, R. 2008. *Research methods in urban and regional planning*, 1st ed. New York, NY: Springer Science & Business Media. Available from Google Book: https://books.google.co.za/books?hl=en&lr=&id=7D8PvxgQbZUC&oi=fnd&pg=PR7&dq=urban+and+regional+planning&ots=boN05u2PLq&sig=7A_oNSeAy179zr0GYdCDfCd_n3w#v=onepage&q=urban%20and%20regional%20planning&f=false Date of access: 20 Jun. 2021.

Wang, Y., Beshir, M., Gibson, L., Stevens, S., Bisby, L. & Rush, D. 2020a. How ‘‘informal’ ’is an informal settlement fire. *SFPE Europe*, *2*. https://www.researchgate.net/profile/Yu-Wang-96/publication/342902907_How_Informal_Is_An_Informal_Settlement_Fire/links/5f0cdae4a6fdcca32ae97747/How-Informal-Is-An-Informal-Settlement-Fire.pdf Date of access: 17 Aug. 2021.

Wang, Y., Gibson, L., Beshir, M. & Rush, D. 2021. Determination of critical separation distance between dwellings in informal settlements fire. *Fire Technology*, 57(3):987-1014.

Ward, P.S. & Shively, G.E. 2017. Disaster risk, social vulnerability, and economic development. *Disasters*, 41(2):324-351.

Weerts, D.J. 2005. Facilitating Knowledge Flow in Community-University Partnerships. *Journal of Higher Education Outreach and Engagement*, 10(3):23-38.

Wekesa, B.W., Steyn, G.S. & Otieno, F.F. 2011. A review of physical and socio-economic characteristics and intervention approaches of informal settlements. *Habitat international*, 35(2):238-245.

White, M.D. & Marsh, E.E. 2006. Content analysis: A flexible methodology. *Library trends*, 55(1):22-45.

Wilhelm-Solomon, M. 2016. Decoding dispossession: Eviction and urban regeneration in Johannesburg's dark buildings. *Singapore Journal of Tropical Geography*, 37(3):378-395.

Wingate, U. 2006. Doing away with Study Skills, *Teaching in Higher Education#,* 11(4):457-469.

World Bank Group. 2020. *Poverty & Equity: Sub-Sahara.* https://databank.worldbank.org/data/download/poverty/33EF03BB-9722-4AE2-ABC7-AA2972D68AFE/Global_POVEQ_SSA.pdf Date of access: 10 Aug. 2021.

Wu, Y.C.J. & Shen, J.P. 2016. Higher education for sustainable development: a systematic review. *International Journal of Sustainability in Higher Education*, 17(5):633-651.

Yabe, T., Tsubouchi, K., Fujiwara, N., Sekimoto, Y. & Ukkusuri, S.V. 2020. Understanding post-disaster population recovery patterns. *Journal of the Royal Society Interface*, *17*(163), e.20190532. http://dx.doi.org/10.1098/rsif.2019.0532

Yakovleva, N.O. & Yakovlev, E.V. 2014. Interactive teaching methods in contemporary higher education. *Pacific Science Review*, 16(2):75-80.

Zhang, X., Chen, N., Sheng, H., Ip, C., Yang, L., Chen, Y., Sang, Z., Tadesse, T., Lim, T.P.Y., Rajabifard, A. & Bueti, C. 2019. Urban drought challenge to 2030 sustainable development goals. *Science of the Total Environment*, 693, e133536. https://doi.org/10.1016/j.scitotenv.2019.07.342

Zhang, X.Q. 2016. The trends promises and challenges of urbanisation in the world. *Habitat international*, 54:241-252.

Zhou, Y. & Liu, M. 2012. Risk assessment of major hazards and its application in urban planning: A case study. *Risk Analysis: An International Journal*, 32(3):566-577.

