

DIGITAL LITERACY FOR ENHANCING PREPAREDNESS CAPACITY TO CLIMATE
RELATED RISKS AMONG AGEING POPULATION IN BANGKOK, THAILAND

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A Thesis Submitted in Partial Fulfillment of the Requirements
for the Degree of Philosophy Program
in Environment, Development and Sustainability
(Interdisciplinary International Program)
Graduate School
Chulalongkorn University
Academic Year 2021
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การรู้ดิจิทัลเพื่อเสริมสร้างศักยภาพในการรับมือกับความเสี่ยงจากการเปลี่ยนแปลง
สภาพภูมิอากาศ : กรณีศึกษาผู้สูงวัยในกรุงเทพมหานคร

นายฉันทิต สว่างเนตร

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาศิลปศาสตรดุษฎีบัณฑิต
สาขาวิชา สิ่งแวดล้อม การพัฒนา และความยั่งยืน (สหสาขาวิชา)
บัณฑิตวิทยาลัย จุฬาลงกรณ์มหาวิทยาลัย
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ฉันทิต สว่างเนตร : การรู้ดิจิทัลเพื่อเสริมสร้างศักยภาพในการรับมือกับความเสี่ยงจากการเปลี่ยนแปลงสภาพภูมิอากาศ : กรณีศึกษาผู้สูงอายุในกรุงเทพมหานคร (DIGITAL LITERACY FOR ENHANCING PREPAREDNESS CAPACITY TO CLIMATE RELATED RISKS AMONG AGEING POPULATION IN BANGKOK, THAILAND) อาจารย์ที่ปรึกษาหลัก : ผศ. ดร. สุทธิรัตน์ กิตติพงษ์วิเศษ 153 หน้า

ผู้สูงอายุเป็นกลุ่มเปราะบางที่สุดกลุ่มหนึ่งที่ต้องเผชิญกับความเสี่ยงที่เกิดจากการเปลี่ยนแปลงของสภาพภูมิอากาศ การศึกษาค้นคว้าครั้งนี้ มีวัตถุประสงค์เพื่อศึกษาพื้นที่เสี่ยงต่อการเกิดน้ำท่วม รวมทั้ง วิเคราะห์ปัจจัยการรู้ร้่าน้ำท่วม และการเตรียมความพร้อมในการเผชิญเหตุน้ำท่วมในกลุ่มผู้สูงอายุในกรุงเทพมหานคร การประเมินพื้นที่เสี่ยงน้ำท่วมอาศัยการวิเคราะห์ด้วยระบบสารสนเทศภูมิศาสตร์ด้วยวิธี Overlay โดยพิจารณาลำดับความสำคัญของ 8 ปัจจัย ด้วยกระบวนการวิเคราะห์ตามลำดับชั้น (Analytical Hierarchy Process: AHP) ซึ่งพบว่า การใช้ประโยชน์ที่ดิน ความหนาแน่นของลำน้ำ และปริมาณน้ำฝนรายปี เป็นปัจจัยที่มีค่าคะแนนความสำคัญสูงสุด ขณะที่ การทรุดตัวของดิน ประวัติน้ำท่วมในอดีตและความลาดชันของพื้นที่มีค่าคะแนนความสำคัญน้อยที่สุด ตามลำดับ ผลศึกษายังพบว่า พื้นที่ร้อยละ 50 ของพื้นที่กรุงเทพมหานคร หรือ 784.089 ตารางกิโลเมตร เป็นพื้นที่เศรษฐกิจ มีความเสี่ยงในการเกิดน้ำท่วมสูง และผลสัมฤทธิ์พบว่าการขาดการบูรณาการของนโยบายในกลุ่มผู้สูงอายุ ด้านการลดความเสี่ยงในการเกิดภัยพิบัติ เป็นอุปสรรคในการลดความเปราะบางเมื่อเกิดภัยน้ำท่วม จากการวิเคราะห์สภาพแวดล้อมและศักยภาพ พบว่าผู้สูงอายุมีความยากในการใช้เทคโนโลยีสารสนเทศสื่อสารเพื่อลดความเสี่ยงและการจัดการน้ำท่วม การขาดการบูรณาการของนโยบายของผู้สูงอายุด้านการเตรียมพร้อมรับมือกับน้ำท่วม ขาดการอบรม รวมถึงการรู้และความชำนาญในระดับต่ำ ยังนับเป็นอุปสรรคสำคัญในการเสริมสร้างการปรับตัวต่อน้ำท่วม ผลแบบสอบถาม (n=739 คน) พบว่า ผู้สูงอายุมีความจำกัดในการใช้เทคโนโลยีสารสนเทศ ระดับการรู้ดิจิทัลและการรู้ทันสื่อสำหรับการเตรียมความพร้อมต่อเหตุภัยน้ำท่วมน้อย ส่วนใหญ่ของผู้ตอบแบบสอบถามไม่มีการสื่อสารหรือกระจายข้อมูลเกี่ยวกับการเตรียมความพร้อมผ่านทางสังคมออนไลน์ (ร้อยละ 75) มีความกลัว และเชื่อในโชคชะตาต่อภัยน้ำท่วม (ร้อยละ 75) และมีเพียงบางส่วนรับรู้ข้อมูลข่าวสารก่อนการเกิดน้ำท่วมจากแอปพลิเคชัน เฟสบุ๊คและ ไลน์ (ร้อยละ 13) และใช้เว็บไซต์ของหน่วยงานราชการในการหาข้อมูล (ร้อยละ 2) ผลวิเคราะห์สถิติเชิงวิเคราะห์พบว่าผู้สูงอายุเพศหญิงมีการรู้ร้่าน้ำท่วมและมีแนวโน้มในการเตรียมพร้อมต่อภัยน้ำท่วมมากกว่าเพศชาย ระดับการศึกษาและรายได้มีความสัมพันธ์อย่างมีนัยยะสำคัญทางสถิติต่อการรู้ร้่าน้ำท่วมและการเตรียมความพร้อม ผู้สูงอายุที่พำนักในพื้นที่เสี่ยงต่ำมีการรู้ร้่าน้ำท่วมน้อยกว่าแต่มีความเตรียมพร้อมต่อน้ำท่วมมากกว่า จากการทดสอบทฤษฎีแรงจูงใจเพื่อป้องกันพบว่าการรับรู้ความเสี่ยง ความเข้าใจในแผนและมาตรการ การรู้ขีดความสามารถของตนเอง การประเมินภัยคุกคามจากการรับรู้ความน่าจะเป็นและผลจากภัย และความสามารถในการเตรียมพร้อมและเผชิญเหตุมีความความสัมพันธ์กันอย่างมีนัยยะสำคัญ ทั้งนี้ เพื่อส่งเสริมการรู้ร้่าน้ำท่วมและการเตรียมความพร้อมในกลุ่มผู้สูงอายุ มีข้อเสนอแนะเชิงนโยบายให้ดำเนินการพัฒนา ความชำนาญในการเตรียมความพร้อม การบริหารจัดการน้ำท่วม และกลยุทธ์ที่มีประสิทธิภาพในการส่งเสริมความร่วมมือทางสังคมจึงมีความจำเป็นอย่างเร่งด่วน การส่งเสริมการรู้ร้่าน้ำท่วมโดยการใช้เทคโนโลยีสารสนเทศและการสื่อสารสำหรับผู้สูงอายุ การบูรณาการนโยบายผู้สูงอายุกับภัยพิบัติและการเปลี่ยนแปลงของสภาพภูมิอากาศ และการจัดสรรทรัพยากรฝึกอบรมเกี่ยวกับน้ำท่วม

6288321120: MAJOR ENVIRONMENT DEVELOPMENT AND SUSTAIAILITY

KEYWORDS: ELDERLY / HAZARD / FLOOD / LITERACY / PREPAREDNESS / BANGKOK

CHANDHIT SAWANGNATE: DIGITAL LITERACY FOR ENHANCING PREPAREDNESS CAPACITY TO CLIMATE RELATED RISKS AMONG AGEING POPULATION IN BANGKOK, THAILAND. ADVISOR: ASSIST. PROF. SUTHIRAT KITTIPONGVISES, Ph.D., 153 pp.

The elderly population is amongst the most vulnerable group confronting climate related risks. This research aims to assess flood hazards distribution and investigate factors influencing flood literacy and preparedness actions among the elderly in Bangkok, Thailand. The AHP-GIS technique, land-use, drainage density, and annual maximum rainfall are the most important factors that influence flood hazard in Bangkok while land subsidence, past flooding events, and slope of the city have the lowest scores. Around 50% (784.089 sq.km.) of total area, mainly situated in the economic centers, is defined as high hazard. The results of policy analysis found that lack of integration of ageing population policy and disaster risk reduction were the key barriers to reduce vulnerability to flood hazard. SWOT analysis found that lack of effective integrated policy for ageing population and flood preparedness, limited training session on flood management, and low literacy skills of the elderly were the key barriers to strengthening flood resilience. A questionnaire survey was conducted with elderly respondents (n = 736) who are living in Bangkok. The results revealed that many senior citizens have limited experience in using information communication technology and low digital and media literacy for flood preparedness. Approximately 75% had neither communicated nor shared flood information and preparedness actions via social network platforms. Almost half of the respondents reported negative feelings of fear and fatalism toward flood disasters. Approximately 13% of respondents obtained information before flood events via Facebook and Line applications. Less than 2% of the elderly assessed to the national/provincial web-based platform. Elderly females showed higher flood literacy and tended to take more preparedness action than male counterparts ($p < 0.05$). Education and income significantly affected their flood literacy and preparedness actions. Elderly residing in low hazard areas tended to have lower flood preparedness literacy, but higher flood preparedness action. In the Protection Motivation Theory, statistical analysis revealed that there were significant positive correlations among risk perception, understanding of preparedness measures, perceived self-efficacy, feeling of helplessness, past flood experiences, and threat appraisal of perceived flood probability and consequences and ability for flood preparedness and response action ($p < 0.01$). To enhance flood preparedness literacy and flood preparedness action amongst ageing population, promoting flood literacy by using information and communication technology for elderly, ease-of-use and availability, flood preparedness action in advance, strengthening emotional well-being to cope with flood, enhancing disaster risk perception, empowering elderly integration into disaster and climate related policies, and arranging flood training program are policy recommendations.

Field of Study: Environment Development and
Sustainability

Student's Signature.....
Advisor's Signature.....

Academic Year: 2021

Acknowledgement

I am overhelmed in all humbleness and gratefulness to acknowledge and to express my deep and sincere gratitude to the 100th Anniversary Chulalongkorn University Fund for Doctoral Scholarship, Environment, Development, and Sustainability (EDS), Graduate Program, Environmental Research Institute, Chulalongkorn University, and my advisor, Asst. Prof. Suthirat Kitipongvises, Ph.D., Director of Environment, Development, and Sustainability, for giving me the opportunity to do research and mentoring invaluable guidance throughout this research. Her dynamism, vision, sincerity, and motivation have deeply inspired me. She has taught me the methodology to carry out the research and to present the research works as clearly as possible. It was a great privilege and honor to work and study under her guidance, friendship, empathy, and her sense of humor.

I am extending my heartfelt thanks to United Nations Fund Population Ageing (UNFPA), Japan Ageing Gerontological Evaluation Studies (JAGES), British Embassy Thailand, Ministry of Digital Economy and Society, Department of Elderly, Office of Natural Resources and Environmental Policy and Planning, Department of Disaster Prevention and Mitigation, and Bangkok Metropolitan Administration for insightful information, as well as all survey respondents for their support, Khun Benchawan Chaisri, who supported me in doing a lot of food hazard mapping. I also would like to thank you Khun Wiwat Lertwilaisak, EDS officer who helped me in the paper works and Khun Nongluck Boontiam Korean Studies officer, Chulalongkorn University, who helped me related to technical works. I am thankful to them.

I would like to thank my family and friends who helped me a lot in gathering different information and guiding me from time to time in making this research. They gave me different ideas in making this research unique.

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CHAPTER 1

Introduction

1.1 Background and Rationale

Presently, many to most people are living longer than ever before and by 2050, a significant proportion of world's population will be older people. Ageing population is becoming a big spotlight in the global economy. In a few decades, by 2050, the United Nation has shown that the world's population is projected to be nearly 9.7 billion. One in six people in the world will be over the age of 65 (United Nations, World Population Ageing 2019). It must be recognized that the ageing population is a global phenomenon and also poses both economic and fiscal challenges. In the next few years, the population growth in developing countries is expected to continue. An increase in the elderly population across the globe is a significant result of a change in demographic such as the shift from high to low in both birth and death rates (Pantazis and Clark, 2017).

In Thailand, according to the Elderly Act (Article 3), elderly is defined as a chronological age of 65 years old or above (Department of Older Persons, 2020). From the record, for more than 30 years, the structure of age of population in Thailand has been changing continuously toward an aged population (NESDB, 2015). Just 50 years ago, the life expectancy at birth of Thai people was 59 years and the elderly population comprised of only 5%. In 2015, the life expectancy of Thai people at birth has been increased to 73 years with 16% being elderly. Offspring of the older generation are the main source of funding to support the elder person. More people in Thailand are living longer than ever before and have begun the challenging process of meeting the need of an ageing society. The most significant challenges due to the rapidity and magnitude of socio-demographic and socio-economic includes work, education opportunities, long-term care plans, and age-friendly housing. The government has updated and revised policies on ageing referring to the Madrid Plan for Action on Ageing (MIPPA), but unfortunately the policies and existing law are not formatively put into practice. Even still, Thailand became an ageing society in 2001 with the population over 65 being more than 7%. Thailand has been facing the challenges of ageing population, as of 2015, with the population of 65.2 million excluding migrant workers. Approximately 16% of the total population of

Thailand is aged over 60. With that, Thailand has the second largest proportion of ageing population in ASEAN after Singapore (18%), whereas Vietnam has the third. Regarding that, it is necessary to understand not only the characteristics of ageing population, but also the risks of climate change and related impacts in the ageing era.

1.2 Problem statement

As above mentioned, the elderly is the most vulnerable group which have difficulty when the impacts of changing in climate arrive. Based on the previous flood response to the floods in Thailand in 2011, it revealed that elderly who has limited capacity for flood risk management are the most at risk group. In recent years, there have been many of previous studies that focused on the socio-economic development for better quality of life. Much of the recent research has linked the use of digital technology for well-being in elderly (Mitzer et al., 2010). Although some studies focused on developing advance technology, there is, however, a dearth of research focusing on the digital literacy in terms of use, understanding, creation, and accessibility, while a digital divide still exists. In the context of Thailand, the digital platform has been widely used as a medium instrument to access the benefit scheme provided by the government, but local residents have found difficulty in terms of the digital literacy. As Bangkok being one of flood-hazard areas, digital literacy would be able to improve adaptive capacity to frequent flooding. Understanding the way in which older individual factors influences digital technology will be able to help narrow down the digital divide in the elderly. The purpose of this research is to explore and investigate factors influencing the digital literacy to improve and strengthen preparedness for climate related risks of the elderly in Bangkok. Specifically, how demographic and socio-demographic compositions, social norms (SN), attitudes, and perceived behavioral control (PCB) affect the use of digital literacy by enhancing their preparedness capacity to climate related risks in Bangkok. More importantly, this study ‘flood preparedness literacy’ refers to the ability of the elderly to use and access all information on flood preparation both from online (social media, internet, mobile technologies, etc.) and offline (printed and written materials) platforms.

1.3 Research Questions

1. What are the current situations, policies, and related strategies for the elderly to strengthen flood disaster preparedness in Thailand?
2. How demographic factors of the elderly respondents influence both flood preparedness literacy and preparedness action of elderly in Bangkok?
3. How the factors related to the theory of planned behavior and the protection motivation theory affect flood preparedness literacy and preparedness action of elderly in Bangkok?
4. What are the possible strategies to promote flood preparedness literacy and preparedness actions of the elderly population to flood hazard?

1.4 Research Objectives

1. To study the current situations, policy programs, and activities for the elderly to strengthen flood preparedness in Thailand.
2. To examine the effect of demographic factors on flood preparedness literacy and preparedness actions of elderly in Bangkok.
3. To assess factors influencing flood preparedness literacy and preparedness actions of elderly in Bangkok.
4. To provide recommendations for promotion of flood preparedness literacy and preparedness actions of elderly population in Bangkok.

CHAPTER 2

Literature Review

To better understand the overall situation of ageing population and the problem statement, this chapter provides a brief explanation of ageing, policy, programs, and activities for the elderly in Thailand, as following details below:

2.1 Thailand's Ageing Population

In 2011, the National Statistical office reported regarding the situation of older people in Thailand, that the well-being of older Thai people has continued to improve in a positive direction. The people 75 or older may require some care and support. Traditionally, the care and support for older people is done at home. The older adults have always faced a higher risk of poverty than average because they are unable to work, thus earn less. Evidently, about 10.9% of older people in Thailand are poor compared to 7.7% of the general population. Fortunately, 83% of people older than the statutory pensionable age receive an old-age pension (contributory, noncontributory, or both) (World Social Protection Report 2017-2019). As indicated in Table 2.1, by 2050, Thailand's ageing population is subjected to increase to 20%, meaning that one out of every five Thais will be a senior. (World Population Prospect, 2019).

Table 2.1 Key statistics on population of older people in Thailand

Key indicators	2019	2050
Population aged of 60 and above (total)	13,412,000	20,961,000
Population aged of 60 and above (% of total population)	19.2	35.8
Older women aged of 60+ (% of total population)	10.6	20
Males Life expectancy	73.12	80.35
Females Life expectancy	80.62	85.22
Older-Age Dependency Ratio (Age 65+ / Age 15-64)	18.4	51.1

Urban older people (% of total population)	14.71	
Rural older people (% of total population)	16.86	
Older persons living alone aged 60 and above (% of total population aged 60+)	6.0	

Source: HelpAge global network (2019)

In 2021, Thailand is an ageing population society, consisting of 17.9% of the total population (11,821,609 / 66,182,808). Moreover, in 2022, Thailand will be a complete-aged society, with 20.66% of its total population age 60 and over. It will be super-aged society in 2033 with 28.55% being elderly population. Alarmingly, Thailand's aged population trend is due to various reasons, particularly due to a rapid decline in fertility, delayed marriage, high usage of contraceptives, healthy lifestyles, and advanced technology raising life expectancy. More information of Thailand's ageing population and life expectancy is shown in Table 2.2.

Table 2.2 Thailand's population and Ageing population in 2021

Thailand population in 2021	66,182,808	
Male	32,361,652	
Female	33,821,156	
Thailand's Ageing Population	11,821,609	
Male	5,215,435	
Female	6,606,174	
Ageing population in 2021	Age (year)	%
	60 - 69	57
	70 - 79	29

	>80	14
Thailand Life Expectancy (year)		
Both sex	77.7	
Male	74.2	
Female	81.3	

Source : Official statistic registration system, Department of Provincial Administration, Ministry of Interior, Based on May 2021; www.worldometers.info/demographics/thailand-demographics

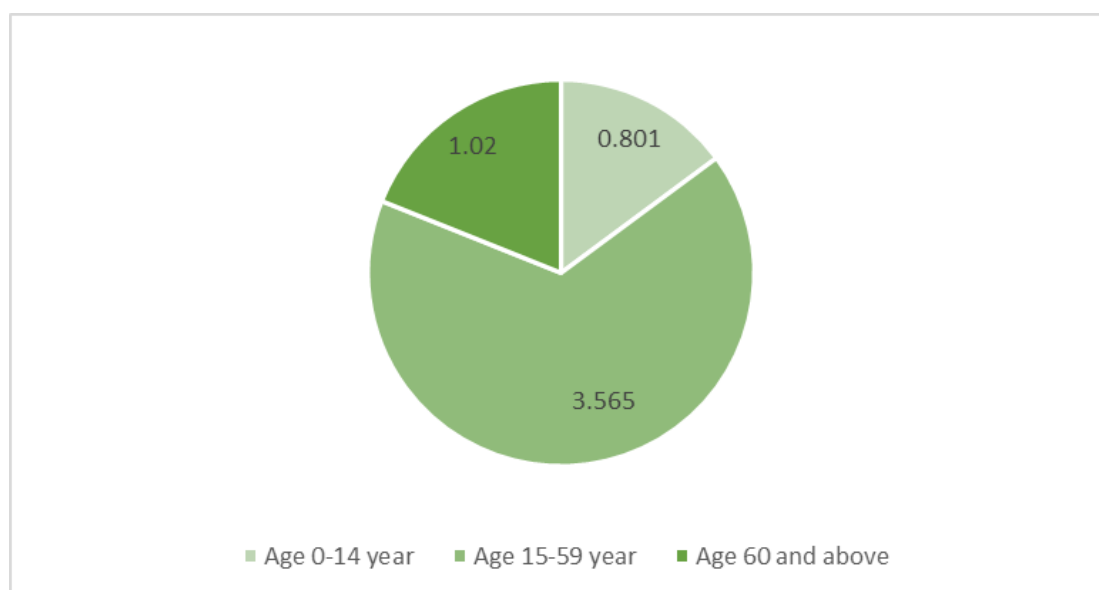
Older people become less impulsive and more emotionally stable than the younger people. Older people tend to better understand the weight of each decision because they know the value of their time. On the other hand, older age is often mistakenly associated with physical and mental deterioration, dependence, and diseases. Older people are at a higher risk of being left behind in situations of displacement and are highly vulnerable to violence due to workforce shortages, asset market meltdowns, economic growth slowdowns, the financial collapse of pension and healthcare system, mass loneliness and insecurity, a growing number of non-communicable diseases, an increase demand for long-term care, changing in climate and related risks, and neglected as the traditional social order. Moreover, the opportunities are a spotlight to help live better in older age. The triumph of public health, medical advancement, and economic development over disease and injury, family-contribute to household shores, grandchildren care, a repository of knowledge, and sustainable development calls for a concerted effort toward building an inclusivity, sustainability, and resiliency for people and the planet (Table 2.3).

Table 2.3 Thailand Ageing Challenges and Opportunities

	Challenges	Opportunities
Society	<ul style="list-style-type: none"> - Lack of realization / preparation - Declining birth rate - Becoming smaller family 	<ul style="list-style-type: none"> - Elder rights advocacy - Integrate all sectors to be ready for an aged society
Health	<ul style="list-style-type: none"> - Chronic disease, bedridden - Depression 	<ul style="list-style-type: none"> - Integration of rural quality of life development to be an operation unit - Enhanced caregiver - Rehabilitation center for intermediate care
Economy	<ul style="list-style-type: none"> - Poverty - Pension 	<ul style="list-style-type: none"> - Income security - Promote working in the elderly
Environment	<ul style="list-style-type: none"> - Safety housing - Public service for senior 	<ul style="list-style-type: none"> - Universal design and appropriate environment provision
Technology & Innovation	<ul style="list-style-type: none"> - Rapidly change in innovation and technology - Lack of digital literacy 	<ul style="list-style-type: none"> - Improving digital skills and living with technology disruption - Promotion of technology and innovation for the elderly care

2.1.1 Bangkok Aged Population

According to the Department of Provincial Administration (2018), the number of elderly people in Bangkok aged 60 and above is 1.02 million, compared to the total population of 5.48 million people (Figure 2.1 and Table 2.4). Therefore, the ratio between the elderly and total population is 18.63%, showing that Bangkok is already an aged society.



Source: Department of Provincial Administration 2018 (million)

Figure 2.1 Bangkok Population 2018

Table 2.4 Population Ageing in Bangkok 2018

Age	Population
60 - 69	586,731
70 - 79	284,074
80 - 89	125,584
90 - 100	23,072
100 and above	1,456

Source: Department of Provincial Administration 2018

2.1.2 Climate Change: Impacts and Responses

According to the IPCC, Thailand is one of the most extremely vulnerable regions to coastal flooding. Climate change problems significantly affect not only the physical, but also delivers a big hit to social problems. The elderly group is vulnerable and highly susceptible to the negative impacts of climate change. In the 21st century, climate change and ageing populations come along as key policy challenges which need to be posted to ensure health, security, equality, and future sustainability. Changing in climate will impact not only environmental dimensions, but also the quality of life, especially for vulnerable older adults (U.S. Census Bureau, 2011). It is necessary to confront and collaborate the impacts of climate change with social aspects in adaptation planning. Many regions across the globe are at high risk of environmental change conditions, such as water shortages, floods, droughts, and rising sea-level (Kousky, 2018). Extremely high temperatures and natural disasters contribute to both human health and the well-being of local people and their communities (Gamble, 2005).

The absence of considered infrastructure that fit the needs of elderly in climate-driven crisis harms more than a comfortable lifestyle, it limits basic access to health care, food, and other necessities of living (S.A. Martin, 2015). Thus, climate change minimizes the chance of sustainable ageing, which not only directly increases elderly health risk, but also affects old-aged social lives. People who live alone when they are older may be at risk during the events of climate change due to the potential for being physically limited, being at risk of increasing hospitalization, and having multi and complex-morbidities (Legrand, 2014). People with limited financial means and not having enough resources to move after a natural disaster occurs will be faced with critical and disproportional impact. A series of previous studies suggest that there is a negative relationship among the capacity and the shifting in age structure. Older people will face a decline in cognitive ability, but there also is some consistency and improvement at old age.

Thailand is likely be the one of the affected countries from climate change due to its geography, economy, and development. There are numerous physical impacts of climate change in Thailand such as flooding, droughts, decrease in agricultural production, rising sea levels, and health-related issues. According to the IPCC, Thailand is one of the most extremely vulnerable regions to coastal flooding. The areas along the Gulf of Thailand are likely to suffer from the expansion of ocean waters caused by the climate change effect of warmer ocean temperatures and melting of ice caps. Thailand is one of the world's biggest food producers and rice exporter.