Zhou, Z.Q., Xie, S.P. & Zhang, R. 2021. Historic Yangtze flooding of 2020 tied to extreme Indian Ocean conditions. *Proceedings of the National Academy of Sciences*, 118(12), e2022255118. https://doi.org/10.1073/pnas.2022255118

Ziervogel, G., Waddell, J., Smit, W. & Taylor, A. 2016. Flooding in Cape Town's informal settlements: barriers to collaborative urban risk governance. *South African Geographical Journal,* 98(1):1-20.

Zimmermann, M. & Keiler, M. 2015. International frameworks for disaster risk reduction: Useful guidance for sustainable mountain development?. *Mountain Research and Development*, 35(2):195-202.

ANNEXURES A: QUESTIONNAIRE

Dear Participant.

You are kindly invited to participate in a survey of approximately 30 minutes that forms part of a research investigation currently conducted as part of my Masters study at the North-West University, Potchefstroom Campus, in Environmental Science and Disaster Science. My dissertation entitled 'Urban Disaster Risk: Evaluating Disaster Risk Reduction integration with Urban Planning curriculums at South African Universities.' investigates the status quo regarding the integration of Disaster Risk Reduction with Urban Planning in Higher Education curricula at Urban and Regional Planning Departments Higher Educational Institutes` of South Africa. The research consists of six objectives namely: To investigate the increasing impact of disasters on urban areas, globally and within the South African context;

1. To investigate the increasing impact of disasters on urban areas, globally and within the South African context;

2. To establish the theoretical underpinnings for the integration between UP and DRR;

3. To investigate international and national DRR policy prescriptions for the integration of DRR and UP;

4. To evaluate the current levels of integration of DRR with UP at Urban and Regional Planning departments and curriculums in higher education institutions in South Africa;

5. To identify integration gaps and best practice cases of integration of DRR in UP within Urban and Regional Planning curriculums in South African HEIs; and

6. To make recommendations for furthering the integration of DRR and UP within Urban and Regional Planning curriculums in South African HEIs.

The participants that are invited to participate in the survey include Urban and Regional Planning lecturers at Higher Education Institutes in South Africa.

This research study has been ethically approved by the FNAS-REC, ethics number: NWU-00538-21-A9 and has been identified as a research study of minimal risk. Please note that:

(i) Participation in the survey is voluntary and you may withdraw at any moment:
(ii) You may choose if there are any questions that you prefer not to answer:

(iii) Your identity will remain anonymous and the data that is generated will not be linked to you or your institution during or after the completion of the research and will not be disclosed to any third party:

(iv) The outcome of the research will be published as part of the MSc dissertation in the form of research findings:

(v) No remuneration will be paid for participation in the research survey.

If you agree to participate in this study, kindly complete the questionnaire that comprises 5 sections and 28 questions. May I please request the complete the survey and return it by 22 July 2022.

I would like to thank you for your participation in this research survey.

Tiana Koen

MSc Candidate

Press next to begin the survey.

Informed Consent

If you agree to take part in this study, please select the 'I consent' option to continue to the next section and to continue with the survey. If you do not agree to take part in this study, please close the tab to end the survey.

I Consent *
Exit

1. Demographic section
This section will collect demographic data questions to understand the profiles of the participants of this study as well as highlighting requirements for taking part in this study. These questions consist of educational qualifications, academic focus and lecturing details.

1.1. Select your highest qualification

a. Bachelor	
b. Honours	
c. Post-graduate Diploma	
d. Masters	
e. Doctorate	

1.2. How long have you been a lecturer at a Higher Educational Institute?

a. Less than 5 years	
b. 5-10 years	
c. 11-15 years	
d. More than 15 years	

1.3. Select the Higher Educational Institute that you are currently teaching/lecturing Urban and Regional Planning at.

a. University of Pretoria	
b. University of Johannesburg	
c. Durban University of Technology	
d. University of the Free State	
e. North-West University	
f. University of Witwatersrand	
g. University of Cape Town	
h. Cape Peninsula University of Technology	
i. University of KwaZulu-Natal	
j. Stellenbosch University	

k. University of Venda	
l. Other	

If you have selected option “l. Other”, kindly elaborate on your answer.

_____

1.4. Kindly identify and elaborate on your field of speciality:

_____

2. Field of teaching and Disaster Risk
This section focuses on the participants lecturing fields and if there have been connections between Urban and Regional Planning and Disaster Risk. These questions evolve around the modules taught by the lectures and whether any include the topic of disasters.

2.1. How many modules are you lecturing/teaching (currently and previously) that are related to Urban and Regional Planning.

	Currently	Previously
a. Less than 5 modules		
b. 6-10 modules		
c. 11-15 modules		
d. More than 15 modules		

2.2. Does Disaster Risk form part of the teaching and learning responsibilities that you have as an Urban Planning lecturer? Kindly elaborate on your answer and specify whether this applies to undergraduates or postgraduates.

_____

_____

2.3. In regard to question 2.2., kindly specify whether this applies to undergraduates or postgraduates. Kindly also indicate the number of modules and the percentage (%) thereof.

_____

_____

2.4. Motivate your reason for including Disaster Risk Reduction in previous modules.

_____

_____

2.5. Kindly provide a broad description of the Disaster Risk Reduction related topics that you have previously or currently included in your Urban and Regional Planning modules.

_____

_____

3. Current knowledge
This section aims to determine the participants knowledge of disaster and Disaster Risk Reduction and the role of Urban Planning in connection to Disaster Risk Reduction. Both their level of knowledge and experience regarding the integration of Disaster Risk Reduction and Urban Planning will be questioned.

3.1. Rate your current knowledge of the concept of Disaster Risk Reduction.

a. Detailed knowledge	
b. Sufficient knowledge	
c. Some/Slight Knowledge	
d. Limited Knowledge	
e. No Knowledge	

3.2. Indicate to what extent you agree with the following statement: Disaster Risk Reduction has no relevance for the field of Urban Planning:

a. Strongly Agree	
b. Agree	
c. Neutral	
d. Disagree	
e. Strongly Disagree	

Kindly elaborate on your answer.

_____

_____

3.3. Rate your awareness level on the National and International policy documents that promote the integration of the Disaster Risk Reduction and Urban Planning?

a. Aware	
b. Unaware	

Kindly elaborate on your answer, e.g., name and elaborate on some of the policies you are aware of.

_____

_____

4. Curriculums
The aim of this section will be to identify the participants understanding regarding the current levels of integration of Disaster Risk Reduction into Urban Planning curriculums at their current HEI.

4.1. Rate your overall level of experience in integrating Disaster Risk Reduction and Urban Planning in your curriculum.

a. Extensive experience	

b. Acceptable experience	
c. Some experience	
d. Limited experience	
e. No experience	

Kindly, elaborate on your answer.

_____

_____

4.2. To what extent to you agree that Disaster Risk Reduction should be integrated into existing Urban Planning curriculums.

a. Strongly Agree	
b. Agree	
c. Neutral	
d. Disagree	
e. Strongly Disagree	

Kindly elaborate on the reasoning for your answer.

_____

_____

4.3. Could it be beneficial for the development of Urban Planning students to integrate Disaster Risk Reduction into their curriculum? Kindly elaborate on your answer.

_____

_____

4.4. In your opinion, at what academic year level should Disaster Risk Reduction be included in Urban and Regional Planning modules and curriculums. If needed more than one option may be selected?

a. First years	

b. Second years	
c. Third years	
d. Fourth years	
e. Post-graduate Diploma	
f. Honours	
g. Masters	
h. Doctorate	

4.5. To your knowledge, how many of the Urban and Regional Planning modules that you are teaching/lecturing include elements of Disaster Risk Reduction included?

a. None	
b. 1-3	
c. 4-6	
d. More than 6	
e. Other	

Kindly list the module or curriculum codes of subjects where integration occurs as well as indicating the amount in terms of percentage (0%-100%) of the module curriculum is dedicated to disaster risk reduction or disaster related topics. (For example, SSBG 101: Sustainable and Resilient Urban Planning, 25%)

_____

_____

4.6. Are the modules you teach/lecture where Disaster Risk Reduction and Urban Planning are integrated more theoretical or practical in nature?

a. Theoretical	
b. Practical	
c. Equal	

4.7. In your opinion as a lecturer and academic, what Urban Planning modules are best suited for integrating concepts such as Disaster Risk Reduction and disaster resilience?