Moreover, more than 40% of the total population is relying on agriculture for their livelihood. Flooding, drought, and changing in rainfall due to climate change will aggravate problems related to water resource management for farmers. Climate change problems significantly affect not only the physical, but is also a big hit to societal problems. Social problems in the urban area, especially in Bangkok, will emphasize a number of cases (i.e., climate related risks on heavy rainfall events, flooding, and urban heat wave). The intensity of heat inland, plus an increase in heat waves during summer due to climate change will affect energy use, labor productivities, and the health of urban and vulnerable population, especially the elderly.

2.1.3 Digital Technology and Literacy

The United Nations Educational, Scientific and Cultural Organization defines literacy as the “ability to identify, understand, interpret, create, communicate, and compute, using printed and written materials associated with varying contexts.” These days, young and old individuals are living in a tech-dependent world and the newborn children are the not just the citizens of the world country, but of a digital citizenship. Digital technology involves what is most used in everyday life (i.e., from the simple electrical appliances such as TV to other more complex systems such as ATMs or mobile phone). The elderly widely accepts the use of new technology that has benefit in improving their quality of life. In the past, people communicated to others through hand-written letters requiring writing and reading skills. Communication using text and email uses the same skills, but additionally requires digital literacy. Knowing how to use technology may not be sufficient enough to achieve an effective and efficient outcome. Digital literacy is the capacity to navigate a variety of digital platforms. It is also frequently known as multi-literacy which is used to explain the skill and capability needed to understand and use digital technology. Understanding digital literacy is needed to keep up with the change in times. Moreover, digital literacy encompasses a broad range of new technology and is a framework that helps collaborate with knowledge and capability in a variety of dimensions. While digital technology is becoming more pervasive, an old age-related underutilization of using digital technology remains observable (Niehaves and Plattfaut, 2014).

2.2 Definition of Ageing Population

It is unclear whether ageing is a process or an outcome (Aland D, 2019). The Cambridge Dictionary and Oxford Dictionary provide the meaning of ageing, as follows:

Ageing (US) / Aging (British): Noun: the process of growing old
 Adjective: (of a person) growing old; elderly

Referring to the World Health Organization, ageing is a natural process of biological reality which his or her must undergo since conception and ends with death. The term “elderly” has been stated and used in many ways which is basically applied to people aged 60 years and older, apparently representing the fastest growing population in the world (Amarya, Singh, and Sabharwal, 2018). Ageing population is a state which a country has fewer young people and faces population decline. By understanding the terms of ageing, the ageing population plays a significant role in shaping and forming economic development in the world’s economy. Ageing comes with many challenges and associates with various changes. The loss of independence is one potential part of the process, as are diminishing physical abilities and age discrimination. The term “senescence” refers to the process of ageing, including biological, intellectual, spiritual changes, emotional, and social. This section discusses some of the challenges people encounter during this process. Table 2.5 provides the definition of ageing population, complete aged population, and super aged population.

Table 2.5 Definition of ageing population

Terms	Definition
Aged population	classifying as a number of people who age of 60 or above is greater than 10% in total number of population or a number of age of 65 years or over is higher than 7% in total
Complete aged population	classifying as a number of people who age of 60 or above is greater than 20% in total number of population or a number of age of 65 years or over is more than 14% in total

Super aged population	classifying as a number of people who age of 60 or above is greater than 28% in total number of population or a number of age of 65 years or over is more than 20% in total
Ageing population	classifying as the society that has the rate of steadily increasing of elderly population

Source: United Nations (2019)

Furthermore, low fertility, longevity, and baby boomers are the causes for global population aging. Firstly, a decrease in fertility rate reflects multiple factors that include higher wages, urbanization, better education, access to government policies, and contraception. Secondly, the rapid growth of life expectancy is due to better access to health services, advancement in medicine, and improved material well-being. Thirdly, a number of baby boomers are considered as aging booming that fasten the drive of the global aging process.

In population ageing, economic development and standard of living receive massive attention by economists and policymakers. Economic development is usually defined by as the process that focuses on qualitative and quantitative growth of the economy, which not only improves a country's wealth, but also increases the standard of people's quality of life (Oliver, 2015). Economic development can create various opportunities in terms of employment, healthcare, social welfare, education, and environment. The quality of living standards includes various things like improved sanitation system, safe and clean drinking water, medical facilities, improved literacy rate, and increase employment opportunities. Standard of living is playing as the main key indicator of economic development. Ageing tends to increase the number of retirees and also reduce the number of workers. The progression of the aging population will lead to the greater proportion of dependency on social support, social risks, and the demand for services.

Compared to the younger generation, it is broadly accepted that the elderly shows a low adjustment to the use of new technology because of the lack of experience or their health condition. Furthermore, the elderly usually faces many difficulties regarding the demographic characteristics such as education, income, possible disabilities, location, and new technology's complexity. The other factors responsible for the low adjustment to new technology are lack of

economic obstacles, motivations, incentives, skills, and knowledge.

2.3 Ageing and Impacts of Climate Change

The attitudes toward climate change in the elderly are diverse. The elderly not only recognize the importance of taking action against the impacts of climate change, but are also concerned about other global changes. Unfortunately, the elderly are less likely to support climate-friendly policies and allocation of public resources (Andor, Schmidt, and Sommer, 2018). Focusing on improving the sustainable health and well-being in elderly, the model for healthy ageing that bridges climate change, health, and community development needs by Robert Wood Johnson Foundation (RWJF). Table 2.6 demonstrates that increase of resources on physical and social environment are important to mitigate the impact of climate change on the community health effects from the change in climate (Mockenhaupt and Woodrum, 2015).

Table 2.6 The model for healthy ageing that bridges climate change, health, and community development needs.

Climate Change Impact	Risk of Older-age Individual	Needs
Wildfires	Mobility (disabilities)	Transportation
Flooding	Social Isolation	Community Living
Heat Waves	Substandard Housing	Housing Infrastructure
Extreme Temperatures	Heart & Respiratory Conditions	AC Access
Air Quality		Healthcare
		Green Space Access

Source: Robert Wood Johnson Foundation (RWJF)

The model constructs are based on the four areas of the Culture of Health Framework which aims to create a shared value, foster a cross-sector collaboration to improve well-being, create healthier and more equitable communities, and strengthen the integration of health services systems. Nevertheless, the model for healthy ageing that bridges climate change, health, and community development needs is well defined, but yet still missing. Although, climate change impact is not only likely to change the climate, but is responsible for raising the presence of new diseases. The World Health Organization identifies that climate change will affect the pattern diseases and deaths (WHO, 2002). However, the effect of new coming diseases is a burden which cannot be qualified. Therefore, new diseases have to be included in the impact of the change in climate. More importantly, in a period of digital era, digital technology is important and necessary as a new indispensable factor that supports sustainable ageing in the elderly.

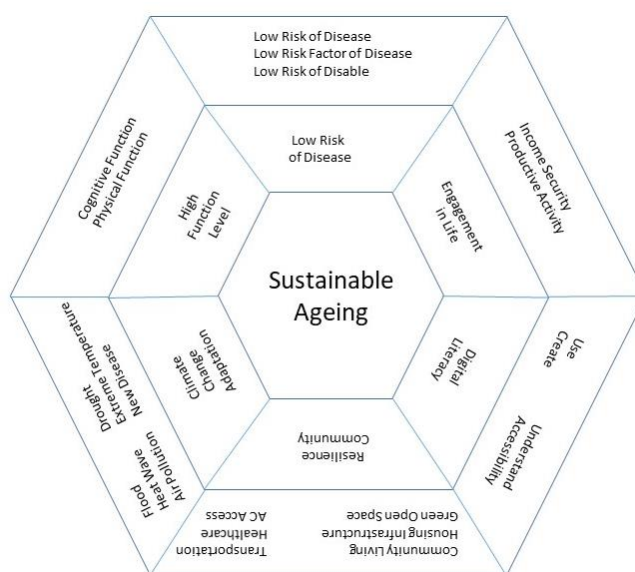


Figure 2.2 Sustainable Ageing Model (Sawangate, 2020)

Many people are becoming concerned about ageing and want to know what to avoid, what to expect, and learn ways to adapt. However, being successful in ageing is not easy. There are several impacting effects to the lives of the elderly. The first to introduce the term of “Successful Ageing” was Havinghurt in 1961, but that was not well defined (Gerontologist, 1961) until 1987, with a book titled Successful Aging published by two scientists, Wallis Rowe and Robert Kahn. Following the Rowe and Kahn’s definition, the concept of successful ageing

was measured relying on 3 dimensions; subjective health status, physical functionality (measured by ADL), and social activities (Wanka, Arnberger, Alex, Eder, Hutter, and Wallner, 2014). Rowe and Kahn had made a definition of successful ageing that was separate from usual ageing (decline in physical, social, and cognitive functions with age) for the first time, rather than separating usual ageing from pathological ageing.

Since then, Rowe and Kahn's successful ageing model is the most widely used. Rowe and Kahn defined the successful ageing as consisting of three main components: low probability of disease and disease-related disability, high cognitive and physical functional capacity, and active engagement in life. All three of them are bounded between one another. The term low probability of disease is not only referred to presence or absence of a disease, but also presence/absence or severity of risk factors for a disease. High functional level including both cognitive and physical components; cognitive and physical capacities are potential for activities. Successful ageing involves activity which goes beyond the potential, while active engagement with life is most concerned with interpersonal relation and productive activity. Interpersonal relations involve transactions and contacts with others, emotional support, exchange of information, and direct assistance. So, an activity is productive when creating social value with or without reimbursement (Rowe and Kahn, 1997). Unfortunately, Bowling and Dieppe argued that Rowe and Kahn's model fails to address the implication of the truth for most people that being disease-free in older age is unrealistic. However, while the absence of diseases, the maintenance of physical health, and mental functioning are the key factors to successful ageing, life satisfaction has been commonly included to successful ageing.

More importantly, successful ageing involves both intrinsic genetic and extrinsic lifestyles. Extrinsic factors including exercise, diet, psychosocial aspect, and personal habits in ageing are often underestimated. Later on, the various terms such as "productive ageing", "ageing well", "healthy ageing", and "compression of morbidity" have been used for the same concept of successful ageing. These days, the exact definition of successful aging is an open table for debate. Repeatedly, it is unclear whether ageing is a process or an outcome (Aland D, 2019). Much of the research has offered different operative definitions of successful ageing, but the term "Sustainable Ageing" still remains observed.

In 2009, the Federal Register identified the meaning of "sustainable" and "sustainability" which aim to create and maintain conditions, under which humans and nature can exist in productive harmony, that permit fulfilling the social, economic, and other requirements of

present and future generations. A concept of sustainable ageing is meant to preserve both physical and mental capacity at age in place and making changes to the environments. In order to achieve sustainable ageing, what course of action and how to need to be identified and studied. In this research, digital literacy will be the main key of study to achieve sustainable ageing in order to enhance well-being and preparedness capacity to climate related risks.

2.4 Disaster Risk Management

2.4.1 Disaster Risk Management Cycle

Disaster management is a core fundamental of disaster risk management. Sum total of all activities, programs, and measures which can be taken up with the purpose to avoid a disaster to reduce its impact or recover from its losses is called Disaster Risk Management. There are three stages (before, during and after a disaster) of the disaster risk management which are collectively called Disaster Management Cycle as shown in Figure 2.3. Broadly, the emergency activities are divided into four phases in Disaster Management Cycle: Prevention and Mitigation, Preparedness, Response, and Recovery (U.S. Department of Homeland Security), as following:

and Reconstruction

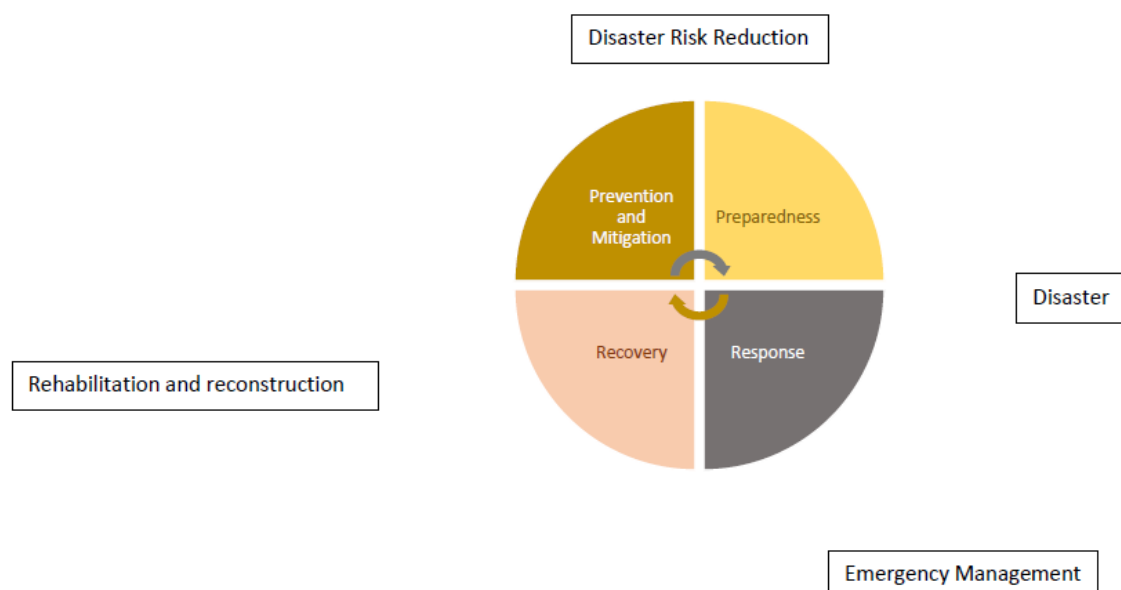


Figure 2.3 Disaster Management Cycle

i) Disaster prevention and mitigation measures are undertaken to prevent or mitigate the adverse effects of a disaster in both short and long term. It includes political, legal, administrative, and infrastructural measures. It also includes educating vulnerable communities influencing people lifestyle and behavior in order to reduce their disaster risk.

ii) Preparedness: the intention of disaster preparedness is to prevent or minimize the damage and losses in case of a disaster, which include the preparedness of all civic bodies such as civil administration, fire-brigade, hospitals, police etc. Preparedness denotes the second phase of emergency management.

iii) Response phase is an effort to minimize the hazards created by a disaster, including the search and rescue, fulfilling basic humanitarian needs of victims, assistance by regional, national and international bodies, etc.

iv) Recovery phase starts after the immediate threat to human life has subsided. The immediate goal of the recovery phase is to bring the affected area back to some degree of normalcy. Therefore, during reconstruction, the location or construction material of the property is considered.



Figure 2.4 Pre and Post Disaster

As shown in Figure 2.4, prevention, mitigation, and preparedness processes include pre-disaster activities that mainly focus on reducing the human and property losses caused by a potential hazard. Meanwhile, the response and reconstruction phase include post-disaster

initiatives that aim to respond to a disaster with the purpose to achieve early recovery and rehabilitation of affected victims and communities.

Developmental considerations contribute to all aspects of the disaster management cycle. Thus, one of the main goals of disaster management is to promote a sustainable livelihood and their protection and recovery during disaster and emergencies.

2.4.2 Humanitarian Action

Humanitarian agencies are responsible for disaster response and recovery. These agencies need experienced leaders, trained personnel, appropriate communications, adequate transport and logistical support, and guidelines for responding to emergencies. Thus, these agencies require preparations in advance of disasters to have effective response and submit to the demand of people in need.

2.4.3 The Sendai Framework

Sendai Framework for Disaster Risk Reduction (Sendai Framework) is the key global instrument for managing disaster risks within the next 15 years, starting from 2015 to 2030. The Sendai Framework was adopted by 187 Member States of the United Nations at the Third UN World Conference on Disaster Risk Reduction between 14 – 18 March 2015, Sendai, Japan.

2.4.4 Thailand and the Sendai Framework

Cabinet Resolution taken on 10 March 2015 approved Thailand to adopt the Sendai Framework for Disaster Risk Reduction 2015 – 2030. After the adoption, the National Committee on Disaster Prevention and Mitigation agreed to incorporate core elements of the Sendai Framework into the newly developed National Disaster Prevention and Mitigation Plan endorsed by the Cabinet on 31 March 2015. To this effect, all concerned agencies, sectors, as well as financial institutions are obliged to implement the Plan and allocate a necessary budget to make sure that disaster risk reduction is substantially translated into action.

2.4.5 Sendai Framework for Disaster Risk Reduction 2015 – 2030

Sendai framework for disaster risk reduction is a framework guideline for disaster management. The framework outcome aims to reduce disaster risks, losses of lives, and increase livelihood of people, businesses, communities, and countries. With the outcome the frameworks work to

prevent new and reduce existing disaster risks. The tool framework incorporates integrated and inclusive approach including the topics of economic, structural, legal, social, health, cultural, educational, political, environmental, and institutional measures. The framework aims to increase preparedness for response and recovery of disaster management, and strengthens resilience to disasters.

Sendai frameworks can be understood through 4 steps priorities. First is understanding of disaster risk. The disaster should be understood through multi dimension such as vulnerability, capacity, exposure, hazard characteristics, and environment. The understanding is important for the policies and practices of disaster management. It is a pre-disaster step that can benefiting development and implementation of appropriate measures for effective response to disaster.

Second is strengthening of disaster risk governance. Governance is at the core of disaster management from regional to national to global level. Participation of stakeholders are needed for creation of clear vision and plans. Partnership across mechanisms and institution is also needed for risk reduction and sustainable development.

Third is investment required for resiliency. Investment can be public or private but it is necessary to invest to create disaster risk prevention and reduction. Resilience of the economic, social, health, person, and communities can be advance through necessary investment. This investment can also be a driver of growth and innovation for a country such as development of new tools and methodologies that will save lives and reduces losses.

Fourth is enhancing preparedness so that “Build back better” is possible in recovery process. To increase resilience and better response to disaster can lead to better result after the disaster. The recovery process can be an opportunity for development, but it required preparedness. Gender equality and universal access can be advanced through effective planning for disaster prevention. The disaster management process needed to ensure integration of people in it.

2.4.6 Global Targets

Seven global targets have been agreed on. These targets will be measured at the global level and will be complemented by work to develop appropriate indicators. National targets and indicators will contribute to the achievement of the outcome and goal of this framework.

1. Substantially reduce global disaster mortality by 2030, aiming to lower average per 100,000 global mortalities between year 2020-2030 compared to 2005-2015.
2. Substantially reduce the number of affected people globally by 2030, aiming to lower the

average global figure per 100,000 between year 2020-2030 compared to 2005-2015.

3. Reduce direct disaster economic loss in relation to global gross domestic product (GDP) by 2030.
4. Substantially reduce disaster damage to critical infrastructure and disruption of basic services, among them health and educational facilities, through developing their resilience by 2030.
5. Substantially increase the number of countries with national and local disaster risk reduction strategies by 2020.
6. Substantially enhance international cooperation to developing countries through adequate and sustainable support to complement their national actions for implementation of this framework by 2030.
7. Substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to the people by 2030.

2.4.7 Thailand's National Disaster Prevention and Mitigation Plan 2015

The Disaster Prevention and Mitigation Act 2007 is the main legal basis providing frameworks for all sectors in disaster risk management. According to Article 44 of Disaster Prevention and Mitigation Act 2007, when it is foreseeable that the country risks situation is changing or the existing National Disaster Prevention and Mitigation Plan has been implemented for five years, it is recommended to revisit and revise the plan in a timely manner. Article 11(1) of the said Act, therefore, mandated The Department of Disaster Prevention and Mitigation (DDPM) to be the responsible agency for such plan development. Before the plan can be in effect, DDPM has to propose it to the National Disaster Prevention and Mitigation Committee (NDPMC), chaired by the Prime Minister or designated Deputy Prime Minister who must approve it and later go through the Cabinet for endorsement.

This current national plan has undergone a participatory planning process, where related sectors are engaged, including public, private, and civil society. The plan was approved by the NDPMC on 9 February 2015. Then on 31 March 2015, the Cabinet endorsed the plan and enforced related sectors of all levels to implement the plan, develop their own action plan, and incorporate projects and programs on disaster risk management into their annual plan. The Cabinet also urged the Budget Bureau, concerned agencies, and local governments to allocate a sufficient budget to projects/programs on disaster risk reduction, emergencies response, and recovery in a sustained manner.

2.4.8 Key Elements of the National Disaster Prevention and Mitigation Plan 2015

Thailand national disaster prevention and mitigation plan has 4 strategies. First is disaster risk reduction. Second is incorporation of multi-sectoral cooperation. Third is enhancing inclusive measure in the recovery process. Fourth is standardizing coordination in disaster risk management. The plan also incorporates concept of Self Sufficiency Philosophy by the late His Majesty the King's Bhumiphol. Disaster risk management is stressed to ensure that people and communities at risk are well prepared and resilient to all types of hazards. The Sendai framework is important to the drafting of Thai's plan. It acts as a guideline. At the core of Thai's disaster plan is "Disaster Risk Management (DRM)."

Thailand's National disaster prevention and mitigation plans stated goals, objectives, and mechanism for disaster management. The goal of the plan is to have an effective disaster management preparing for unprecedented emergencies. In addition to that that plan aims to create a learning society which is capable of managing disaster risk. The awareness of people has to be raised to create a safety minded and resiliency. To achieve those goals, three objectives are outlined. First is providing concept of operation in disaster risk management which is important for integration and systemization of sectors related. Second is to provide international framework that can be applied to Thai context. Third is to enhance the country's capacities to disaster risk management through risk reduction, emergency management, damage and loss minimization, and "Build back Better" recovery.

National Disaster Prevention and Mitigation Plan 2015 determined the national policy framework, and its four interconnected strategies are as follows:

1. Implementing and mainstreaming disaster risk reduction - 1st Strategy Disaster risk reduction oriented.
2. Ensuring multi-sectoral cooperation in emergency management - 2nd Strategy Integrated emergency management.
3. Enhancing an inclusive measure for Build Back Better and Safer in recovery, rehabilitation, and reconstruction - 3rd Strategy Effective recovery and resilience building.
4. Strengthening and standardizing international cooperation and coordination in disaster risk management - 4th Strategy Strengthened international cooperation.

Concept of Operations

The current National Disaster Prevention and Mitigation Plan 2015 embraces the umbrella concept of His Majesty the King’s Self Sufficiency Philosophy, under which disaster risk management is stressed to ensure that people and communities at risk are well prepared and resilient to all types of hazards.

Drawn from experiential knowledge, feedback from all sectors, international, and national action frameworks, and in particular The Sendai Framework for Disaster Risk Reduction (the Sendai Framework) and the 11th National Economic and Social Development Plan, the concept of “Disaster Risk Management (DRM)” became the core value of this plan. Based on this concept, Disaster Risk Reduction (DRR) is highlighted to ensure proactive disaster risk management and ultimately sustainable development.

2.4.9 Mechanisms to Manage Disaster Risks

The mechanism of Thai disaster risk management outlined 6 level of command as outlined below in Table 2.7. with National Disaster Prevention and Mitigation Committee (NDPMC) at the top responsible for development of national policy framework and ensuring effective.

Table 2.7 Operational level of National Disaster Prevention and Mitigation

Level	Operational	Authorize
Committee	National Emergency Operation Headquarter (NEOH)	Interior Minister: Commander of NEOH
Central	Central Emergency Operation Centre (CEOC)	DDPM Director-General: Director of CEOC
Provincial	Provincial Emergency Operation Centre (PEOC)	Governor: Director of PEOC
	BMA’s Emergency Operation Centre (BMA EOC)	BMA Governor: Director of BMA EOC

District	District Emergency Operation Centre (DEOC)	District Chief: Director of DEOC
Local	Local Emergency Operation Centre (LEOC)	Chief of Local Government: Director of LEOC
Community	Municipality (MEOC)	
	Sub-district Administration Office (SAO EOC)	
	Pattaya City (Pattaya EOC)	

Source: Department of Disaster Prevention and Mitigation, Ministry of Interior

National Emergency Operation Headquarter (NEOH)

Roles: Command, control, and coordinate operations on disaster risk management of subsequent Emergency Operation Centers at each level.

Central Emergency Operation Centre (CEOC)

Roles: In non-emergency situation, CEOC is responsible for information collection, sharing, and coordination of disaster risk management efforts. When a disaster is in the foreseeable future, the CEOC is on standby, monitoring and assessing the situation, and relaying warnings to authorities at risk areas, if needed. The CEOC also gives recommendations on scaling-up emergency response to Commander of NEOH or Prime Minister according to the agreed emergency level. Once a disaster strikes at a scale of emergency level 1 and 2, the CEOC assesses the situation and gives support to the local EOCs as necessary. In view of an overwhelming emergency, CEOC shall recommend to the Commander to scale up emergency response to level 3. If it becomes an extremely large-scale disaster, the CEOC shall ask the Prime Minister or designated Deputy Prime Minister to take charge and announce state of level-4 emergency.

Provincial Emergency Operation Centre (PEOC)

Roles: Command, control, support, and coordinate response operations within its boundary.

BMA Emergency Operation Centre (BMA EOC)

Roles: Command, control, support, and coordinate response operations within Bangkok.

District Emergency Operation Centre (DEOC)

Roles: Command, control, support, and coordinate response operations with local authorities in its boundary.

Local Emergency Operation Centre (LEOC)

Roles: Command, control, respond, and develop an action plan on disaster risk management.

2.5 Digital Technology and Digital Literacy

2.5.1 Definition of Digital Technology

Meaning: technology is the use of knowledge in scientific terms to create tools (Spacy, 2017). The term “digital” came from the Latin word—digitus (finger) which refers to one of the oldest tools for counting. Therefore, when information has been stored, forwarded, or transmitted in digital format, the information will be converted into numbers at the most basic machine-level as “zeroes and ones.” Digital technology is representing the use of technology that basically relies on microprocessors; hence, computers and other applications that are dependently related with computers such as the Internet and also, any technological device that functions through a binary computational code such as video-cameras. This also includes mobile devices such as cell phones, tablets, laptops, personal-digital assistants (PDAs), etc. (Pullen, 2009) (Anjos-Santos, Kadri, Gamero, and Gimenez, 2016) Digital technology also refers to use of new algorithms or other applications in order to solve a problem of using online tools (Omariba, 2019). Digital technology includes computing, content, and communication that uses a computer or a semiconductor that is required to install, STEM, integrate, and other technology systems to perform its functions (Coklar, Efilti, and Sahin, 2019). Digital technology involves any scientific or engineering knowledge, processes, working principles, and standards which apply to the technology industry (Mousa and Kalonde, 2019) that deal with methods, creation

and use of digital, and system (Sony, 2019). Digital technology can enhance the level of creativity and distribution of information, entails the use of devices that open access to cyberspace, and information communications technology (ICT) (Maclean, Elwood, 2009). For example, digital technology is “computer programs and software; web pages and websites, including social media; data and databases; digital audio such as mp3s; and books are examples of digital media” (Conway, Harris, Smith, Brackett, and Hayes, 2006).

2.5.2 Type of Digital Technology

Digital technology plays an important key role in allowing older individuals to remain and maintain active citizens in the communities. Many articles or search engines identify the type of technology in many different criteria such as artificial intelligence (AI), Internet of things (IoT), networks, robotics, consumer technology, IT infrastructure, personal technology, space, information technology, low technology, and physical technology. However, this paper will name the type of digital technologies classified by the purpose and the benefit of use as shown in Table 2.8.

Table 2.8 Type of digital technology solution to sustainable ageing

Type of Digital Technology	Examples
Digital Technology for health and longevity	The Internet of things (medical equipment, and wearable devices), automate diagnosis, biotechnology, and health-related big data analysis, robot
Digital Technology for well-being	Household, communications, human function aiding devices, AI, machine learning, robot
Digital Technology for supportive labor market	Industrial robot, automation, remote/telework platform

Digital technologies are not only becoming accepted, but are also impacting every aspect of everyday lives (Omariba, 2019). From previous studies, most of the elderly have experience with the use of technology, but experience it differently. The use of technology is basically improving the well-being and quality of life. Therefore, it is an individual preference based on each interest. Women and men are using the technology in different aspects, such as to help on a household task or to enjoy themselves (Roupa, Nikas, Gerasimou, Zaferiri, Giasyrani, Kazitori, and Soptiropoulou).

2.5.3 Defining Digital Literacy

These days, everyone is living in a tech-dependent world. The newborn children are not the citizens of the world country, but digital citizenship. In years past, people have communicated to the other through hand-written letter, which required writing and reading skills. Today, using text and email to communicate, the same skills are still required, but digital literacy is also needed. Knowing how to use may not be sufficient enough to achieve the effective outcome. Digital literacy is the capacity to navigate in a variety of digital platforms and is also frequently known as multi-literacy. Table 2.9 is used to explain the skills and capabilities that need to be understood and used for digital technology.

Table 2.9 The multi-literacy toward digital literacy

Literacy	Implementation
Media literacy	Boosting the ability in analytic and produce the output to spread out the perception with the awareness of the outcome. The law, ethics, and privacy are the keys of concern in use of media.
Technology Literacy	Being skillful in use of new advance technology from basic to complexity, to implication to daily lifestyle.

Information Literacy	It is important and necessary for online search engines. Know-how and able to analyze the source of information and use it effectively.
Visual Literacy	Ability to interpret the scene from previous experiences.
Communication Literacy	Ability to use multi and variety of information to communicate in an appropriate occasion.
Social Literacy	Ability to manipulate the networking and connection to gather knowledge and information to communication.

Becoming equipped and understanding digital literacy are both necessary and is needed to keep up with the changes in times. Moreover, digital literacy encompasses a broad range of new technology and is not stationary. It is a framework that helps with collaborating knowledge and capabilities in a variety of dimensions.

For the elderly, they are familiar with multi-literacy, but the level of skill and capacity in each of the multi-literacy are different based on demographic characters and individual interest. Regarding to flood risk management, all of the multi-literacies toward digital literacy are needed. Flood risk management is basically about information. The skill in each of multi-literacy supporting each other helps to enhance the capacity in flood management. When flooding occurs the ability to understand the information from social media, skill in use of technology, ability to analyze information of situation, ability to interpret information, ability to communicate, and ability for socialize with other are needed.

By the definition from the American Library Association, digital literacy is the ability in using information and communication technologies to find, evaluate, create, and communicate information, requiring both cognitive and technical skills (The American Library Association, ALA, 2019). Moreover, digital literacy includes four components and a digital literacy overview is shown in Table 2.10 and Figure 2.5.

Table 2.10 The components of digital literacy

	Implications	Indicators
Use	Capacity in using of technology tools and equipment to perform.	Skill in use of technology tools and equipment Ability to use technology equipment as a tool; smart phone
Understand	Capacity in understanding, classifying, and evaluating the information effectively.	Perception towards the information Ability to classify and evaluate the information; fake news
Create	Capacity in creating, adapting, and applying to solve the problem or to invent new output.	Know how to build and apply Ability to build and share; VDO, voice recorded
Access	Capacity in accessing, searching, and selecting the electronical data, information, and security.	Availability and limitation of accessibility Ability to access; internet, Wi-Fi

Source: Office of the Civil Service Commission

ICT INNOVATION (IN ICT /WITH ICT)	CONSTRUCTIVE SOCIAL ACTION	CRITICAL / CREATIVE THINKING
DIGITAL LITERACY		
RIGHT & RESPONSIBILITIES SOCIAL AWARENESS & IDENTITY POOLING KNOWLEDGE JUDGEMENT PROBLEM-SOLVING REFLECTION SYNTHESIZING SAFETY & SECURITY	<p style="text-align: center;">CREATE</p> <p>capacity in creating, adapting, and applying to solve the problem or to invent new output.</p> <p style="text-align: center;">UNDERSTAND</p> <p>capacity in understanding, classifying, and evaluating the information effectively.</p>	CULTURAL EMPOWERMENT CITIZENSHIP RESEARCH / INFORMATION FLUENCY DISTRIBUTED COGNITION CREATIVITY NETWORKING SIMULATION DECISION – MAKING
NAVIGATION SKILLS ACCESSING SKILLS	<p style="text-align: center;">USE</p> <p>capacity in using of technology tools and equipment to perform.</p>	MULTI – TASKING INPUT / OUTPUT SKILLS TOOLS & TEXT SKILLS
OPPORTUNITY	<p style="text-align: center;">ACCESS</p> <p>capacity in accessing, searching, and selecting the electronica data, information, and security.</p> <p style="text-align: center;">(Distribution, Infrastructure, Tools)</p>	COMPETENCE

Figure 2.5 Digital Literacy

In order to apply the digital literacy for climate related risks of the elderly, use and access are required. In terms of use, it is necessary to have an electronic device as the equipment. Access includes the ability to have an electronic device and the ability to get a connection with the

internet. Understanding and creating are individual skills and capabilities based on demographic characters and experiences. Understanding needs multi-literacy to comply a message or information from multiple sources of information. Meanwhile, creating is the ability to distribute or share the information among others in social and community.

2.6 Previous studies on ageing

There are many of previous studies focusing on ageing in different dimensions. However, this research aims to focus on ageing related to well-being, climate change, and digital technology in a different context to identify the gap of the research on success of sustainable ageing.

2.6.1 Ageing and Climate Change

Rapaport, Krawchenko, and Keefe (2015) argued how coastal climate change can have an impact on the lives of elderly and social communities. The authors found that several impacts can affect the personal lives of the elderly. The municipalities have been working on adaptation and planning for climate change, but do not address the adequate planning for elderly, infrastructure, and the communities' assets. In terms of sea level rise and coastal flooding, the mixed-use design which creates convenient access to services and facilities to the elderly has not been sustained. However, the communities design is needed to be considered including the natural environmental process in all policy and planning when it comes to commercial, residential, and institution land uses.

Wanka, Amberger, Alex, Eder, Hutter, and Wallner (2014) argued how climate change, age, the living environment, and social inequalities would affect the chances of successful ageing in urban areas. Although, which adaptation or extension to deploy mediate stress to increase the chance of successful ageing under the condition of climate change? Therefore, the results showed that the climate change and raising of temperatures are in fact one of the important determinants of weather and affecting how elderly able to maintain well-being into their later life. Unfortunately, the elderly with poor health conditions, low socio-economic status, and those who tend to be isolated are the most at risk related to climate change.

Andor, Schmidt, and Sommer (2018) argued on the perceived importance of taking action against climate change. The research found that personal experience with adverse natural events, particularly personal losses will lead to higher level of awareness in environment issues. Nevertheless, the elderly populations are less concerned about the impacts of climate change,

but more concerned about other global change. Also, the elderly is less likely to support the climate-friendly policy and the allocation of public resources.

Aquino, Morales, Aung, Keovosai, and McGee-Avila (2019) argued that the built environment and community's well-being are linked to ageing with many concerned, and societies would not leave it on side. Therefore, the changing in demographic landscape drives planners and developers to consider the need of older individuals. Population ageing is not only required novel and health-promoting built environment, but also a lift in investors and priorities developers. Ageing is at the margins of conversations about community development and climate change. Moreover, in order to achieve ageing successfully, an integration of science and environment, health, and community development should be insisted.

Carter (2016) developed a mapping tool for exploring vulnerability of elderly to climate change in the Nordic region, with the following five key questions: i) What do we already know? ii) What climate-related risk factors do the elderly face? iii) How does vulnerability vary regionally? iv) How relevant is information shown in the mapping tool? and v) How could the mapping tool be improved?

Those elderly persons suffering from conditions such as cardiovascular and respiratory illnesses, weakening of cognitive abilities or depression, as well as those experiencing poor economic situations, living alone with few social contacts were seen as especially vulnerable to the impacts of climate change.

The key finding includes a general awareness of the threats that heat waves pose for elderly people, recognition of increasing risks of storms, extreme snowfall and power cut and their effects, especially in rural areas. The injury risk of slippery streets was not as clearly connected with climate change and was seen more as a question of street maintenance by respondents, though accidents involving falling among the elderly was recognized in a climate change context by interviewees in Sweden, and climate change impacts had not been considered systematically at a planning and strategic level in the interviewees' organizations.

Some future developments within elderly care that can have interactions with climate change are recognized. A larger share of the elderly is also expected to be living at home (which is government policy in most Nordic countries). Living at home can increase the vulnerability of elderly people to heat waves and other weather events. There is a risk of growing polarization in the quality-of-care services among the elderly population, as well as a widening gulf between municipalities.

Rashid, Hussain, Bagat, Noor, and Sabri (2018) identified specific needs and problems faced by older persons during the 2014 flood as well as the NGOs perceptions towards them. It also studied the impact of flood disasters on older persons. Their preparedness to face emergencies and the suitability of the relief programs organized by NGOs were investigated.

A mix method approach was adopted in this research which included qualitative (Focus Group Discussion) and quantitative (face-to-face interview) survey. The questionnaire covered background information of the respondents such as their socioeconomics and health status and specific questions related to issues, problems, and needs during a flood disaster. Data was analyzed using Statistical Package for Social Science (SPSS) and used as input to develop Standard Operating Procedures (SOPs) for NGOs to meet the special needs of the older persons and reduce vulnerability associated with ageing.

Based on findings from the FGDs, there was no Standard Operating Procedure on flood relief for the older persons adopted by the NGOs. There is a clear need for SOPs to ensure proper guidelines and procedures to meet the special needs of the older persons in times of disasters. Baan and Klijn (2004) showed that it is common practice to perform technical and economic analyses to determine the feasibility of flood protection plans and usually institutional and administrative aspects are addressed. But how the people that live in the polders feel about flood risk and protection plans seldom gets the attention it deserves. This paper primarily looks into the attitude of the people. How do people live with (flood) risks and how do they feel about that? What can be learned from that for communication on flood risks and flood risk management?

A discussion has started on the further development of the present flood risk management strategy. Psychological aspects and communication should be done in close co-operation with the citizens and other parties, and especially with the people and businesses that may be affected in one way or another. They should be involved from the beginning, i.e. from the problem formulation, through the design of measures and their analysis, to the end, i.e. the evaluation of alternatives and the real decision making. This calls for intensive communication with all parties involved, in a language people understand easily, whilst being honest about all uncertainties, and sincerely considering the feelings of the people involved.

A study of Huerta and Horton (1978) revealed the effects of the Teton Dam Disaster in 1976 upon the elderly provides a test of the assertion in the literature that the elderly is more likely to overreport their losses and express feelings of relative deprivation than younger cohorts. A

total of 387 victims were interviewed by telephone from a close-ended structured interview schedule over a 2-week period. Thus, purposive sampling methods were used for both the elderly and nonelderly victims. The findings suggest that elderly persons cope quite well with disaster situations and tend to report fewer adverse emotional effects and feelings of relative deprivation than younger victims. High agreement was found between subjective comparative estimations of loss and actual loss.

2.6.2 Ageing and Digital Technology

Morueta, Aguaded-Gomez, and Hernando-Gomez (2017) revealed that socio-demographic divide in internet usage is moderated by digital literacy support. So, the elderly populations are a heterogeneous collective in relation to the use and access of the Internet. The levels of use and access of the internet are correlated with one another with successive and cumulative effects. However, age is not factor related to the use and access of Internet. It is associated with socio-demographic status. The socio-demographic factors were shown to be associated to fundamental level of use and access of Internet. Nevertheless, the obstacles derived from the lack of social, advanced age, and economic resources can be compensated with help and support programs.

Baker, Al-Gahti, and Habona (2007) aimed to investigate the effects of age, gender, and education on the implementation of new technology by using the Theory of Planned Behavior. The model was well performed. The age and gender had been reported as a significant moderator of the influence of attitude, subjective norm, and perceived behavior control on intention behavior. Moreover, the strong influence of subjective norm and perceived behavior control in intention behavior will be stronger in culture with strong group of identification and religious.

Castilla, Botetta, Miralles, and Breton-lopez (2008) argued that elderly people living in rural communities face a lack of telecommunication infrastructures, which increases their difficulties in accessing ICTs. Therefore, the results showed that one of the most frequent emotions at the beginning of the ICT sessions was "fear" (related to breaking the computer or to making a fool out of themselves).

Schaffer (2007) questioned on how many people belonging to the 50+ generation make use of the Internet in Germany and what for. There is a strong relationship between older age and the intensity of using computers for task-oriented purposes less intensively than younger adult.

The largest difference in intensity of use is between the ages of 46 to 55 and 56 to 65, suggesting that older workers and retired persons are not performing these tasks regularly.

2.6.3 Perception to Flood Risk

Bubeck, Botzen, Kreibich, and Aerts (2013) revealed that the study on coping appraisal is important, but little is known about the independent influence of component of coping appraisal, response efficacy, self-efficacy, and response cost, on precautionary behavior. However coping appraisal constructed from Protection Motivation Theory (PMT) refers to the cognitive process of evaluation of people with the ability to avoid a certain risk. The result from the study confirmed that flood-coping appraisal is an important variable in term of precautionary behavior. Both response efficacy and self-efficacy contribute to the models which explain the four different types of flood-mitigation behavior; structural building measure, adapted building use, the deployment of flood barriers, and purchase of flood insurance. Therefore, it is concluded that risk communication should focus more on the potential of flood-mitigation measures to effectively reduce or avoid flood damage, as well as on information about how to implement such measures in practice.

Based on Bubeck, Botzen, Laudan, Aerts, and Thieken (2018), protection motivation theory (PMT) has become a popular way to explain the risk reduction behavior of residents against natural hazards. PMT captures the two main cognitive processes that individuals undergo when faced with a threat, namely threat appraisal and coping appraisal. According to the survey of more than 1600 flood prone household in Germany and France, five hypotheses were tested using multivariate statistics regarding related to flood-coping appraisals.

According to study of Weyrich, Modino, Borga, Baldassarre, Patt, and Scolobig (2019), private risk reduction behaviors can significantly reduce the negative impacts of flooding and flash flood. Over the past decades, researchers have used various socio-cognitive models or threat/coping mechanisms to explain individual protective behavior. However, the models ignore that people are not equally ready to act upon a danger and they give limited insights into the effectiveness of communication strategies to foster risk reduction behaviors.

By exploring the current state of homeowner's readiness to undertake risk reduction behaviors in risk areas by applying a dynamic protection motivation framework and conducting a survey in an Italian municipality that experienced severe flash flood, the research shows that people are motivated by different factors in prompting risk reduction behavior based on their type of

protective measures. People that undertook structural or avoidance measures are more likely to be motivated to protect themselves by increasing perceptions of vulnerability and response efficacy, and are less worried about expected flood losses compared to people that undertook only basic emergency measures.

The research found that socioeconomic characteristics alone are not sufficient to explain flood-coping appraisals. Observational learning from social environment, such as friends and neighbors, is positively related to flood-coping appraisals.

2.7 Policies Related to Ageing Population

2.7.1 National Policy on Ageing Population

The populations around the world are rapidly ageing. This demographic transition will have an impact on almost all aspects of society. In 1991, the United Nations with their pledge of “No one left behind and that every human being will have opportunity to fulfill their potential in dignity and equality” (The world United, Agenda for Sustainable Development, 2015), in 2016, the Strategy; the WHO global strategy and action plan on ageing and health adopted by WHO’s Member States. The Strategy (WHO, 2016) in Table 2.11 provides a policy framework to ensure the global population ageing will be responded aligning with those ambitious development agenda. The Strategy is more than focusing the absence of disease, but considering healthy ageing regarding to the functional capacity that older people able to do, and to be, and what they have reason to value.

The Strategy commits to act in the purpose where the evidence is strong, but states many crucial gaps in capacity and knowledge. The actions require resourcing, but are likely to sound like investments. To achieve the strategy, there 10 priorities focus on action are required as shown in Table 2.11.

Table 2.11 The Strategy; the WHO Global strategy and action plan on ageing and health

Priority	Action	Description
1	Establishing a platform for innovation and change	Igniting change for healthy ageing by connecting people and ideas from around the world
2	Supporting country planning and action	Countries gets the skills and tools they need to create policies that enable people to live long and healthy lives
3	Collecting better global data on healthy ageing	What gets measured get done – together we collect accurate up-to-date and meaningful data on healthy ageing
4	Promoting research that addresses the current and future need of older people	Research includes and benefits older people by answering relevant questions in innovative ways
5	Aligning health systems to the needs of older people	Older adults get the health they need – where and when they need it
6	Laying the foundations for a long-term-care system in every country	Older people and care givers gets the care and support they need to live with dignity and enjoy their basic human rights

7	Ensuring the human resources necessary for integrated care	People have skills to delivery health and long – term – care services for older people
8	Undertaking a global campaign to combat ageism	Changing how we think, feel, and act towards age and ageing is possible – we can make it happen
9	Defining the economic case for investment	Better understanding the costs and opportunities of healthy ageing – the starting point for sustainable, equitable and effective responses
10	Enhancing the global network for age-friendly cities and communities	Cities and communities, around the world, enable older people to do the things they have reason to value

Source: WHO (2016)

Fortunately, investing in these 10 priorities are investments for future societies in order to give older people the freedom of opportunities to benefit and to contribute to sustainable development and live long and healthy lives. Many countries may lack sufficient capacity to implement the policy and to shape a foster healthy ageing.

2.7.2 The Second National Plan for Older Persons (2002-2021)

In 1999, the National Committee of Senior Citizens was established. However, the government’s policies and programs are currently in line with the Second National Plan for Older Person (2002 – 2021). This plan is focusing on the development of policies and programs to help and support older person. For instance, Thailand initiated the activities concerning the population ageing parallel with UN activities as shown in Table 2.12.

Table 2.12 Timeline of activities concerning ageing population in Thailand, in relation to UN activities.

Year	Thailand activities	United Nations activities
1982	First Elderly Council in Thailand	World Conference of Aged Populations
1982	First National Plan for Older Persons (1982–2001)	
1991		UN Assembly Recognized Elderly Rights
1997	New Constitution of Kingdom of Thailand, with two sections devoted to elderly	
1999	National Committee of Senior Citizens Declaration of Thai Senior Citizens	UN International Elderly Year
2002	Second National Plan for Older Persons 2001–2021	UN Second World Assembly on Aging; led to Madrid International Plan for Action on Aging.
2003	Elderly Act	
2005	Healthy Thailand: one component focused on promoting health of the elderly	

Source: National Policies and Programs for the Ageing Population in Thailand, 2009 (Jitapunkul and Wivatvanit).

2.8 Theoretical Framework

This research was designed to identify individual behavior of older people by applying the Theory of Planned Behavior to study the level of adaptation of digital technology in order to improve well-being and preparedness related risk of climate change among elderly. The definition and the component of Theory of Planned Behavior was explained in Table 2.13.

Table 2.13 Theory of Planned Behavior Framework

Theory of Planned Behavior	Core Components	Definitions
The Theory of Planned Behavior is an extended by adding on the construct of perceived behavior control to the Theory of Reasoned Action (Ajzen and Fishbein, 1980; Fishbein and Ajzen, 1985). Many of studies successfully used the Theory of Planned Behavior to predict intention and behavior in various setting (Venkatesh, Morris, Davis and Davis, 2003). The Theory of Planned Behavior had been successfully applied in order to understand the individual acceptance and usage of variety	Attitude Toward Behavior (Personal evaluation of behavior)	“An individual’s positive or negative feeling about performing the target behavior” (Fishbein and Ajzen, 1975).
	Subjective Norm (Socially expected mode of conduct)	“The person’s perception that most people who are important to him think he should or should not perform the behavior in the question” (Fishbein and Ajzen, 1975).
	Perceived Behavior Control (self-efficacy with respect to the behavior)	“the perceived ease or difficulty of performing the behavior” (Ajzen, 1991).

of technology (Harrison et al., 1997; Mathieson, 1991; Taylor and Todd, 1995).		
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Source: User Acceptance of Information Technology: Toward a Unified View, 2013

The growth in population ageing is happening at the same time as the explosion in digital technology. There are many positive impacts from using digital technology for the elderly in improving their quality of life and capacity to live independently in their own home. The digital technology may also help improve the better health status among elderly. The elderly is able to use the internet as a window to the world. Beneficially, the elderly who are familiar with internet have positive advantage comparing to those who are not (Mostaghel, 2016).

The attitude on the elderly towards using the digital technology comes with many factors. Literacy, access, design, cost, and privacy play a role in how the elderly choose to use technology (Ramakrishnan, 2011). The elderly is probably less likely to adopt the digital technology than the other populations (Niehaves and Plattfaut, 2014). The elderly will use the digital technology if they are able to buy technology equipment which is affordable, the information and services regarding to digital technology are available, and the ease of use of digital technology does not lead to feel of confusion and stress (Iwasaki, 2013).

The processes of digital technology adoption in elderly are not only affordable, accessible, and usable, but required of physical and mental status. Several existing studies have identified the barriers due to impairment of older individual's physical status which are auditory, visual, monitoring control ability (Eekk & Wressle, 2011), and cognitive function (Czaja et al., 2006; Eekk & Wressle, 2011; LeRouge, Ma, Sneha, and Tolle, 2013).

Although, the barriers in mental status are behaving and manner of felling (Ellis and Allaire, 1999; Skymne et al., 2012), safety (Bostrom et al., 2013; Caine, Fisk, and Roger, 2006; Miskelly, 2001; Magnusson and Hanson, 2003; Petersson et al., 2012), security and privacy concerns (Harrefors et al., 2010), and replacement with digital technology such as robots (Kristoffersson et al., 2011; Lundberg, 2014). The digital technology tools, such as smartphone or tablet empower the elderly to be more active and involved with their friends and family. The support from relatives and family have a key influence for elderly to or not to adopt the digital

technology. Use or not use digital technology has both positive and negative impacts on their family as well as related friends.

In healthcare services, many healthcare providers have improved services and digital technology (Hanson et al., 2011) that able to virtually visit older people through a mobile-teleoperated robot and pursue a normal visit (Kristoffersson et al., 2011). Globalization has raised an increase in economic development and people's quality of life. The market integration and changing in technology have driven the rise of the economic development growth and also have driven the growth in the use of digital technology at the same time. Several existing articles address the evolution in many countries especially China toward being cashless societies. Eliminating the use of cash makes for security and greater traceability, but maybe not for elderly. The problems pose for elderly, who may find it difficult in adopting new digital technology. The elderly is involving in changing in capital market mechanism and daily habit that force them to move on. Indeed, for many of elderly, it is necessary to adopt and learn. For instance, the perceived behavior control, and the importance of actual behavior control is self-evident refers to older people perception of the ease or difficulty of performing the behavior of interest in using the digital technology.

The process of attitude and subjective norm are leading the elderly intention regarding to the digital technology in both positive and negative dimensions, but it links to active possibility to willingness to use and to learn digital technology. Finally, the action trend to increasing the adaptive capacity for elderly's disaster management is easy accesses to healthcare service, make life easy and more convenience, and engagement in social interrelation. Though, the action is also increasing adaptive capacity for climate change; floods, to learn, experiment, and be innovative to response to shock and stress.