_____

_____

4.8. In your opinion, should curriculums include more practical learning opportunities regarding Disaster Risk Reduction in Urban and Regional Planning modules? Kindly motivate your answer.

_____

_____

4.9. In your opinion, should Disaster Risk Reduction be included as a sub-component in current Urban and Regional Planning curriculums OR as a stand-alone module/subject?

Sub-component		Stand-alone Module	

Kindly motivate your answer.

_____

_____

5. Challenges
This section consists of questions designed to identify the current obstacles of the impeding integration of Disaster Risk Reduction into Urban Planning curriculums. These questions aim to highlight the best practice in integration or recommendation on improving integration

5.1. To what extent do you agree/disagree with the following statement: “Integrating Disaster Risk Reduction in Urban and Regional Planning curriculums will help students and graduates in carrying out their duties in practice”?

a. Strongly Agree	
b. Agree	

c. Neutral	
d. Disagree	
e. Strongly Disagree	

Kindly motivate your answer.

_____

_____

5.2. To what degree has your institution integrated Disaster Risk Reduction in Urban and Regional Planning curriculums.

a. Significant integration	
b. Sufficient integration	
c. Some integration	
d. Insufficient integration	
e. No integration	

5.3. In your opinion is there room to increase Disaster Risk Reduction integration with Urban and Regional Planning curriculums? Motivate your answer.

_____

_____

5.4. Rate the following options from most (1) to least challenging (9), in regard to the integration of Disaster Risk Reduction in Urban and Regional Planning curriculums in your faculty?

Options	1 (most challenging)	2	3	4	5	6	7	8	9 (least challenging)
a. Lack of finances									
b. Lack of academic resources									
c. Lack of understanding of the field of DRR									

d. Lack of learning and practical material									
e. Lack of exposures to the best practice examples of integration being implemented at other institutions.									
f. Lack of interest in the field of disaster risk reduction									
g. Complexity									
h. Irrelevance of integrating disaster risk reduction with urban planning									
i. Other									

Kindly elaborate on the nature or extent of current challenges or challenges not identified that hamper the integration of Disaster Risk Reduction in Urban and Regional Planning curriculums in your institution (5.4.)?

_____

_____

5.5. What procedures or steps would you propose to increase the integration of Disaster Risk Reduction in Urban and Regional Planning curriculums?

_____

_____

6. Additional Comments

6.1. Should you have any additional comments, theories, or questions, kindly write them below. Or feel free to contact me via email; tianakoen@gmail.com

_____

_____

ANNEXURES B: ETHICS APPROVAL LETTER

NORTH-WEST UNIVERSITY
NOORDWES-UNIVERSITEIT
YUNIBESITI YA BOKONE-BOPHIRIMA

Private Bag X1290, Potchefstroom
South Africa 2520
Tel: 018 299-1111/2222
Fax: 018 299-4910
Web: http://www.nwu.ac.za
Senate Committee for Research Ethics
Tel: 018 299-4849
Email: nkosinathi.machine@nwu.ac.za

ETHICS APPROVAL LETTER OF STUDY

Based on approval by the **Faculty of Natural and Agricultural Sciences Ethics Committee (FNAS-REC)**, the Faculty of Natural and Agricultural Sciences Ethics Committee hereby **approves** your study as indicated below. This implies that the North-West University Senate Committee for Research Ethics (NWU-SCRE) grants its permission that, provided the special conditions specified below are met and pending any other authorisation that may be necessary, the study may be initiated, using the ethics number below.