In order to study the motivation toward protection result from a perceived threat and the desire to avoid the potential negative outcome, the Protection Motivation Theory was applied. Protection Motivation Theory provides an understanding of why attitude and behavior was able to change when people are faced with threat. (PMT) is originally developed to explain the effects of fear on health attitude and behaviors. Fear-arousing communications have a significant impact on the selection of behaviors. Therefore, increases in the perceived level of fear consistently resulted in increases in acceptance of the proposed adaptive behavior or intention. PMT also includes self-efficacy as a separate component. For instance, self-efficacy has yielded converging evidence that self-efficacy is an important influencing agent in

motivational, cognitive, and affective process (Bandura, 1992).

CHAPTER 3

Methodology

3.1 Exploring District Data in Bangkok

Bangkok, the capital, and the most populous city of Thailand, was selected as a case study of this research. The city occupies approximately 1,568.7 square kilometres or 605.7 square miles in the Chao Phraya River delta in central Thailand. In 2020, the total population of Bangkok was about 10.539 million or 15.3% of the country's population. As shown in Figure 3.1 and Table 3.1, Bangkok is divided into 50 districts (in the other provinces, district or khet, equivalent to amphoe and 180 sub-districts (khwaeng, equivalent to tambon). Thirty-five of these districts are on the east of the Chao Phraya, while fifteen lie to the western bank of the city.



Figure 3.1 Map of Bangkok (Bangkok Metropolitan Administration)

Table 3.1 List of Fifty districts of Bangkok

1.	Phra Nakhon	26.	Din Daeng
2.	Dusit	27.	Bueng Kum
3.	Nong Chok	28.	Sathon
4.	Bang Rak	29.	Bang Sue
5.	Bang Khen	30.	Chatuchak
6.	Bang Kapi	31.	Bang Kho Laem
7.	Pathum Wan	32.	Prawet
8.	Pom Prap Sattru Phai	33.	Khlong Toei
9.	Phra Khanong	34.	Suan Luang
10.	Min Buri	35.	Chom Thong
11.	Lat Krabang	36.	Don Mueang
12.	Yan Nawa	37.	Ratchathewi
13.	Samphanthawong	38.	Lat Phrao
14.	Phaya Thai	39.	Watthana
15.	Thon Buri	40.	Bang Khae
16.	Bangkok Yai	41.	Lak Si
17.	Huai Khwang	42.	Sai Mai
18.	Khlong San	43.	Khan Na Yao
19.	Taling Chan	44.	Saphan Sung
20.	Bangkok Noi	45.	Wang Thonglang
21.	Bang Khun Thian	46.	Khlong Sam Wa
22.	Phasi Charoen	47.	Bang Na
23.	Nong Khaem	48.	Thawi Watthana
24.	Rat Burana	49.	Thung Khru
25.	Bang Phlat	50.	Bang Bon

In terms of the flooding issue, Bangkok is home to a population of more or less than 10 million who are vulnerable to flood events. With the scenario of increasing temperature by four-degree Celsius, in 2030, Bangkok is therefore predicted to experience severe flooding. This is a partly due to Bangkok's geographic location being at the southern end of the Chao Phraya River Basin. As well as being coupled with low-lying terrain of approximately 1.5 meters in average elevation above the mean of sea level. Moreover, a further expansion of prediction demonstrated 70% of inundation and 88 centimeters of sea level rise by 2080 (The ASEAN

Post, 2019). Germanwatch, a non-governmental organization, has ranked Thailand as one of the top ten countries that will be most affected by changing in climate for over the next two decades (Global Climate Risk Index, 2017). Adaptation related to climate change is key to improving and maintain Bangkok's livability by decreasing down the occurrence of flooding in urban areas. Other things non-related to the climate factor such as the issue of land use and utilization can be more important. As noted, each district is manipulated by a District Director assigned by the governor. Most of the administration's responsibilities concern the city's planning include infrastructure, building control, transportation, drainage (as well as flooding related problems), city beautification and waste management, rescue services, medical, and education.

3.2 Flood Hazard Assessment

Bangkok's flood hazard map was performed by using the Geographic Information System (GIS) and Analytic Hierarchy process (AHP) technique. Flood hazard was selected as a representative of climate change related impact. By applying ArcGIS 9.3, the overlay method was conducted to combine the characteristics of the following eight factors into hazard areas: past flood experiences, annual maximum rainfall, land-use types, land subsidence, slope, sea-level rise, road density, and drainage density (Figure 3.2). Each layer was combined by the weighting approach when the weighted averages of continuous criteria are standardized to a weighted average. Finally, flood hazard areas were classified as high, moderate, and low hazard level.

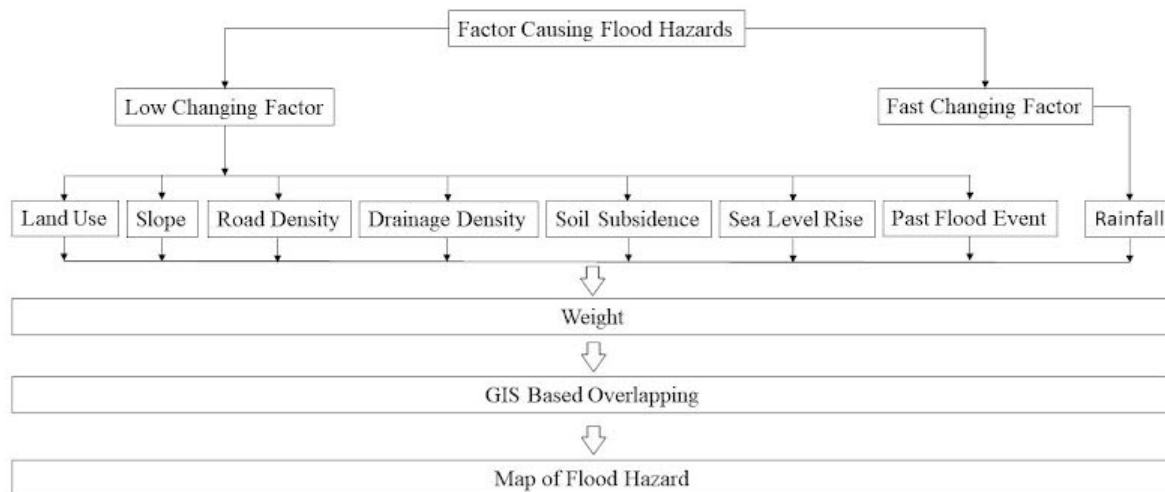


Figure 3.2 Bangkok's flood hazard assessment using GIS and AHP

Table 3.2 Analytical Hierarchy Process (AHP) and list of experts

Analytical Hierarchy Process (AHP)	List of experts
Weight	Land Development Department Department of Disaster Prevention and Mitigation Water Resource Department Groundwater Resource Department Thai Meteorological Department Hydrography Department Department of Citi Planning and Development Office of Natural Resources and Environmental policy and planning Bangkok Metropolitan Administration

In AHP technique, all experts ($n = 9$) were asked to complete the pairwise comparison of each flood hazard factor by rating the alternative of each factor between 1/9 to 9, ranking from less important to the most important variables. To be specific, the comparative scale lies between 1 to 9, where 1 is the factor which is equally important, and 9 is the factor that is extremely more important than the other (Saaty, 1977; Saaty and Vargas, 1984, and Saaty 1990). So thus, the consistency ratio (CR) was computed to weight the discordance between the pairwise comparison and the reliability. The consistency ratio must be less than 0.1 and be used as a tool to create a matrix.

$$CR = CI/RI \quad \text{Eq. (1)}$$

Where:

CI = the consistency index

$$CI = \frac{\beta \max - n}{n-1} \quad \text{Eq. (2)}$$

Where:

$\beta \max$ = sum of the priority vector multiplied by each column total

n = the size of the matrix

RI = the random index

3.3 SWOT Analysis and Expert Interview

For better understanding of strengths, weakness, opportunities, and threats of flood disaster management plans, some scholars have applied a SWOT in water management and disaster risk research (Loudyi, 2002). A SWOT was used in China for urban water management (Yang, 2021) and flood management in the southeast of Iran (Vafaei, 2010). In Bangladesh, a SWOT analysis was used for a vulnerability assessment of drought and flood in the river basin (Al

Hussain, 2021). For instance, in order to understand management strategy or policy related to older people in flood risk management, a SWOT analysis was applied based on 4 expert interviews from the Department of Older Persons of Thailand, Department of Disaster Prevention and Mitigation under the Ministry of Interior, Ministry of Defense, and the Bangkok Metropolitan Administration (BMA). Strengths and weaknesses determined internal factors of the residents in the communities (Grama, 2021) with older adults in Bangkok, while opportunities and threats were external factors that could affect the older adults' capabilities of flood preparedness actions and flood literacy. The key questions for interview were noted as follows:

- What are the strengths and weaknesses of flood disaster management (i.e., knowledge about flood, flood awareness and communication, flood literacy, and flood hazard perception and related preparedness actions, etc.) of Thai's older respondents?
- How to share or communicate the flood situation with the people in the community?
- when flood comes, who would be the key authorize person in the actions?
- What would be opportunities for enhancing flood literacy skills, flood hazard perception, and actions related flood preparedness among Thai's older respondents?
- For flood literacy and flood perception of older Thai respondents, what are treats in implementing their flood preparedness actions and flood risk management?
- What would be recommendations to support and strengthen flood perception, communication, flood literacy, and flood preparedness actions to respond to flood risk event among Thai's older respondents?

For instance, In-depth interviews (n = 21) with representatives from the following national and international organizations were conducted to better understand current situations of digital literacy of the elderly related to flood risk preparedness and all related topics:

Table 3.3 List of in-depth interviews

Organizations	Aspects of the interview	n
United Nations Fund Population Ageing (UNFPA)	Global viewpoints on ageing population	1
Japan Ageing Gerontological Evaluation Studies (JAGES)	<ul style="list-style-type: none"> ● Ageing population and prompt response to disaster ● Age of employment in superaged population 	3
British Embassy, Thailand	Climate change and vulnerability: impacts and challenges in the 21 st century	1
Ministry of Digital Economy and Society, Thailand	Digital literacy and ageing population	2
Department of Older Persons of Thailand	Ageing population in Thailand	1
College of Population, Chulalongkorn University, Thailand	Ageing research innovation	1
Livwell, Thailand	Ageing, wellness, and services	1
Tetsuyu, Singapore	Environment, ageing, and personal responsibility	1
Office of Natural Resources and Environmental policy and planning, Thailand	<ul style="list-style-type: none"> ● Climate change: impacts vs challenges ● Causes of flood in Thailand ● Vulnerable to flood 	2
Department of Disaster Prevention and Mitigation, Thailand	Disaster: challenges vs opportunity Policies / measures in flood preparedness	2
Bangkok Metropolitan Administration, Thailand	Policies and measures when flood Flood management Causes of flood in Bangkok	2
Department of Citi Planning and Development	Flood management Causes of flood in Bangkok	3
Military Development Office	Measures and action when flood	1
Total		21

3.4 Community Survey

3.4.1 Target Group and Sample Size

The target group of this survey research was the elderly population age 60 and over who is living in Bangkok. As shown in Eq. (3), Taro Yamane's method (Yamane, 2012) was used to calculate the survey sample size. As noted, the total population in Bangkok in 2020 was 10.539 million (BMA). At a confidence level of 95%, the sampling size of survey respondents should be more than 399 ($n > 399.99$). The target group of this survey method was based on random sampling by dividing a population into smaller sub-groups of respondents. Only elderly residents who are living the two districts from high, moderate, and low hazard areas obtained by the AHP-GIS technique and one district which has the highest older adult population (7 districts in total), were selected as the target population (see Chapter 4).

$$n = \frac{N}{(1+Ne^2)} \quad \text{Eq. (3)}$$

Where:

N = Number of population in Bangkok (Royal Thai Government Gazette, 2019)

n = Sample size required

e = Allowable error (%)

*95% confidence level and $p = 0.5$ are assumed

Substitute numbers in formula:

$$n = \frac{5,556,631}{1+(5,556,631)(0.05)^2}$$

n = 400 (rounded)

3.4.2 Questionnaire Design

To investigate factors influencing the digital literacy to strengthen preparedness for flood risk of the elderly in Bangkok, the questionnaire was designed and constructed referring to both the Theory of Planned Behavior and the Protection Motivation Theory on Coping Response to Flood Risks (Figure 3.3 – 3.4).

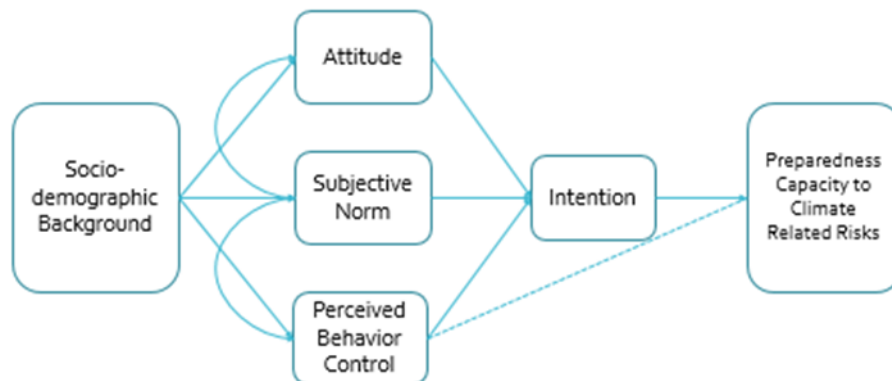


Figure 3.3 Theory of Planned Behavior on Preparedness Capacity to Flood Risks

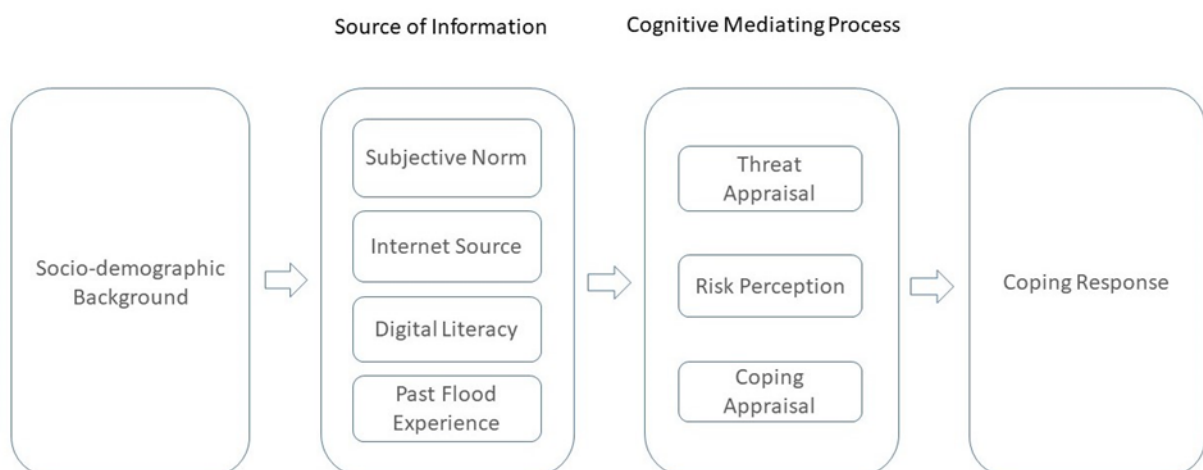


Figure 3.4 Protection Motivation Theory on Coping Response to Flood Risks

The questionnaire consisted of the following four parts relevant to the above-mentioned theories (Annex 2).

Part 1: the demographic information of the respondents. The queries about the

personal information of the sample. There are age, gender, marital status, education, income, and occupation.

Part 2: the questionnaire is the questions on intention and action toward flood preparedness based on the Theory of Planned Behavior.

Part 3: the questionnaire is the questions on views on coping responsibility to flood based on the Protection Motivation Theory.

Part 4: the questionnaires is the questions on digital literacy.

The questionnaire was approved by Office of the Research Ethic Review Committee for Research Involving Human Subjects: The Second Allied Academic Group in Social Sciences, Humanities and Fine and Applied Arts on 2 June 2021. COA No. 120/2564.

3.5 Data Analysis and Statistics Used in The Data Analysis

The data of this research study was analyzed through the Statistical Package for Social Science (SPSS) program by analyzing both descriptive and regression analysis methods, as following:

3.5.1 Descriptive Analysis

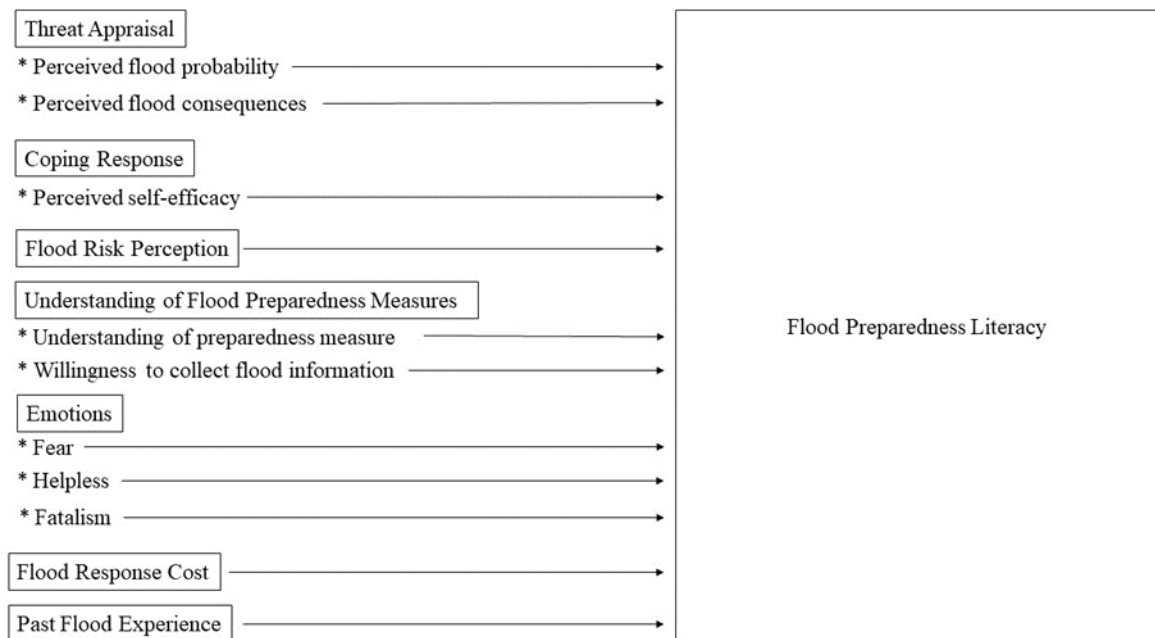
Descriptive statistical analysis was performed and reported as percentage of each survey question (i.e, demographic background information of the respondents, such as gender, age, education, income, occupation, health status, frequency of hospital or health care visit, housing, t, and also the use of digital literacy for improving coping with climate related risks of target population). Meanwhile, both statistical analysis methods of Kruskal-Wallis (i.e., one-way non-parametric ANOVA) and Mann-Whitney test were performed to determine if all above demographic variables had a significant influence on both flood preparedness literacy of the elderly respondents in Bangkok and also their flood preparedness actions.

3.5.2 Correlation Analysis

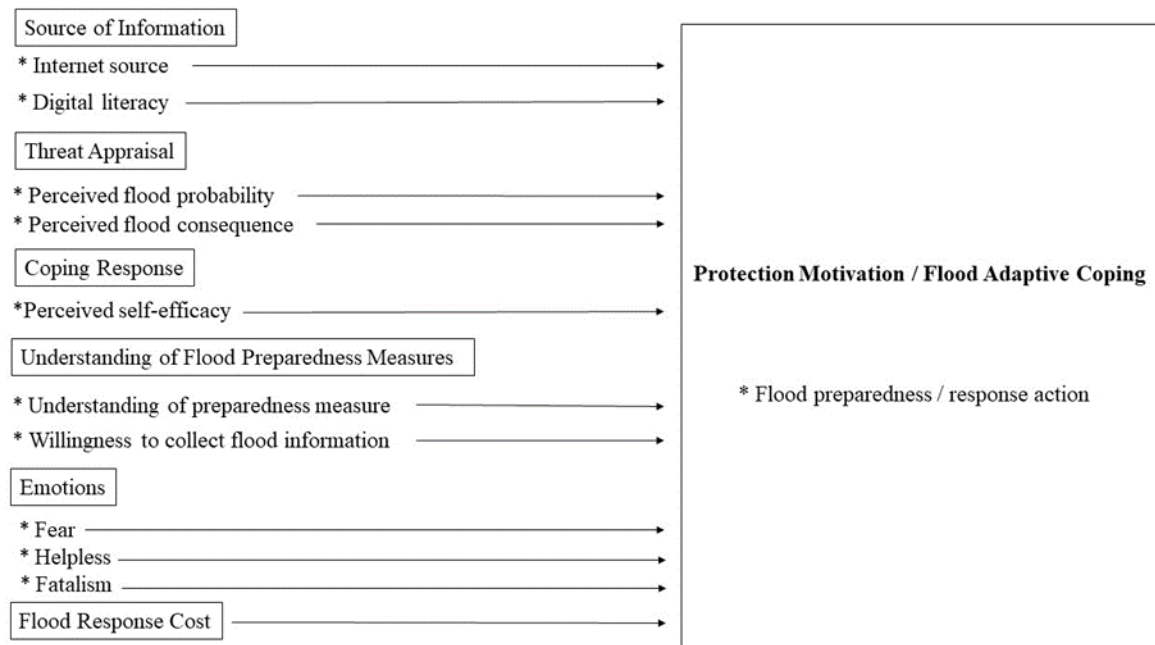
As nonparametric statistic methods, Spearman's correlation coefficient was conducted to analyze the relationship among variables, especially affecting both flood preparedness action and flood preparedness literacy. Extended Theory of Planned Behavior on preparedness capacity to flood risks (Figure: 3.5a) and Protection Motivation Theory on coping response to flood risks (Figure: 3.5b) were analyzed. The Extended Theory of Planned Behavior had been

used in order to understand, investigate, and predict the intention factors influencing flood preparedness literacy. Therefore, in this research study, the Theory of Planned Behavior was

attended with the digital literacy. The following factors were considered and analyzed:



(a)



(b)

Figure: 3.5 Factor influencing (a) flood preparedness literacy, (b) flood preparedness action

3.5.3 Hypothesis test

In order to answer the research objectives and questions 2 and 3, the following research hypothesis were formulated and tested:

Hypothesis 1 (H1):

1.1 Male elderly respondents with high education and high-income level tend to have more flood preparedness literacy.

1.2 Male elderly respondents with high education and high-income level tend to better prepare themselves for flood events.

Hypothesis 2 (H2):

Flood preparedness literacy and flood risk perception of the elderly respondents residing in high-risk flood hazard areas may be different from those living in moderate and low flood hazard areas.

Hypothesis 3 (H3):

3.1 Threat appraisal of both perceived flood probability and consequences, perceived self-efficacy, and understanding flood preparedness measures could able to promote flood preparedness literacy among the elderly respondents.

3.2 Threat appraisal of both perceived flood probability and consequences, perceived self-efficacy, and flood preparedness literacy, and understanding flood preparedness measures could induce the elderly respondents to be better prepared for floods.

Hypothesis 4 (H4):

4.1 Negative emotions (i.e., fear and helplessness) could be an obstacle for the elderly against use of or access to flood preparedness information before floods (flood preparedness literacy).

4.2 Negative emotions (i.e., fear and helplessness) inhibit actions in response to flood disaster

among the elderly respondents.

CHAPTER 4

Result and Discussion

To answer research objective 1, to study the current situations, policy programs and activities for the elderly to strength flood preparedness in Thailand, all current situations, policy programs and activities for the elderly to strength flood preparedness in Thailand were presented and analyzed as following:

4.1 Policies related to ageing population and flood preparedness

4.1.1 The Second National Plan for Older Persons (2002-2021)

As depicted in Table 4.1, it seems that the current national plan for older persons is mainly focused on welfare, but not much on disaster impacts and related management actions. The plan is lacking the planning for protection of vulnerability group to flood disaster, the lesson learn management related to previous flood experiences for future prompt preparation, the welfare or budgeting for elderly who was victim of flood impact and consequences, and also the agencies or organizations to support and strengthen role of elderly in disaster preparedness and responses.

Table 4.1 The Second National Plan for Older Persons (2002-2021)

Section	Strategies	Measures
1	Strategies in the preparation for old age with quality	<ul style="list-style-type: none"> - Extension of income security for old age to cover the population in general - Life-long education

		Public education of the importance and the dignity of old age.
2	Strategies for encouraging and promoting older persons	<ul style="list-style-type: none"> - Health promotion, disease prevention and self-care among older persons - Enhancing the co-operation and strength of organizations and networks dealing with older persons NPA of Thailand 20 - Promoting income security and employment for older persons - Supporting the potential and value of older persons - Encouraging the mass media to broadcast programs for older persons and encouraging older persons to have access to various forms of information - Providing older persons with proper accommodations and living environments
3	Strategies of social security for senior citizens	<ul style="list-style-type: none"> - Income security and employment in old age Health security - Family - caregivers and protection rights of older persons

		- Service systems and support networks.
4	Strategies of management systems at the national level and in personnel development	- Management systems at the national level - Personnel and caregiver education and training.
5	Strategies of research to support policy and program development and of monitoring and evaluation of the Second National Plan for Older Persons	- Promoting and supporting research on older persons which focus on policy and program development - Promoting and supporting research relevant to older persons (The research should focus on policy and program development, service improvement and other knowledge which is useful for the improvement of older persons' quality of life) NPA of Thailand 21 - Developing mechanisms for continuous monitoring and evaluation of the Second National Plan for Older Persons.

Source: The Second National Plan for Older Persons (2002-2021)

4.1.2 Thailand's 20-Year National Strategy (2018 - 2037)

In 2010, the Act on Older Person had been revised. The comprehensive ageing policy aims to develop and raise the quality and equality of education, promote saving, and create good practice of oriented communities for elderly. More importantly, the main key aspect of the National Strategy, shown in Table 4.2, is aiming to prepare for coming ageing society, across social, health, and well-being. Preparing for population ageing, therefore, the National Strategy for 2018 – 2037 was created. The National Strategy is the country's first national long-

term strategy developed to focus on human resource and social equality development. The 20-Year National Strategy (2017-2036) is a big umbrella aiming to ensure that the country would achieve the vision of being a developing country with security, prosperity, and sustainability to meet people's awareness and happiness at all levels. However, Thailand needs a comprehensive think tank and plan that will help to steer the wheel toward the proper path to achieve security, prosperity, and sustainability. Therefore, each of the counterpart stakeholders must develop a plan based on each agency objectives and expertise including quality of citizens and the environment. Fortunately, each of the plans cover almost all aspects and are always revised to fit with the present context. Interestingly, the people are included in most of the plans, but something is missing, especially elderly. The elderly has been noticed as the vulnerable, but not much has been stated in most plans except the Department of Older Persons. Although, the people's quality of life, technology, elderly, and environment should become a whole package to achieve sustainability.

Table 4.2 The key goals of national development of the national strategy

Goals	Indicators
A Secure Nation	Well-being of Thai people and society
Contented People	National competitiveness, economic growth, and income distribution
Continued Economic Growth	Development of human capital
An Equal Society	Social equality and equity
Sustainable Natural Resources	Sustainability of national biodiversity, environmental quality, and natural resources

Source: Thailand's National Strategy (2018-2037)

In order to drive both economic and quality of living in becoming an ageing population, Thailand's cabinet needs to act urgently to accommodate and measure this demographic change. Upgraded skills and re-designing of jobs for facilitating employer's incentive is very much needed for Thailand. Therefore, its beneficial for whom, and which section has to be the focus. For quality of life, both public and private sectors can improve the quality of elderly life

and also the others. The main key authority in charge, more importantly, the policy makers and coordinators, must recommended policies to cope with population ageing in the long run for the Department of Older persons of Thailand. This is necessary to promote and enable elderly to live to enhances their quality of life. Encouraging elderly to remain in the original home and modifying the environment and infrastructure inside and outside the home is needed to be elderly friendly. Providing relevant information and knowledge, support local community networks and local government to help develop resilience mechanisms and modify the public-amenities is also necessary to make it elderly friendly. Raising the standards of living to accommodate newcomer elderly whether in the public and private sector is important. To support the elderly to have a secure lifestyle by reducing ageism against the elderly throughout the population will promote social equality and equity. Helping the elderly to protect themselves from the threats to their welfare by providing knowledge and technology to facilitate safe and living in old age must be accomplished. Promoting elderly support group to play a strong and meaningful change. Encourage related stakeholders to campaign for social value, gratefulness, and appreciation to the elderly. To promote a better healthcare in youngers, so, they can become elderly who are healthy and provide easy access and elderly friendly health services in the communities. Providing the elderly friendly health care services in the community to ensure elderly have a certain income that is sustainable and secure to cover their basic needs by creating a job for the elderly and educating them about the savings so they will have secure income in retirement. For instance, promoting employment and new image of elderly, educating about the personal savings, and creating retirement savings fund are required, and then they will have a secure income in old age.

Referring to The Second National Plan for Older Person (2002- 2021) and Thailand's National Strategy (2018 – 2037), both of the major policies are mainly focusing on the quality of life and preparation for the fast-coming ageing population. Neither disaster risk reduction, disaster management nor flood literacy have been directly mentioned. However, in terms of the policies and strategies related to disaster risk reduction and disaster management, scale management and strategies for disaster risk management of Bangkok shows in Table 4.3 – 4.4.

Table 4.3 Disaster Management Scale

Level	Management Scale	Authority in charge
1	Small scale disaster District Director	Local Director and/or BMA Assistant Director commands and controls
2	Medium scale disaster	Provincial Director or BMA Director controls, directs and commands
3	Large scale disaster	Commander of National Emergency Operation Headquarter controls, directs and commands
4	Extremely large scale disaster	Prime Minister or assigned Deputy Prime Minister controls, directs and commands

Table 4.4 Strategies for Disaster Risk Management of BMA

<p>Aims</p> <p>1. To avoid disaster and mitigate its impact through reducing vulnerabilities and exposure and at the same time enhancing disaster preparedness capabilities</p> <p>2. To develop countermeasures/operational procedures for more effective disaster prevention, mitigation, and preparedness</p> <p>Approaches</p> <p>1st Approach</p>	<p>Aims</p> <p>1. To ensure systematized, standardized, and unified emergency management system that allows all-sector engagement in an effective and efficient manner</p> <p>2. To ensure rapid, inclusive, and timely relief provision to disaster affected people</p> <p>3. To minimize people's losses of lives and properties from disasters</p> <p>Approaches</p> <p>1st Approach Standardize emergency response</p>
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<p>Construct the standardized disaster risk assessment system</p> <p>2nd Approach</p> <p>Develop measures for disaster risk reduction</p> <p>3rd Approach</p> <p>Encourage all sectors at all levels to develop their own disaster risk reduction procedures</p>	<p>2nd Approach Develop system/tools to support emergency response operations</p> <p>3rd Approach Strengthen disaster relief system and implementing procedures</p>
<p>1st Strategy Disaster risk reduction oriented</p>	<p>2nd Strategy Integrated emergency management</p>
<p style="text-align: center;">Goals</p> <ol style="list-style-type: none"> 1. An effective disaster risk management system is in place to tackle unprecedented emergencies. This is ensured by the integrated manner of cooperation among all sectors at both national and international levels. 2. Thai society is regarded as the Learning Community and capable of managing disaster risks. 3. Thai people have safety minded culture which enables communities and society to be resilience 	
<p>3rd Strategy Effective recovery and resilience building</p>	<p>4th Strategy Strengthened international cooperation</p>
<p>Aims</p> <ol style="list-style-type: none"> 1. To ensure that disaster affected people are provided recovery and rehabilitation programs in a timely, continued, and equitable manner, and ultimately able to resume their normal life. 2. To ensure the disaster affected areas <p>Approaches</p> <p>1st Approach</p>	<p>Aims</p> <ol style="list-style-type: none"> 1. To strengthen disaster risk management coordinating mechanism with international organizations and communities. 2. To improve and maintain the standards of collaboration on disaster risk management with sub-regional, regional, and international get revived to its normal function and when partners possible built back better and safer <p>Approaches</p>

Develop a Post Disaster Needs Assessment (PDNA) system	1 st Approach
2 nd Approach	Develop a more unified humanitarian coordinating mechanism
Develop a common approach for recovery provision and management	2 nd Approach
3 rd Approach	Uplift the standards of humanitarian operations
Promote and strengthen build back better and safer in recovery	3 rd Approach
	Encourage disaster-related knowledge learning and sharing atmosphere
	4 th Approach
	Promote Thailand's leadership on disaster risk management in the region

Disaster management is categorized by the level of disaster. Although, strategy for disaster risk management must be considered as a framework aiming to reduce disaster risk, to integrate emergency management, to build effective recovery and resilience, and to strengthen international cooperation to make Thai people have peace of mind, safe community, and resilience. Unfortunately, the policies and related strategies did not mention the elderly. However, the solid policies and strategies related to disaster risk reduction and disaster management to strengthen flood preparedness of the elderly is very weak. The elderly has been recognized as vulnerable, but not much policy or planning has directly stated or mentioned it. Community power and volunteers are needed to lead and support the older person in action in terms of information distribution and also hands on action that the older person has to take when facing with flood or other disasters.

Table 4.5 Analysis of disaster management related policies in Bangkok

Agency	Strength	Weakness	Opportunity
---------------	-----------------	-----------------	--------------------

<p>Department of Disaster Prevention and Mitigation, Thailand (Ministry of Interior)</p>	<ul style="list-style-type: none"> - The main objectives are policies, strategies, and measures making. - Phases of disaster management: Before/ during / after disaster 	<ul style="list-style-type: none"> - Difficulty, and lack of information in approaching the emergency event. 	<ul style="list-style-type: none"> - Networking with the organization direct contact to people - Connecting with volunteers - Platform Direct line: 1784
<p>Armed Force Development Command (Ministry of Defense)</p>	<ul style="list-style-type: none"> - Strong vision to reduce the loss and damage of life and property - Availability of manpower resources 	<ul style="list-style-type: none"> - Less action in public relations 	<ul style="list-style-type: none"> - CSR - Collaborating with community, training
<p>Department of Older Persons, Thailand</p>	<ul style="list-style-type: none"> - Focusing in strengthening wellbeing and quality of life of the elderly 	<ul style="list-style-type: none"> - No such specific action plans related to preparedness of climate related risk 	<ul style="list-style-type: none"> - Collaborating and networking with related agency; DEPA, BMA
<p>Bangkok Metropolitan Administration, Thailand</p>	<ul style="list-style-type: none"> - Well aware of the current and future situation related to climate change impacts and aged population - Metropolitan system which having its own 	<ul style="list-style-type: none"> - Too centralize - Slow in taking proactive actions. - Policy basically looked over for total population but not elderly 	<ul style="list-style-type: none"> - Collaborating with other agency and private organization (CSR) to improve and develop preparedness

	<p>policies and strategies</p> <ul style="list-style-type: none"> - Focusing in structure and maintenance 		<p>capacity in elderly</p>
<p>Digital Economy Promotion Agency (DEPA)</p>	<ul style="list-style-type: none"> - Promoting digital literacy of elderly - Promoting opportunity of using digital technology in retirement life 	<ul style="list-style-type: none"> - Slightly touch on the awareness of climate change 	<ul style="list-style-type: none"> - Strengthening digital literacy in order to promote capacity in use of digital technology to find as a source of information and instrument of communication

From Table 4.5, the Department of Disaster Prevention and Mitigation is the key agency who is setting policy direction, the strategic plans, and creating measures of the preparation process to face with disaster by considering the following key concerns: How severe would it be? How large is the area? Are there resources or equipment? Do people aware of the coming disaster? How to raise or promote the awareness in the community? The Department of Prevention and Mitigation is under the ministry of interior which aims to reduce the damage and loss of life. To upscale standardization of Disaster Management in Thailand by providing training courses to support and build safety awareness and readiness, but there is still a lack of flood preparedness for the elderly. However, the Department of Disaster prevention and mitigation also has some difficulties in approaching the emergency event. Nevertheless, the direct line; 1784 is also available.

More likely, Armed Force Development Command, under the Ministry of Defense, is known as the army in a blue suit who basically show up whenever a disaster event occurs. The Armed Force Development Command is a part of the army. Imagine army bases located in almost of the areas. So thus, the opportunity of accessibility in terms of help and support are prompt and accessible. To make it clearer, the Department of Disaster Prevention and Mitigation is named

as policy makers and the Armed Force Development Command is the action taker with manpower and equipment. They are mostly the first who arrive when an emergency event has occurred, but have less action in public relation.

In practice, the Department of Disaster Prevention and Mitigation and Armed Force Development Command work together, but the rule of command is different. The work of the Armed Force Development command is unofficial until the disaster event has been announced by the Department of Disaster Prevention and Mitigation.

The policies and related disaster management strategies set by the Department of Disaster Prevention and Mitigation is considered as a master blueprint for disaster risk reduction and disaster management. In the case of Bangkok, as a special administrative region, the metropolitan has its own policies and strategies for disaster risk reduction and disaster management. Many of the strategies related to disaster management set up by the Bangkok Metropolitan Administration (BMA) is more focused on operational aspects, such as structure and maintenance, developing, and cleaning drainage systems. Specifically, the Giant Bangkok drainage tunnel project and 1,980 canals in Bangkok area are the top subject listed for the yearly plan. Technically, BMA is quite centralized. Therefore, it takes time and is slow in taking action.

Meanwhile, BMA is well aware of the current and future situation related to climate change impacts and aged population. Fortunately, elderly is known as vulnerable as part of the plan, due to the difficulty in public relation and communication. The Department of Older Persons of Thailand is focusing more on the actions to strengthen well-being and quality of life of the elderly. Housing and monthly reimbursement are the top priority, but not much in such specific action plans relating to preparedness of climate related risk has been listed.

To improve and develop the disaster preparedness capacity in elderly requires a collaboration with other agency and private organization. The Digital Economy Promotion Agency (DEPA) is another key agency which involves strengthening better well-being for the elderly. DEPA, an inclusive society emphasized on inequality reduction in aging population; developing digital literacy in elderly, has a program to promote digital literacy for the elderly and the program opportunities of using digital technology in retirement life. Those programs are aiming to build knowledge and create ease of use of digital technology in order to increase the channel of information and elderly economy in terms of either new income or less loneliness and happy daily life. DEPA is well stated on wellbeing development, but it lacks a policy related to risk

communications to disaster, flood preparedness, prevention, response, and also lacks the development of literacy; use, understand, create, and access to flood disaster in real time. They only slightly touch on the awareness of the climate change. Digital literacy would help to promote capacity in use of digital technology to find as a source of information and instrument of communication for flood literacy and flood preparedness action. Moreover, networking with the organization and direct contact to people the community leader and volunteers are very supportive.

4.2 SWOT Analysis

Bangkok's flood related actions and flood literacy responding to flood risk of the elderly population were analyzed through SWOT analysis. For the strengths, the results had found that the overall awareness of the Thai resident, especially the older adult to flood disaster risk, was observed at a high-risk level. Heavy precipitation may possibly continue to flood and expand in many areas of the country. Bangkok is located in the delta of the Chao Phraya River Basin (flood prone areas). In contrast, many older adults who live in their own house with limited physical functions and income were pinned as the weakness of flood resilience in the making of a process of flood management and preparation. Most of the older adults often have low media and digital literacy and have both difficulty and low of experiences in the use of information and communication technology for flood risk management and disaster risk reduction. Lack of knowledge and training opportunities about flood disaster may limit the participation of older adults in emergency preparedness and risk reduction. The presence of national policy responses to ageing population, provincial development plan on management of climate change, and Thailand's developmental implications of digital platforms are considered as the opportunities as a key to enhance flood resilience. Unfortunately, lack of access to flood management training in disaster risk reduction for the older adult is a key barrier in lowering flood vulnerability. Moreover, ineffectiveness of warning, forecasting, and risk communication are considered as a high threat. A study of Kittipongvises and Mino (2013) supported that most of the Thai respondents claimed that they did not receive the early warning during the Thailand flood in 2011. More than half of them received a warning before flooding arrived in only less than one hour. Unfortunately, waiting until the massive disaster of floods has been a fully established means that the risk of inaction is placed by vulnerability themselves. All strengths, weaknesses, opportunities, and threats analysis of flood literacy,

perception, and related actions of the elderly population are given as below:

Strengths: As known as the rapid growth of population ageing, Thailand is a place of long stay after retirement and Bangkok is recognized as a senior citizen club. The older adults who are living in Bangkok are commonly aware of flood events and flood related risks in their community. Surprisingly, ageing comes with experiences, the folk wisdom is a common literacy they have learned.

Weaknesses: Geographically, Bangkok is a natural floodplain due to being located in the downstream of the Chao Phraya River. The situation of an ageing society in Bangkok becomes bigger with high unemployment rate. The older adults have limited literacy and have difficulties in information and communication technology for flood risk management and disaster risk reduction. Ageing with physical function limitation and housing condition are pursuing the elderly as one of the most vulnerable; dependent and need of help, low access to the online source of information (i.e., social media), low knowledge of flood risk management, and disaster risk reduction, and response.

Opportunities: In terms of policy and related strategies, being older adults and long-term care system in Thailand has been well-prepared. Although, for climate change, Bangkok has its own provincial development plan named Bangkok Master Plan on Climate Change 2013 -2023 in order to reduce the related disaster impact management. There are several NGOs and international organizations working in Bangkok. Therefore, collaboration between agencies and private organization could help to support elderly people's quality of life. Promoting digital literacy is one of the missions established by the Digital Economy Promotion Agency of Thailand. For instance, a digital platform for adults and community volunteers are available.

Threats: The frequency and intensity of flooding in Bangkok has increased from time to time. Unfortunately, in Thailand, there is a lack of effective flood warning, forecasting, and risk communication in the community and also lacks scientific databased and evidences on older adults and disaster preparedness and management. Moreover, there are low multi-stakeholder engagement in flood risk management and disaster risk reduction and professional training on flood risk management and disaster risk reduction are limited. There are lacks an adequate

budget and human resources from the government in order to build capacity of older adults to respond to flood risks. The government works are basically focusing on structure such as the quality of pumping, canal, and drainage. This is time consuming for the workflow and action from the government and lack of effectiveness of flood emergency management systems.

In order to answer the objective 2 and 3, examining the effect of demographic factors on flood preparedness literacy and preparedness actions of elderly in Bangkok and assessing factors influencing flood preparedness literacy and preparedness actions of elderly in Bangkok, AHP-GIS Flood hazard mapping and community survey were applied.

4.3 AHP-GIS flood hazard mapping

By applying ArcGIS 9.3, the overlay method was conducted to combine the characteristics of the following eight factors into hazard areas: past flood experiences, annual maximum rainfall, land subsidence, slope, sea-level rise, land-use types, road density, and drainage density (Figure 4.1 – 4.9 and Table 4.6). Each layer was combined by the weighting approach when the weighted averages of continuous criteria are standardized to a weighted average. Finally, flood hazard areas were classified as high, medium, and low hazard level. To address what the distribution of flood hazard in Bangkok is, the relative weights of each factor associated with flood hazard were established. The results of AHP pairwise comparison showed that land-use (0.332), drainage density (0.179), annual maximum rainfall (0.170) were the most important factors that influence flood hazard in Bangkok. Road density (0.164) and sea-level rise (0.050) were ranked as fourth and fifth of the relative weights of AHP, respectively. The relative weights of land subsidence (0.047), past flood events (0.038) and slope (0.019) of the city had the lowest scores in terms of contribution to flood hazard. These results are inconsistent with a previous study on AHP-GIS flood hazard identification in Ayutthaya by Kittipongvises (2021), who found that runoff and road density were considered the most important contributors to flooding in the local community. Therefore, in this study, the possible output could be the difference due to geographical landforms between the urban and sub-urban areas of Thailand. Spatial data and weight evaluation of all factors influencing flood hazard in Bangkok are presented in Table 4.6. The weight of each factor was used to generate a flood risk map (CR = 0.098).

Table 4.6 AHP weight evaluation of the factor affecting the flood hazard areas in Bangkok

Factors	Rank	Weighting (a)	Sub-factor	Rating (b)	Sources
Land-use	1	0.332	Settlement	8	Land-use data (2019), Land Development Department
			Crop Land	6	
			Others	4	
			Forest Land	2	
Drainage Density (km/km²)	2	0.179	> 15	8	Land-use data (2019), Land Development Department
			7.5 – 15	6	
			2.8 – 7.4	4	
			< 2.8	2	
Annual Maximum Rainfall (mm/y)	3	0.170	> 1100	8	Annual maximum daily rainfall during 2010 - 2010, Thai Meteorological Department
			1001 – 1100	6	
			901 -1000	4	
			< 900	2	
Road Density (km/km²)	4	0.164	> 0.6	8	Department of City Planning and Development, 2018
			0.41 – 0.60	6	
			0.21 – 0.40	4	
			0.00 -0.20	2	
Sea Level Rise (m:mean sea level)	5	0.050	> 500	8	Annual maximum daily sea level rise during 2010 - 2020, Hydrographic Department
			301– 500	6	
			101 – 300	4	
			0 -100	2	
Soil Subsidence (cm:mean sea level)	6	0.047	-2 ≤	8	Soil subsidence data (2018), Groundwater Resource Department
			-2 - 0	6	
			0 - +2	4	
			≥ +2	2	
Past Flood Events (yrs)	7	0.038	Flooded ≥ 3 yrs	8	All of previous flood events during 2005 – 2007, Geo-Informatics and Space Technology Development Agency: GISTDA, TISTR (1999)
			Flooded ≥ 2 yrs	6	
			Flood in a year	4	
			Never Flooded	2	

Slope (%)	8	0.019	0-5	8	Land-use data (2019),
			6-10	6	Land Development
			11-15	4	Department
			> 15	2	
	CI =	0.1377	CR =	0.097697	
		53			
	IR =	1.41			

As shown in Figure 4.10 and Table 4.7, flood hazards in Bangkok were mainly defined as high and moderate levels, accounting for 50% (784.089 sq.km.) and 35% (551.814 sq.km.) of the total area, respectively. In this context, medium and high flood areas in Bangkok were observed in the central of Bangkok, where it is located in the business center, crowded populated, and low to non-agricultural economic activity. Whereas, only 14% (sq.km.) were defined as low-flood hazard areas, mainly situated in the Southwest of Bangkok. As a result, the flood hazard percentage in of each district, the AHP-GIS flood mapping showed that Chatuchak, Wang Thonglang, and Phaya Thai districts were located where the highest risk of flooding in Bangkok (approximately 96.33 - 99.88% of the total area of each district). Meanwhile, Bangkok Yai, and Don Muang were defined in the top five among moderate hazard of flooding. The low-hazard area of flooding was Thawi Wattana. Therefore, only the elderly respondents who are living in the high, moderate, and low flood hazard areas and Sampantawong district where the highest population of elderly living in Bangkok (7 districts in total), were selected as the target population in questionnaire survey (see section 4.2).