Study title: Urban Disaster Risk: Evaluating Disaster Risk Reduction integration with Urban Planning curriculums at South African Universities.
Study Leader/Supervisor: Dr C Coetzee
Student: T Koen

Ethics number:	N	W	U	-	0	0	5	3	8	-	2	1	-	A	9
	Institution				Study Number						Year			Status	

Status: S = Submission; R = Re-Submission; P = Provisional Authorisation; A = Authorisation

Application type: Single **Risk Category:** **Minimal**

Commencement date: 24/06/2021
Expiry date: 30/09/2022

Approval of the study is initially provided for a year, after which continuation of the study is dependent on receipt and review of the annual (or as otherwise stipulated) monitoring report and the concomitant issuing of a letter of continuation.

Special in process conditions of the research for approval (if applicable):

- The following documentation are archived by FNASREC and should be complete and kept up to date:
  - Research proposal
  - Signed approval from the scientific committee indicating the proposed risk category
- All researchers involved in the study should submit signed NWU code of conduct statements annually.
- All researchers of low risk studies should submit proof of relevant ethics training every two years.
- All researchers that take part in activities that pose a safety and security threat to the researchers or the environment should submit a risk assessment form annually.
- All research involving human interaction should follow best ethical practise and keep documents as proof. This includes informed consent, questionnaires, incorporation of risk-benefit, and responsible data management.
- Any research at governmental or private institutions, permission must still be obtained from relevant authorities and provided to the FNASREC. Ethics approval is required BEFORE approval can be obtained from these authorities.

Special conditions:
The best practices with regards to interviews should be implemented, including proper negotiation of access to participants; representative sampling; documented informed consent that includes the important elements; alignment of information collected with research questions; anonymization of collected information, ensuring the integrity and security of all data collected. If personal information is collected as part of the study, it will change the risk level of the project.

General conditions:
While this ethics approval is subject to all declarations, undertakings and agreements incorporated and signed in the application form, the following general terms and conditions will apply:

- *The study leader/supervisor (principle investigator)/researcher must report in the prescribed format to the FNASREC:*
  - *annually (or as otherwise requested) on the monitoring of the study, whereby a letter of continuation will be provided, and upon completion of the study; and*
  - *without any delay in case of any adverse event or incident (or any matter that interrupts sound ethical principles) during the course of the study.*
- *The approval applies strictly to the proposal as stipulated in the application form. Should any amendments to the proposal be deemed necessary during the course of the study, the study leader/researcher must apply for approval of these amendments at the FNASREC, prior to implementation. Should there be any deviations from the study proposal without the necessary approval of such amendments, the ethics approval is immediately forfeited.*
- *Annually a number of studies may be randomly selected for an external audit.*
- *The date of approval indicates the first date that the study may be started.*
- *In the interest of ethical responsibility, the NWU-SCRE and FNASREC reserves the right to:*
  - *request access to any information or data at any time during the course or after completion of the study;*
  - *to ask further questions, seek additional information, require further modification or monitor the conduct of your research or the informed consent process;*
  - *withdraw or postpone approval if:*
    - *any unethical principles or practices of the study are revealed or suspected;*
    - *it becomes apparent that any relevant information was withheld from the FNASREC or that information has been false or misrepresented;*
    - *submission of the annual (or otherwise stipulated) monitoring report, the required amendments, or reporting of adverse events or incidents was not done in a timely manner and accurately; and / or*
    - *new institutional rules, national legislation or international conventions deem it.*
- *FNAS-REC can be contacted for further information or any report templates via Roelof.Burger@nwu.ac.za 018 299 4269*

The FNASREC would like to remain at your service as scientist and researcher, and wishes you well with your study. Please do not hesitate to contact the FNASREC or the NWU-SCRE for any further enquiries or requests for assistance.

Yours sincerely,

Prof Roelof Burger
Chairperson Faculty of Natural and Agricultural Sciences Ethics Committee (FNASREC)