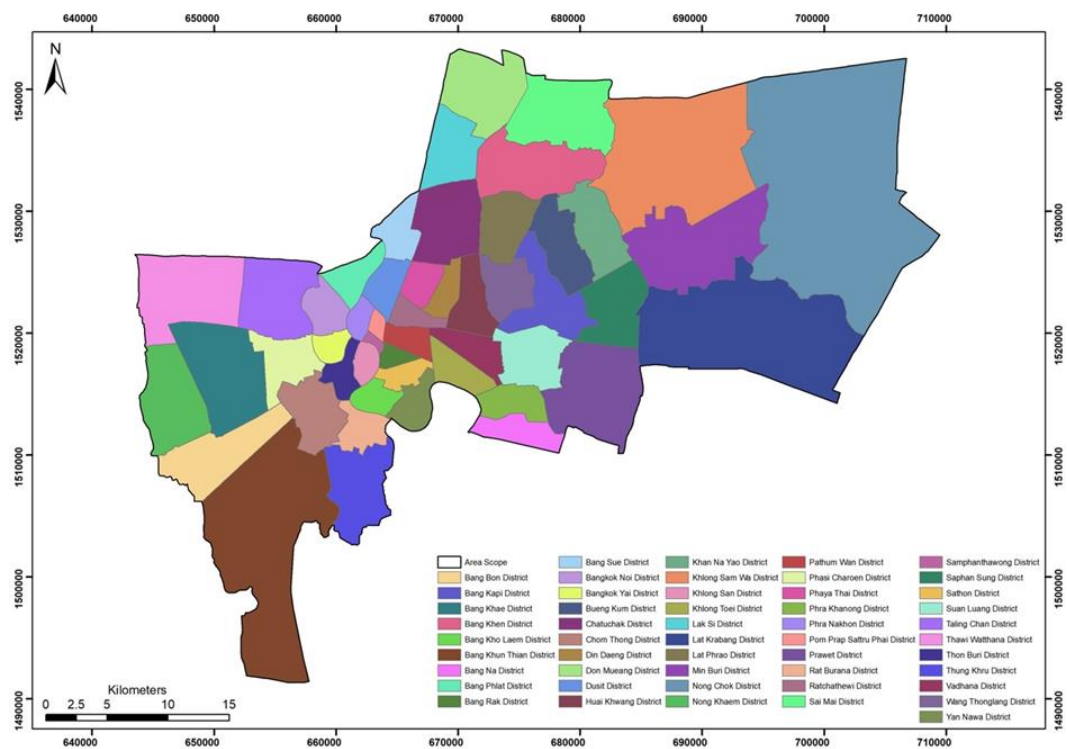


Figure 4.1 Layer of 50 districts of Bangkok

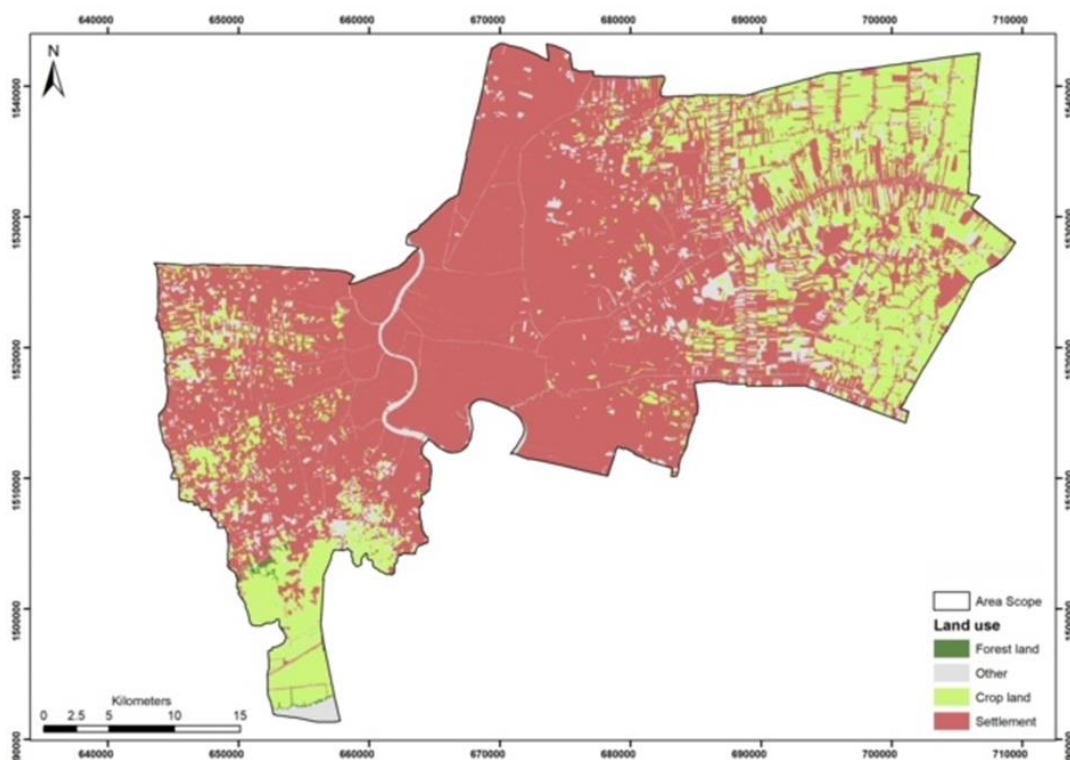


Figure 4.2 Land-use types in Bangkok

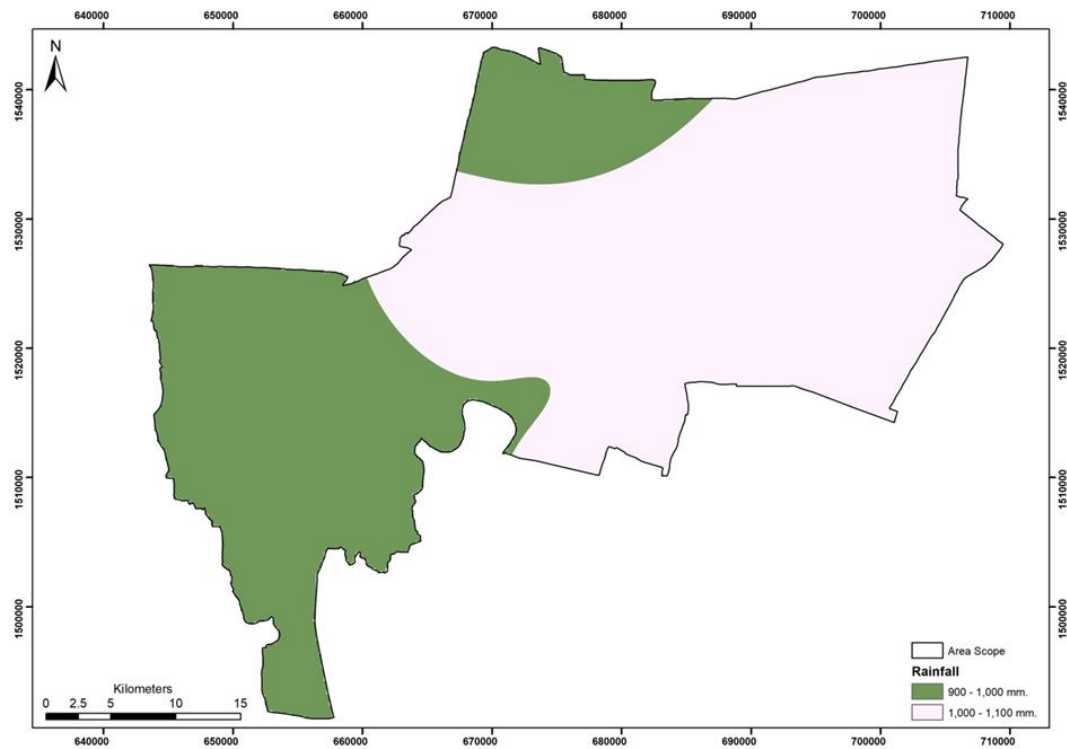


Figure 4.3 Maximum rainfall in Bangkok (mm/y)

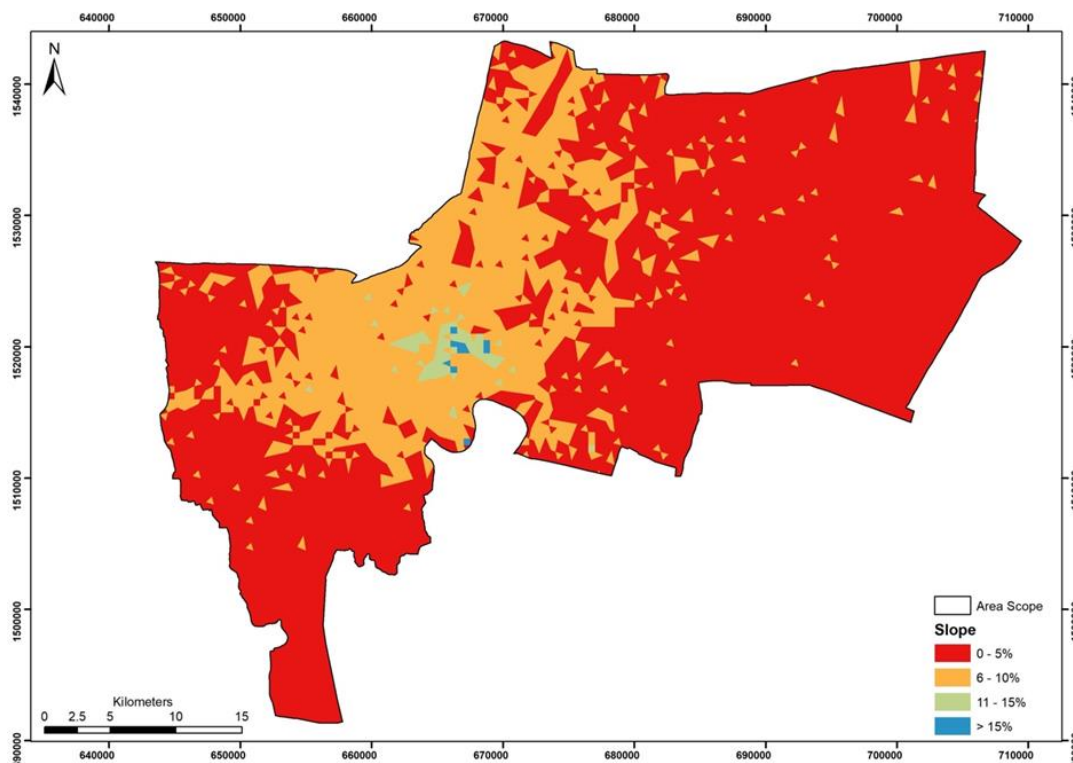


Figure 4.4 Slope of the area in Bangkok (%)

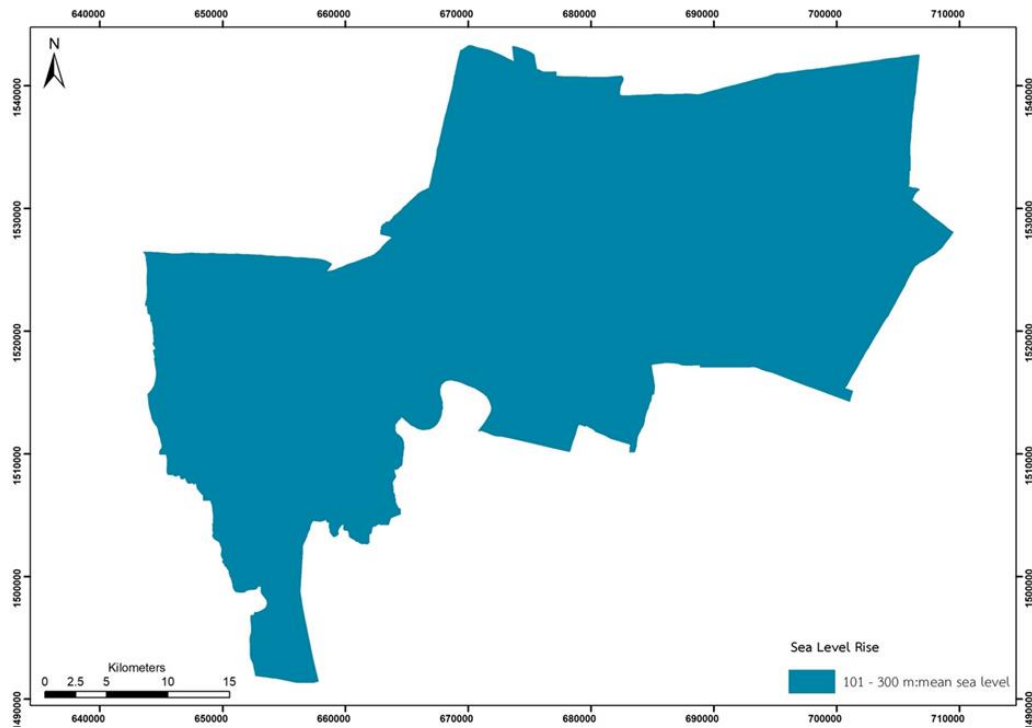


Figure 4.5 Sea level rise in Bangkok (m: mean sea level)

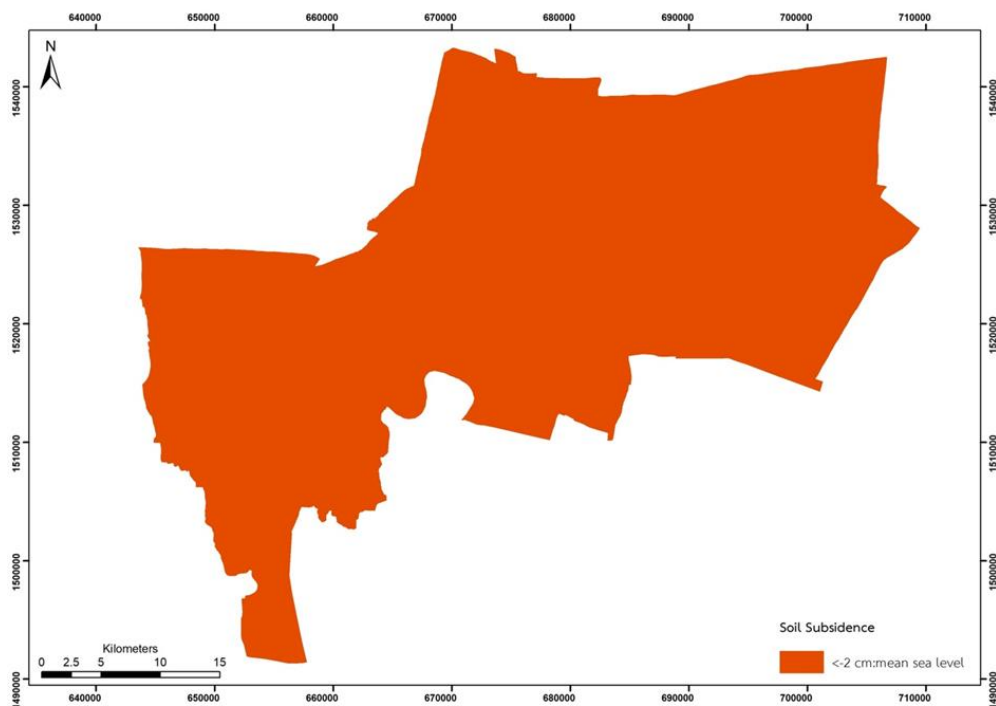


Figure 4.6 Soil subsidence in Bangkok (cm : mean sea level)

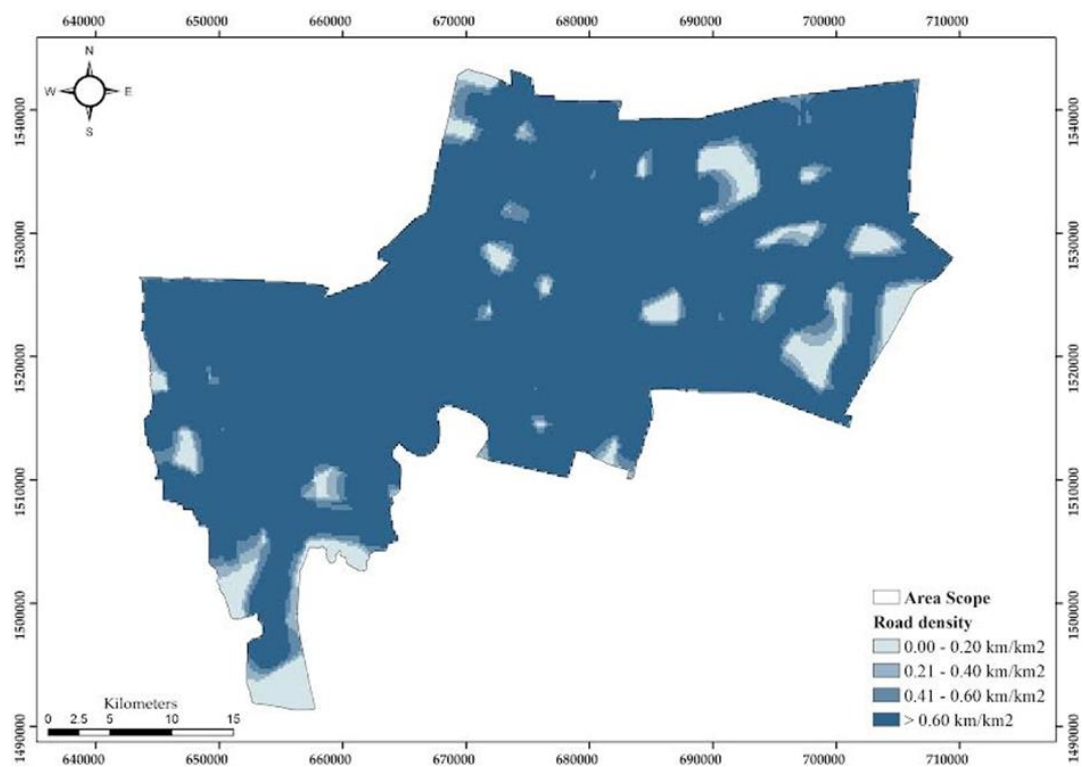


Figure 4.7 Road density in Bangkok (km/km²)

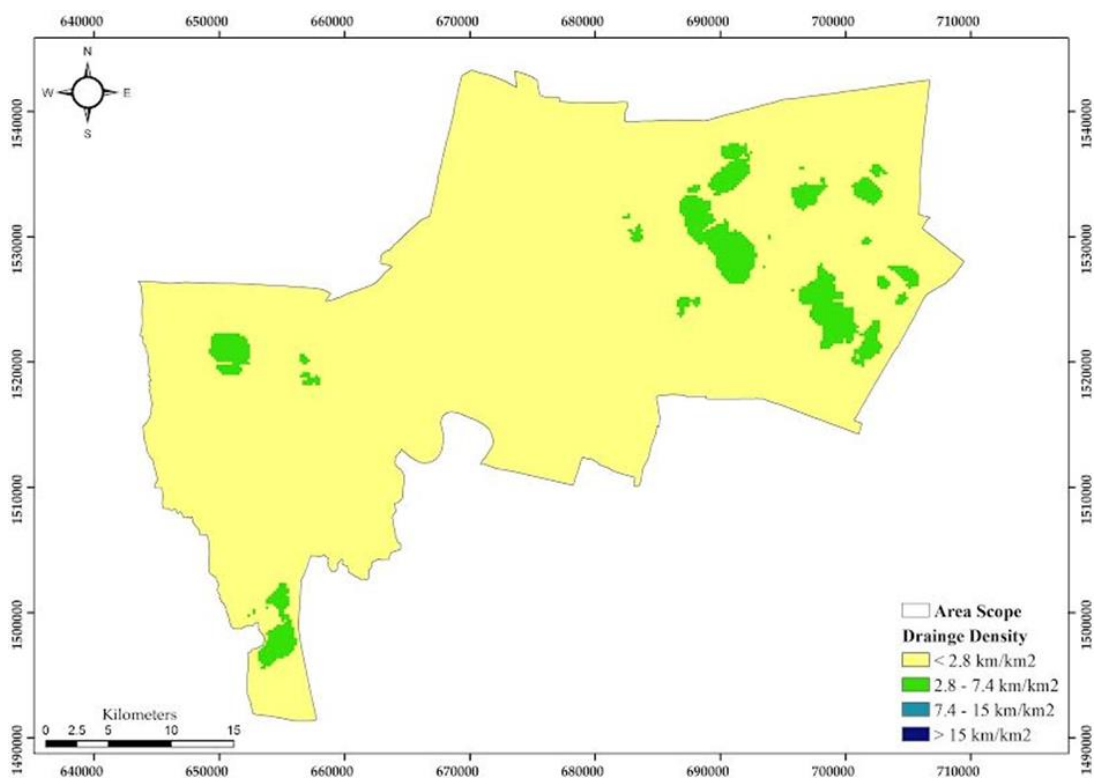


Figure 4.8 Drainage density in Bangkok (km/km²)

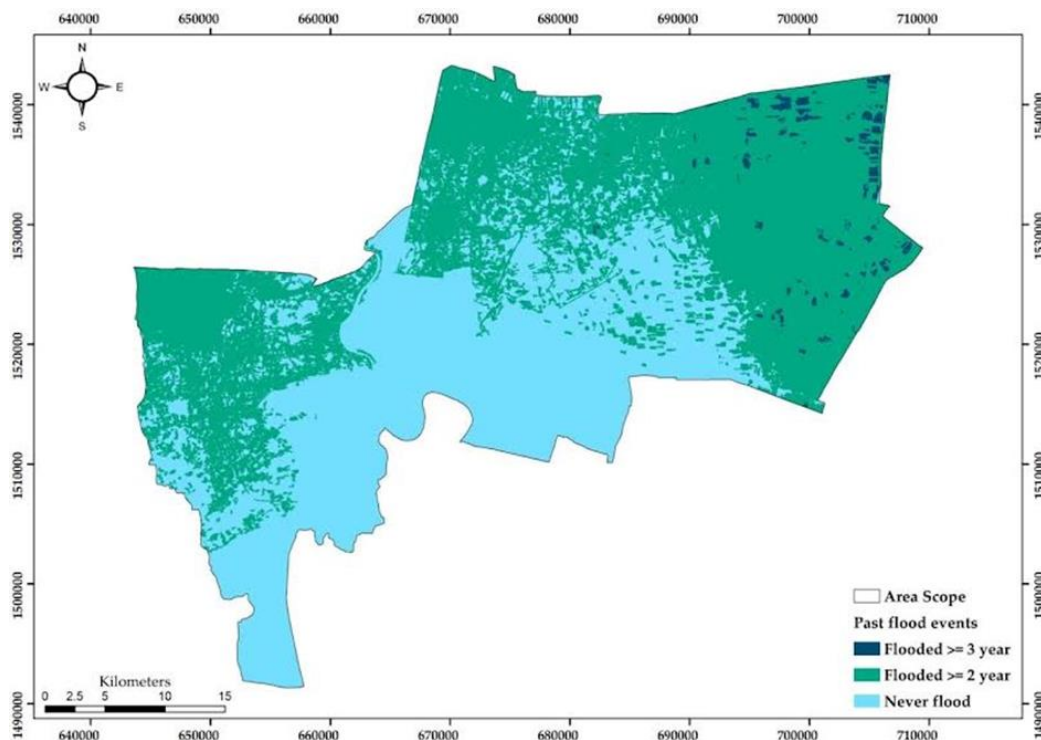


Figure 4.9 Past flood events in Bangkok (times per year)

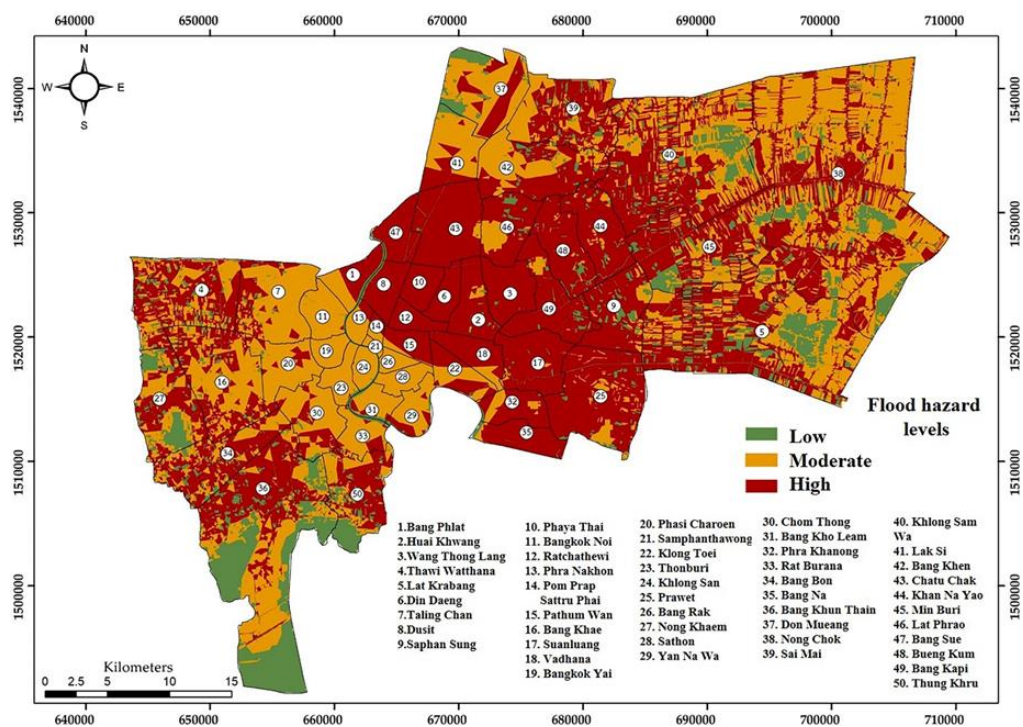


Figure 4.10 Bangkok's flood hazard map (based on GIS-AHP Multi-criteria Analysis)

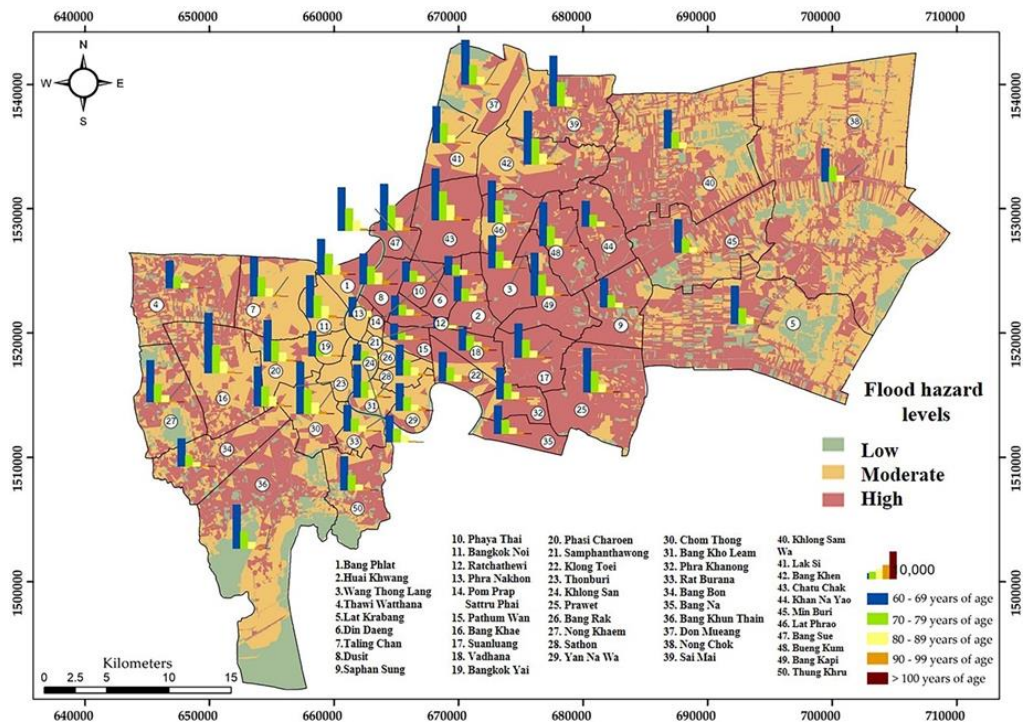


Figure 4.11 Elderly residing in Bangkok's flood hazard area

As shown in Figure 4.11, the districts of Samphanthawong and Chatuchak were the largest population of male and female elderly in Bangkok.

4.4 Questionnaire results and data analysis

4.4.1 Demographic characteristics

As previously mentioned, the target population in this questionnaire survey were the elderly respondents who are residing in the high, moderate, and low flood hazard areas and the districts of the highest elderly population as shown in Table 4.7. In Table 4.8, Samphanthawong, the district that has the highest population of elderly, and Chatuchak has the highest number of respondents at 15%. This is followed by Wang Thonglang, Phaya Thai, Bangkok Yai, Donmuang, and Thawiwattana shared the same number or respondents at 14%.

Table 4.7 Six districts in high, moderate, and low flood hazard level

Level	District	Area in District (sq.km.)	Level by %	Elderly by %
High	Wang Thonglang	16.97	99.33	17.52
	Chatuchak	31.46	96.33	21.70
	Phaya Thai	9.18	99.57	18.72
Moderate	Bangkok Yai	6.07	19.63	27.42
	Don Muang	6.12	17.09	14.64
Low	Thawi Wattana	6.57	13.18	18.86

Table 4.8 District of respondents (n = 736)

Risk Level / Elderly	District	n	%
High	Wang Thonglang	102	14
	Chatuchak	110	15
	Phaya Thai	102	14
Moderate	Bangkok Yai	101	14
	Don Mueang	104	14
Low	Thawi Watthana	103	14
District with Highest Population of Elderly	Samphanthawong	114	15
Total		736	100

As shown in Table 4.9, the survey results found that about 41% and 59% of the total respondents (n=736) were male and female. About half of the respondents were aged between 60 and 69 years and 36% were aged between 70 and 79 years. Approximately 12% of the elderly respondents 80 and over. Considering their education and current status, the

survey found that about 63.2% had completed primary education, and 51.1% were retired. More than half (54.6%) live with their family. As regards to personal income, more than one-thirds of the respondents (38.9%), earned less than 10,000 THB per month.

Table 4.9 Demographic Characteristics of the respondents (n = 736)

Personal Factors	n	%
Gender		
Male	302	41
Female	434	59
Age (year)		
< 50	25	3.4
50 - 59	6	0.8
60 - 69	360	48.9
70 - 79	261	35.5
80 +	84	11.4
Marital Status		
Single	95	12.9
Married	334	45.4
Divorced	108	14.7
Split / Separate	199	27
Education Level		
Uneducated	27	3.7
Primary School	465	63.2
High School	152	20.7

College	16	2.2
Bachelor	56	7.6
Master or Higher	18	2.4
Other	2	0.3
Occupation		
Government / Public Enterprise	29	3.9
Private Company	68	9.2
Business Owner / Self-Employed	33	4.5
Unemployed	200	27.2
Working Part-time	30	4.1
Retired	376	51.1
Personal Income (Thai baht / month)		
No income	256	34.8
< 10,000	286	38.9
10,001 – 30,000	152	20.7
30,001 – 50,000	6	0.8
➤ 50,000	17	2.3
Other	19	2.6
Housing		
Living at Own Home	334	45.4
Living with Family	402	54.6

4.4.2 Health status

By asking about health status of the elderly respondents, the survey results found that over 60% had no congenital diseases. However, about a half of the total respondents visited a hospital 1 – 3 times per month and 36% never visited a doctor at the hospital (Table 4.10).

Table 4.10 Demographic Characteristics: Health Data (n = 736).

Health Data	n	%
Congenital		
Yes	269	36.5
No	467	63.5
Visiting Hospital (time / month)		
None	264	35.9
1 - 3	383	52
4 - 6	63	8.6
6 +	26	3.5

On the other hand, the findings presented the respondents with higher education level tend to buy inverter type more than those with lower education level.

4.4.3 Attitude, Subjective Norm, Perceived Behavioral Control and Intention to Take Actions to Deal with Flood Risk

As shown in Table 4.11 all survey results regarding to the factors related to the theory of planned behavior are given as following:

Attitude: More than half of the elderly respondents (56.6%) were rather likely or very likely concerned about the impact of flooding in their area. Approximately 48.8% reported that they would like to know more about flood prevention and flood preparedness. About 40% of the elderly respondents agreed that they tend to ask someone in their family or their friend about flood preparedness and action in case of emergency situation. Moreover, interestingly, 43.8%

thought that digital technology would assist and took a part in flood preparedness.

Subjective Norm: Half of the respondents (51.3%) received information about flood prevention or preparedness measure from their family. About 46.7% talked about flood prevention or preparedness with their friends. Moreover, 49.4% of them perceived more information on flood situations and preparedness activities from mass media and about 44.3% from the government.

Perceived Control Behavior: Surprisingly, more than half of the respondents (63.4%) were strongly agreed and agreed that they believed in their ability to prepare themselves for flood preparedness.

Intention and actions: Surprisingly, about three-quarters of respondents (71.6%) intended to prepare themselves for flood preparedness and 67.9% intended to take proactive actions (i.e., evacuate to the safe zone) when flood occurs. Anyway, by asking about their actions to deal with flood disasters, about half of the elderly respondents reported that they took flood preparedness measures in their daily life and also their proactive action when flood occurs. However, most of them (82.2%) had never participated in flood preparedness program.

Table 4.11 Attitude, subjective norm, perceived behavioral control and intention to take actions to deal with flood risk (n = 736)

Theory of Planned Behavior					
Attitude	Likely	Rather Likely	Neutral	Rather Unlikely	Unlikely
Concern Impact Flood	179	238	207	68	44
	24.3%	32.3%	28.1%	9.2%	6.0%
Like to know Flood Prevention	108	251	288	45	44
	14.7%	34.1%	39.1%	6.1%	6.0%
Like to ask someone	80	213	260	128	55
	10.9%	28.9%	35.3%	17.4%	7.5%
Digital Technology Assist	64	258	189	165	60
	8.7%	35.1%	25.7%	22.4%	8.2%

Flood Preparedness					
Subjective Norm	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Information from Family	84	294	265	52	41
	11.4%	39.9%	36.0%	7.1%	5.6%
Talking about Flood with Friends & Family	43	301	276	54	62
	5.8%	40.9%	37.5%	7.3%	8.4%
Perceived Flood Situation & Prevention from Mass Media	45	319	220	70	82
	6.1%	43.3%	29.9%	9.5%	11.1%
Perceived Flood Situation & Prevention from Government	51	268	219	98	100
	6.9%	36.4%	29.8%	13.3%	13.6%
Perceived Control Behavior	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Believed in Ability to Prepare for Flood Preparedness	126	341	171	49	49
	17.1%	46.3%	23.2%	6.7%	6.7%
Intention to Prepare for flood preparedness	132	395	123	64	22
	17.9%	53.7%	16.7%	8.7%	3.0%
Intention to take proactive action when flood	82	418	171	36	29
	11.1%	56.8%	23.2%	4.9%	3.9%

Taking flood preparedness measures in daily life	37	376	219	50	54
	5.0%	51.1%	29.8%	6.8%	7.3%
Taking proactive action when flood	42	393	142	94	65
	5.7%	53.4%	19.3%	12.8%	8.8%
Participating Flood Preparedness	Yes		131		17.8%
	No		605		82.2%

4.4.4 Sources of Information, Threat Appraisal, Emotions and Flood Risk Perception

Table 4.12 showed the survey results of all factors associated with the protection motivation theory, as follows:

Source of Information: Nearly half of the elderly respondents (44.8%) stated that they believed in news about flood situations and flood-coping measures reported in internet sources. Also, about a half agreed that digital literacy would help them to perceive the information about flood coping measures and better enhancing flood coping appraisals.

Threat Appraisal: Approximately 39.8% of the elderly respondents strongly agreed and agreed that flood events would probability occur in their community. Around 52.2% were agreed on consequence or severity of flooding occurring in their community.

Emotions: Nearly half of the respondents (44%) agreed and strongly agreed that they felt fear when they encountered a flood. About half of elderly respondents felt helpless when facing floods. About 53% believed that flooding was inevitable. Clearly, almost all of the respondents (84.5%) have experienced major flooding at least one time in their life.

Risk Perception: By asking about their perception of flood risk, about 45.2% were strongly agreed and agreed that their home is located in a flood risk area.

Coping Response: More than half of the respondents (67.7%) confidently agreed in their ability to take flood preparedness measure in their daily life. About 68.4% were agreed to prepare an emergency kit and food supplies kit before a flood disaster. Moreover, approximately 60.3% of the respondents were agreed to collect some information on flood disaster preparedness. About a half of the elderly respondents presented that they understood about flood prevention

measures, followed by flood news, attended flood emergency training, and stored important items in a safe place. Moreover, 46.6% of them perceived that the cost of implementing a specific flood mitigation in their community were rather costly.

Table 4.12 Sources of information, threat appraisal, emotions and flood risk perception (n = 736)

Source of Information	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Believed in news about flood from Internet	37	293	291	85	30
	5.0%	39.8%	39.5%	11.5%	4.1%
Digital literacy helps to perceive more flood measure and related information	73	304	246	88	25
	9.9%	41.3%	33.4%	12.0%	3.4%
Digital literacy help more perceive in flood coping measure	85	294	286	47	24
	11.5%	39.9%	38.9%	6.4%	3.3%
Threat Appraisal	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Perceived probability flood event in community	148	145	190	218	35
	20.1%	19.7%	25.8%	29.6%	4.8%
Perceived consequence of flood event in community	156	228	168	152	32
	21.2%	31.0%	22.8%	20.7%	4.3%
Emotion					
Fear when flood	142	182	134	234	44
	19.3%	24.7%	18.2%	31.8%	6.0%
	44	136	187	271	98

Feel helpless when facing flood	6.0%	18.5%	25.4%	36.8%	13.3%
Believed that flood is inevitable	129	261	199	113	34
	17.5%	35.5%	27.0%	15.4%	4.6%
Experienced major flood	Yes			No	
	622			114	
	84.5%			15.5%	
Risk Perception	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Perceived that home located in flood zone	131	202	84	230	89
	17.8%	27.4%	11.4%	31.3%	12.1%
Coping Response	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Believe in ability to prepare to encounter flood	91	407	183	42	13
	12.4%	55.3%	24.9%	5.7%	1.8%
Necessary prepare emergency and flood supplies kit	161	342	152	30	51
	21.9%	46.5%	20.7%	4.1%	6.9%
Like to collect Info on flood disaster preparedness	44	400	159	59	74
	6.0%	54.3%	21.6%	8.0%	10.1%
Totally understand all flood prevention measure	25	397	238	31	45
	3.4%	53.9%	32.3%	4.2%	6.1%
Estimated cost of implementing flood mitigation measure	Costly	Rather Costly	Neutral	Rather Not Costly	Not Costly
	57	286	291	26	76

	7.7%	38.9%	39.5%	3.5%	10.3%
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4.4.5 Using ONLINE / Web-based Application in Flood Management

Less than half of the elderly respondents (34%) use online / web-based application for their flood hazard management in both before and during flood disasters. Also, 32% of them attempted to share and to communicate about flood related information via online (i.e., Line, Facebook, Twitter) platform (Figure 4.12a-b). In Southeast Asia, based on multi-country surveys (n = 1,603) conducted by Lai et al. in the Philippines, Vietnam, Indonesia, and Myanmar, generally, no attention is directed towards the building of mobile applications for dissemination of disaster-related information. Evidently, more than 90% of the respondents in Vietnam, Myanmar, and Indonesia stated that they have never received any information on disasters and related topics via mobile applications. A slow adoption rate of internet and mobile technologies was also reported in some case countries in Southeast Asia (Lai, Ling, 2015). According to Vacek and Rybenska, the difficulties experienced in using of information and communication technology by the older adults are very common. So thus, more specifically, identifying the source of information about flood monitoring and response via online / web-based application, only 16-17% of the total respondents have had experience using Line / Facebook applications to obtain information before the flood event (Figure 4.12c). Kuoppamaki (2018) proposed how age and life course stage are associated with digital participation and to what extent can the take part? The research found that individuals aged 50 or over utilize online service more frequently than younger. The knowledge gap of digital participation in older adults is becoming less relevant when they have both access and skill. Importantly, skill and access are mainly associated with socio-economic position. From the results, it could be implied that older adults are slower adopters of digital literacy (i.e., ability to use technology in general, computer related programs, the World Wide Web, etc.) than their younger counterparts.

Evidently, a survey conducted by the American Association of Retired Persons (2002) confirmed that respondents over the age of 65 have fewer computer skills and less confidence in their ability to use a computer. This is further supported by the key findings of Mitzner et al. (2016), who confirmed that technology experience and personality dimensions of openness (i.e., trust) to both attitudes and experience were the key driving factors affecting perceived

ease of use and usefulness of computers by elderly users. Emotional stability of the elderly respondents was also significantly correlated to perceived ease of computer technologies.

More interestingly, the survey found that less than 2% of the elderly respondents have used national online / web-based platform to find the related flood information before a disaster (i.e., website of GISDA, Department of Disaster Prevention and Mitigation, Bangkok Metropolitan Administration (BMA), etc.). At this point, low levels of satisfaction with flood risk management and flood risk communication by local authorities of Thailand was also reported in the study of Kittipongvises and Mino (2013).

During the flooding event, the survey found that Line and Facebook are the most popular online / web-based applications as a key to access flood related information (Figure 4.12c). These results were familiar with a study of Vacek and Rybenska (2015) conducted in Malaysia, revealed that people used social media such as Facebook to obtain and share an occurrence of flood related information in their local community. Similar to the study by Jayasekara (2019) in Sri Lanka, it was reported that the most popular social network during and post-disaster phases was Facebook. In between disaster situations, the Facebook application has been used to share, post, rescue teams' contact number, and request for help. In the case of post-disaster, Facebook had been used to provide feedback of disaster management, call for donations, and request volunteer help in their communities.

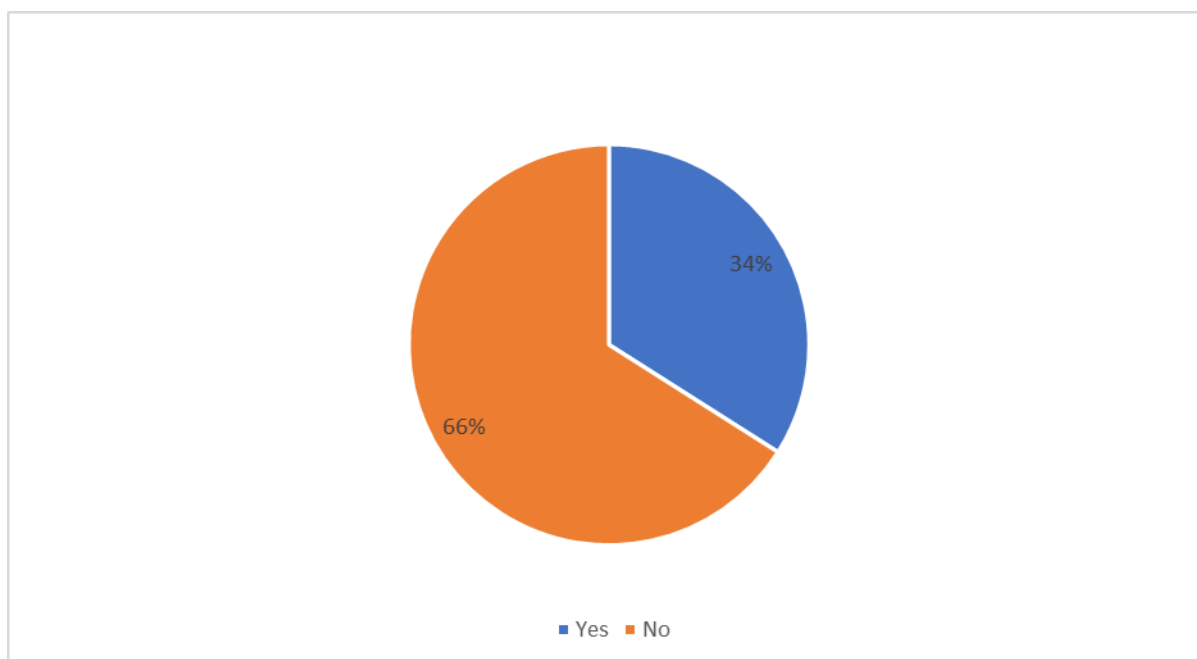


Figure 4.12 (a) Using online applications for flood management (before and during flood)

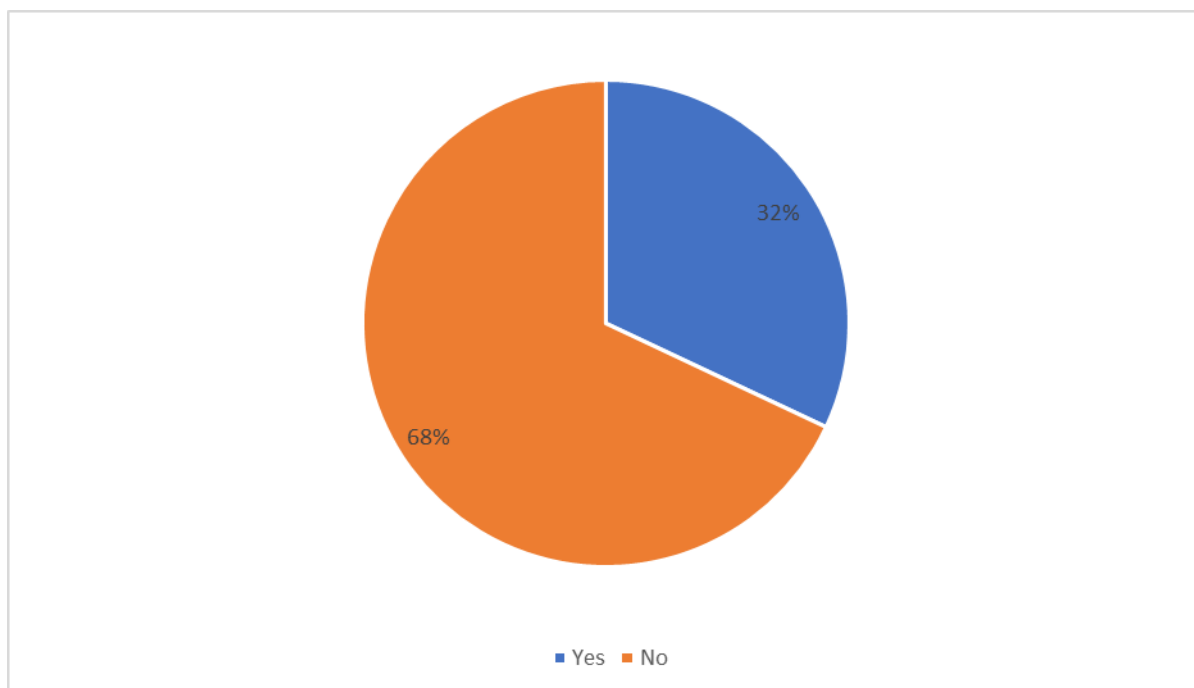


Figure 4.12 (b) Communicating and sharing flood information via ONLINE platform

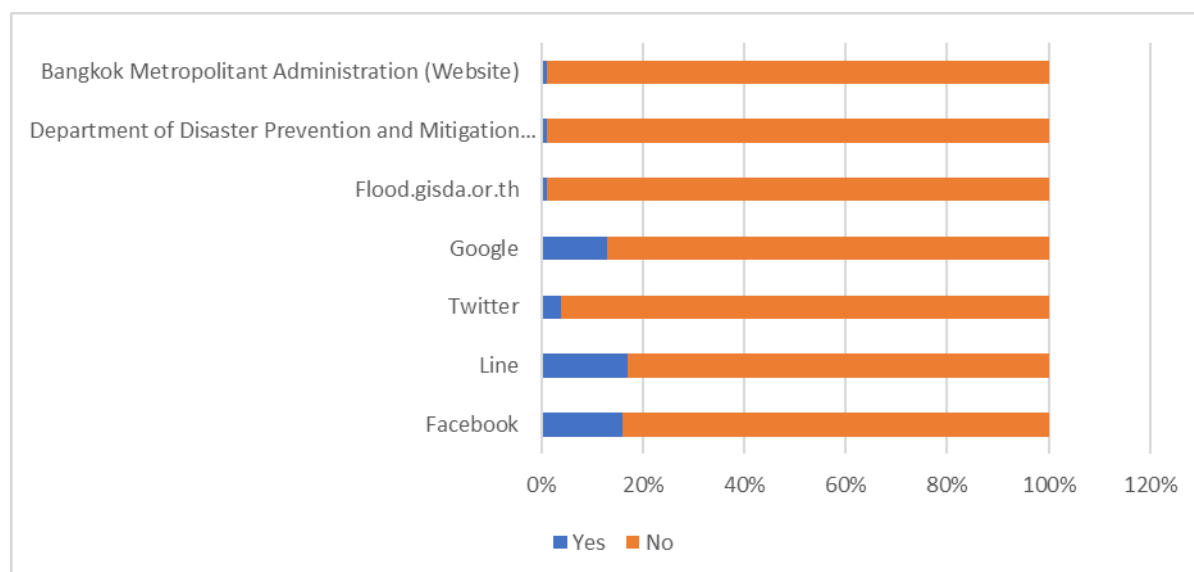


Figure 4.12 (c) Using ONLINE application for flood preparedness and management (before flood)

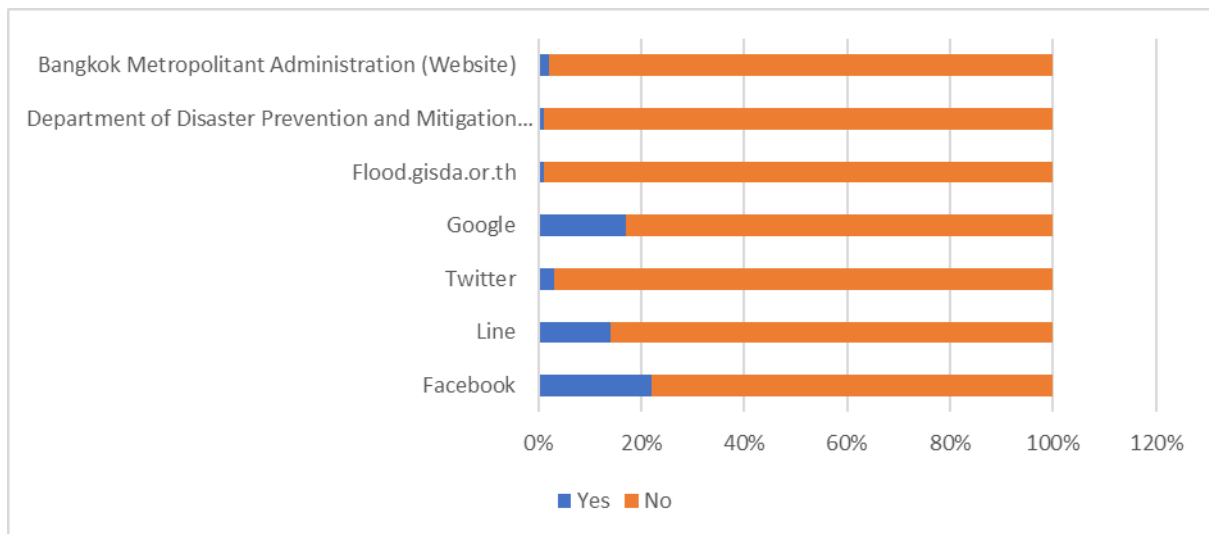


Figure 4.12 (d) Using ONLINE application for flood preparedness and management (during flood)

4.4.6 Flood Training Experience and Preparedness Action

For flood training (Figure 4.13a), nearly all of the respondents (82%) have never participated training of flood management, preparedness, and response in the community. However, about half of the respondents (51%) presented that they probably will take actions in response to flood disaster (Figure 4.13b). Therefore, Brockie and Miller (2017) presented that family support such as how the family members called in case to warn about flood risk, decision of evacuation when flood disaster, and past flood experiences were the three drivers for flood preparedness of the older adult respondents in Queensland, Australia. when flood, the older adult respondents were faced with a real situation of flood disaster response whether to evacuate or stay. Supports from official emergency operations, family and neighborhood, flood experiences, and their ability (physical) and emotional conditions were the key factors affecting older adult respondents to flood response. Nevertheless, one of the older female adult respondents reflected that she was not be able to find out about the location of the flood evacuation center and did not know where to go during a flood disaster.

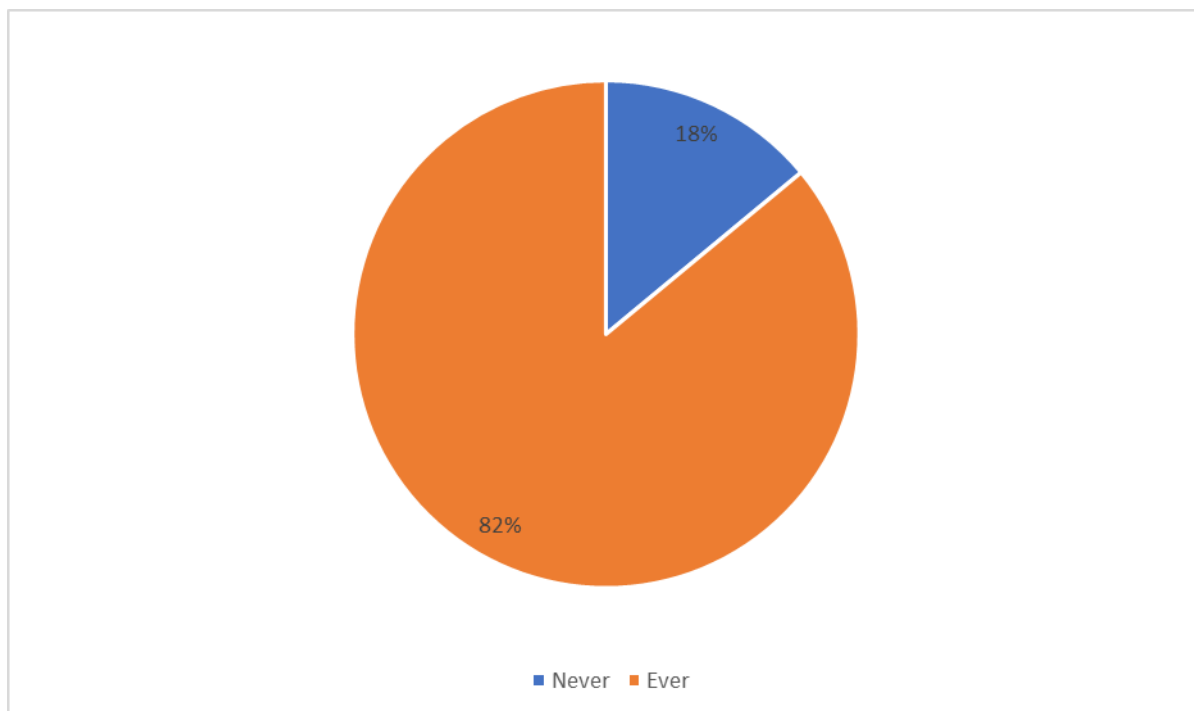


Figure 4.13 (a) Experiences in flood preparedness and management

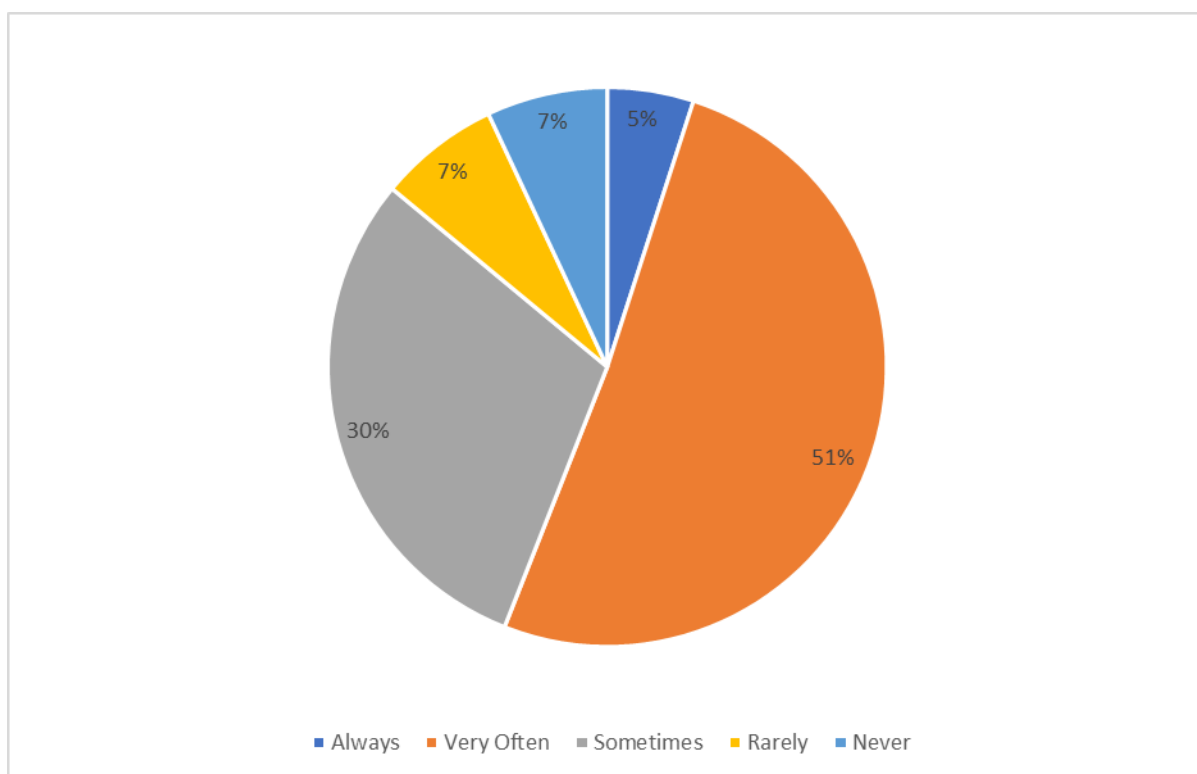


Figure 4.13 (b) Flood preparedness action in daily life

4.4.7 Using ONLINE Application for Flood Hazard and Flood Training Experience in Each District

The District of Samphanthawong presented the highest of elderly population in Bangkok. For instant, 13% of the elderly respondents reported that online / web-based applications (i.e., Google, Line, Facebook) were used to find flood related information before and during flood event (Figure 4.14a -b). On the other hand, nearly all of the respondents (86 – 87%) residing in Sampanthawong and Chatuchak (the district of highest female elderly) had never attended training for flood management, preparedness, and response in their local community (Figure 4.14c).

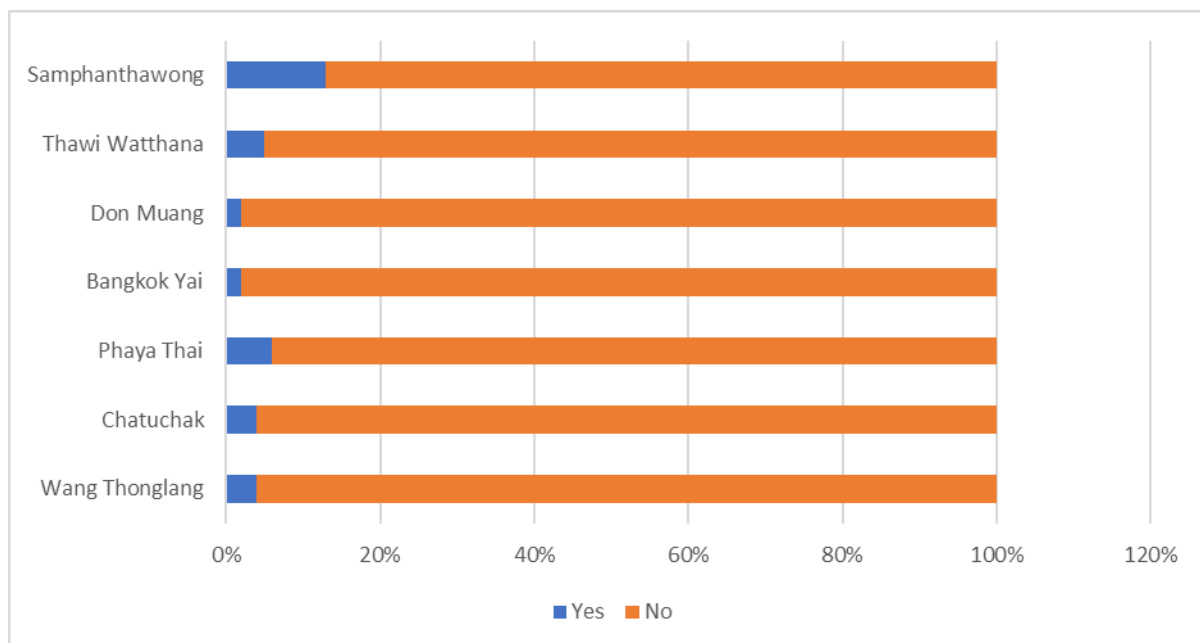


Figure 4.14 (a) Using ONLINE application for flood preparedness and management (before flood)

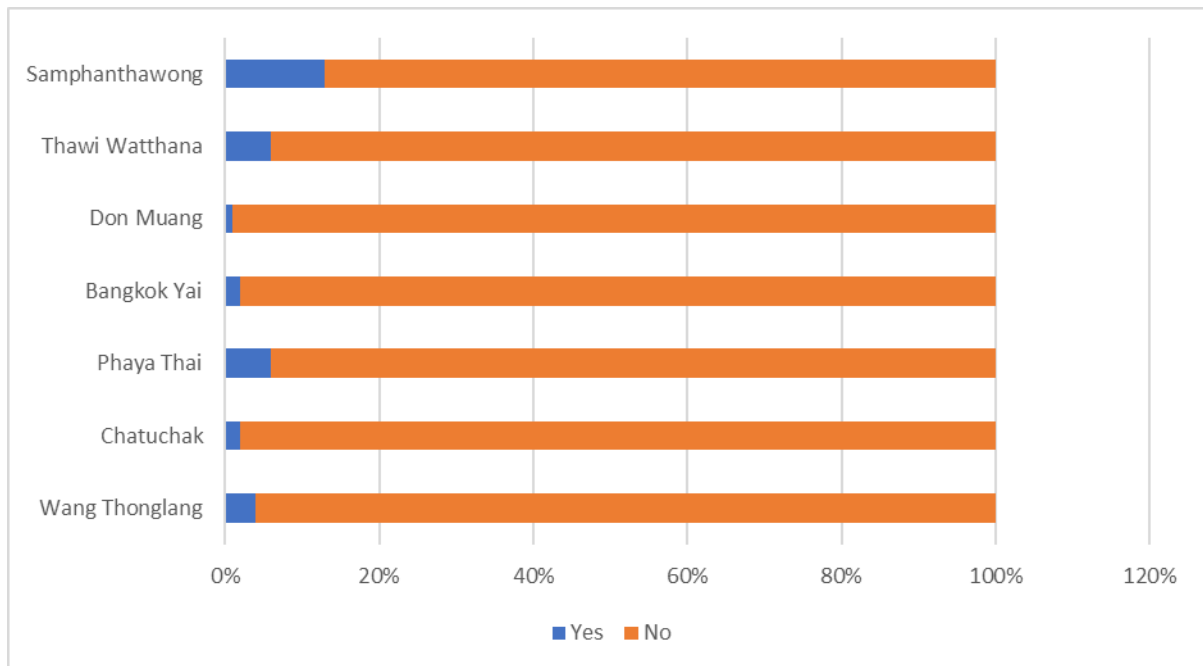


Figure 4.14 (b) Using ONLINE application for flood preparedness and management (during flood)

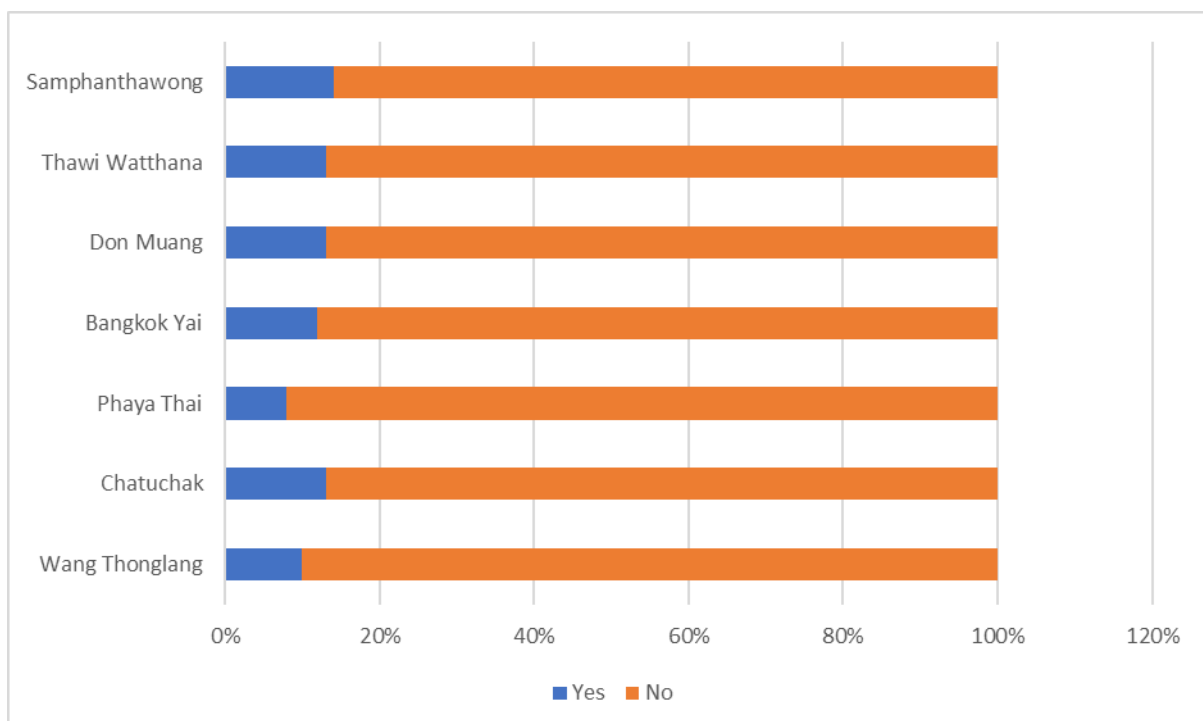


Figure 4.14 (c) Experiences in flood preparedness and management training (by districts)

4.4.8 Flood Preparedness Literacy and Coping Response to Flooding in Different Flood Hazard Areas

Elderly respondents residing in high flood hazard areas tended to have higher flood preparedness literacy (61.8%) than those living in moderate (40.5 %) and low hazard areas (43.6%). Although, the use of application to find the information about flood preparedness before and during flood was shown, the elderly residing in high risk areas have used the application higher than those residing in moderate and low hazard areas, or 25.49%, 11.88%, and 4.95% respectively (Figure 4.15). Surprisingly, the survey showed that a slightly higher proportion of elderly respondents in low flood hazard areas took preparedness actions to deal with flood events (79.6%) than those in moderate (72.2%) and high hazard areas (77.5%). Hypothesis 2 was, therefore, accepted.

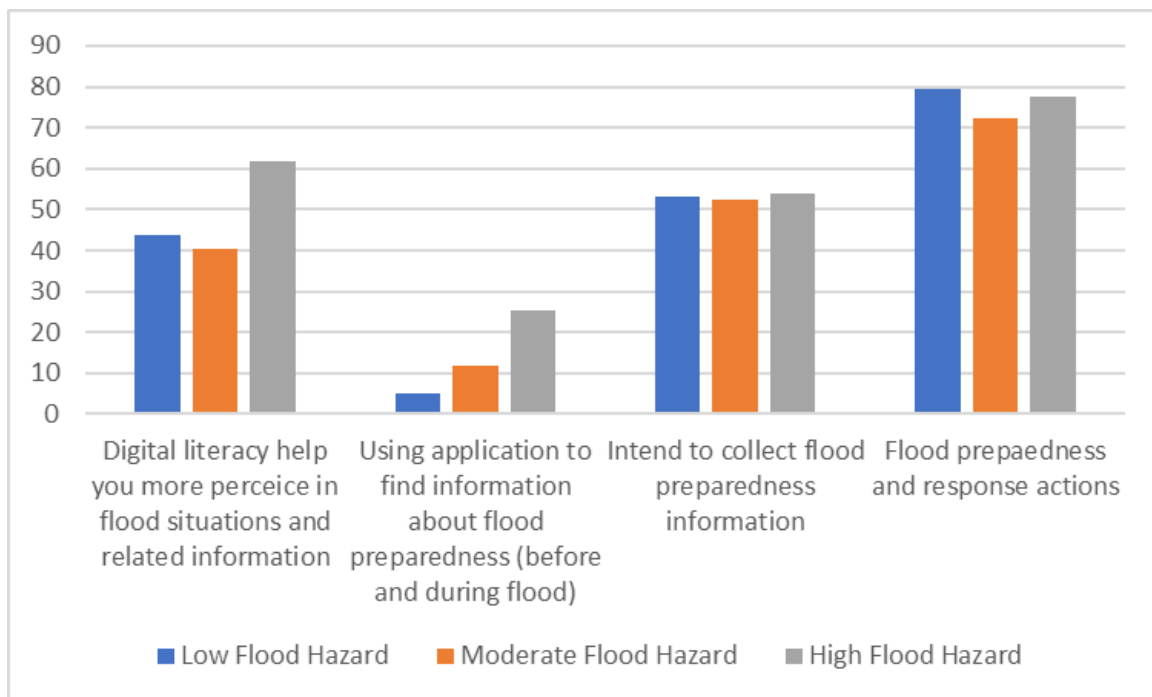


Figure 4.15 Survey results on flood preparedness literacy and flood preparedness action based on hazard level

4.5 Statistical Analysis

4.5.1 Demographic factor influencing flood preparedness action.

Table 4.13 Mann-Whiney U Test on gender to flood preparedness action (n = 736)

Mann-Whiney U Tests	n	Mean Rank	Sum of Rank	U	Z	Asymp. Sig.
Flood Preparedness Action						
Male	302	358.51	108270.00	62517	-1.134	.257
Female	434	375.45	16294.00			

From Table 4.13, there was no significant difference between males and females on the means of flood preparedness action of the elderly respondents ($p > 0.05$). So thus, the result had found that both male and female elderly have no different flood preparedness action. However, females showed a higher mean rank than males on flood preparedness action. In contrast, the above result is not consistent with a study conducted by McDowell et al. (2020) in the Republic of Ireland wherein male respondents reported a higher level of awareness of the need for flood related actions. More interestingly, in this research, the Kruskal-Wallis test revealed a significant difference between education and occupation of respondents and their flood preparedness actions ($p < 0.05$).

Table 4.14 Kruskai-Wallis Test on demographic character and flood preparedness action (n = 736)

Kruskai-Wallis Test	n	Mean Rank	Chi-Square	P
Flood preparedness action				
Age				
<40	9	359.44	8.014	0.155
40-49	16	324.16		
50-59	6	304.25		
60-69	360	387.81		
70-79	261	346.39		

>80	84	368.42		
Education				
No Education	27	448.37	28.612	0.000
Primary School	465	347.48		
High School	152	386.06		
College	16	332.50		
Bachelor	56	478.19		
Master or Higher	18	338.31		
Other	2	332.50		
Income				
No Income	256	388.41	7.955	0.159
<10,000	286	366.90		
10,000 – 30,000	152	349.95		
30,001 – 50,000	6	247.92		
>50,000	17	373.85		
Other	19	306.03		
Occupation				
Government / Public Enterprise	29	306.48	56.731	0.000
Private Company	68	405.85		
Business Owner / Self- employ	33	485.55		
Unemployed	200	379.00		
Working Part-time	30	564.68		

Retired	376	335.02		
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From Table 4.14, there were significant difference between education and occupation ($p < 0.05$), while age and income had no significant difference ($p > 0.05$) indicating that education, occupation have similar level on flood preparedness action except age and income. Whereas age of 60-69, earning bachelor degree, no income, and working part-time were the highest mean rank on flood preparedness action. However, patterns of relationships are, however, unclear. For instance, elderly respondents with no education tended to have a higher mean of flood preparedness related actions than elderly respondents with higher education and income levels. Further, the elderly respondents working part-time tend to have higher levels of flood literacy preparedness and actions compared to others ($p < 0.05$). Therefore, Hypotheses 1.1 and 1.2 were rejected. Similarly, Czaja et al. (2006) reported that computer self-efficacy among different demographics characteristics of older adults can be predicted based on age, education, and computer anxiety.

4.5.2 Demographic Factor Influencing Flood Preparedness Literacy

Table 4.15 Mann-Whiney U Test on gender to flood preparedness literacy (n = 736)

Mann-Whiney U Tests	n	Mean Rank	Sum of Rank	U	Z	Asymp. Sig.
Flood Preparedness Literacy						
Male	302	358.98	108413.00	62660	-1.074	.283
Female	434	375.12	162803.00			

From Table 4.15, there was no significant difference between males and females on the subscale measuring elderly on flood preparedness literacy ($p > 0.05$). So thus, the result had found that both male and female elderly have different flood preparedness literacy, which was females showing a higher mean rank than males on flood preparedness literacy. This is similar to the finding of Lindell, who revealed that females tend to perceive hydrological risks more acutely than male respondents. In terms of technology literacy, as argued by Czaja et al., female

elderly respondents reported lower computer self-efficacy, lower computer attitudes, higher computer anxiety, and consequently lower interest in computer use than their male respondents (i.e., female elderly reported less experiences with the use of websites than male elderly). The two top web activities of the older respondents were communication and entertainment, and travel related activities. Better understanding of computer acceptance could provide insights into older users' acceptance of other new technologies (i.e., tablets and smart phones).

Table 4.16 Kruskai-Wallis Test on demographic character and flood preparedness literacy (n = 736)

Kruskai-Wallis Test	n	Mean Rank	Chi-Square	P
Flood preparedness literacy				
Age				
<40	9	153.72	51.412	0.000
40-49	16	121.81		
50-59	6	86.17		
60-69	360	392.53		
70-79	261	356.89		
>80	84	391.76		
Education				
No Education	27	491.26	73.180	0.000
Primary School	465	401.49		
High School	152	315.38		
College	16	221.44		

Bachelor	56	307.71		
Master or Higher	18	119.94		
Other	2	193.50		
Income				
No Income	256	465.12		
<10,000	286	325.42		
10,000 – 30,000	152	294.81		
30,001 – 50,000	6	139.83	127.112	0.000
>50,000	17	93.00		
Other	19	217.03		
Occupation				
Government / Public Enterprise	29	282.59		
Private Company	68	271.62		
Business Owner / Self- employ	33	388.86		
Unemployed	200	324.16	71.096	0.000
Working Part-time	30	585.55		
Retired	376	397.13		

From Table 4.16, there were significant differences between age, education, income and occupation ($p < 0.05$), indicating that elderly in different age, education, income, and occupation groups have different levels on flood preparedness literacy. Interestingly, age of 60 - 69, no education, no income, and working part-time have the highest mean rank on flood preparedness literacy.

4.5.3 Correlation Analysis

In order to understand the factors related to the theory of planned behavior and the protection motivation theory from high, moderate, and low flood hazard level ($n = 736$), Spearman correlation analysis were shown as follow:

4.5.3.1. Factors Influencing Flood Preparedness Literacy of the Elderly

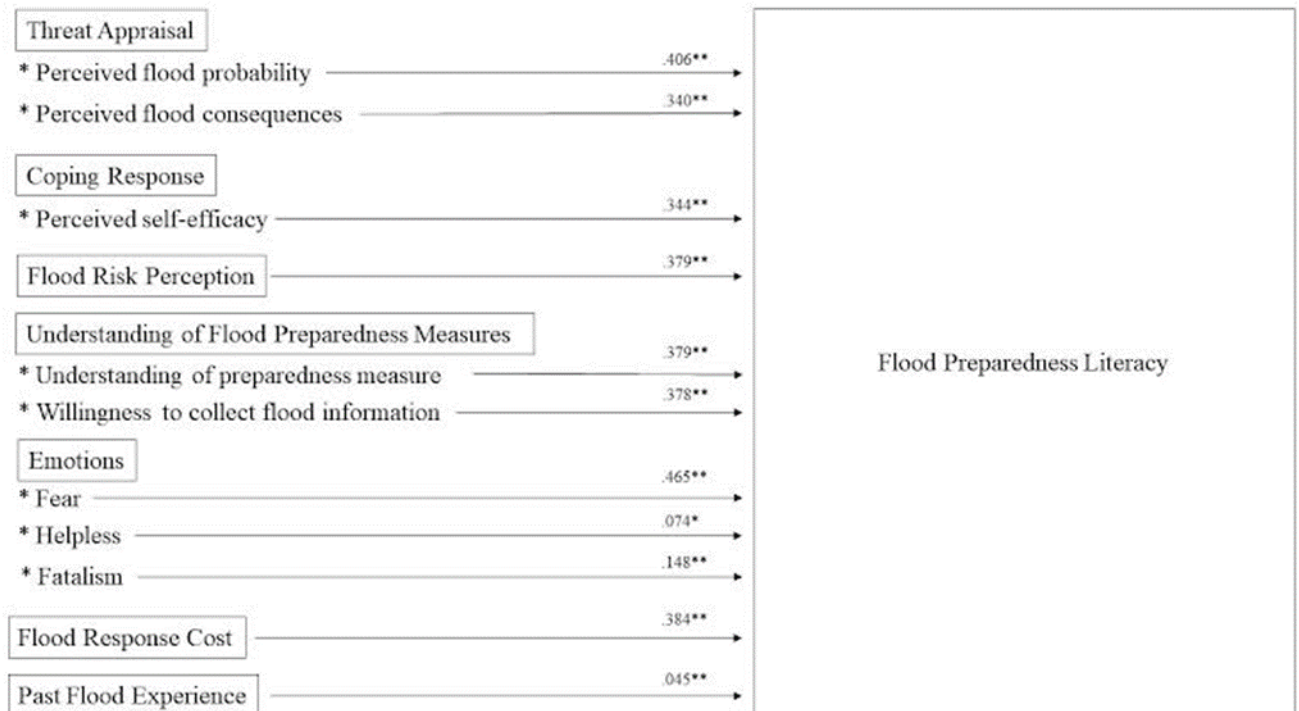
In terms of factors influencing the literacy of the elderly in Bangkok as mentioned in Hypotheses 3 and 4, significant positive correlations were found between appraisal of both perceived flood probability ($r = 0.406$) and consequences ($r = 0.340$), perceived self- efficacy (belief in their ability to prepare and take actions to deal with flood; $r = 0.344$), understanding of flood preparedness measures ($r = 0.379$), and flood preparedness literacy (i.e., the ability of the elderly to use and access information on flood preparation on both online and offline platforms; $p < 0.01$) (Figure 4.16(a)). This means that Hypothesis 3.1 was confirmed. Based on the Theory of Planned Behavior, attitudes, intentions, and subjective norm was positively related to use of information and communication technology in order to strengthening flood preparedness literacy. A study of Wu and Song in 2020 revealed that intention of individual's behavior was affected by various factors. For instance, the elderly who have flood literacy tend to perceive more on both perceived flood probability and consequences, perceived self- efficacy, and understanding flood preparedness measures among the elderly respondents. Meanwhile, Hypothesis 4.1 was also accepted. There were significant positive correlations found between negative feelings of fear ($r = 0.465$), the feeling of helplessness to flood events ($r = 0.074$) and fatalism ($r = 0.148$), past flood experiences ($r = 0.045$) and flood preparedness literacy ($p < 0.01$) (i.e., the elderly respondents who felt helpless against flood disasters and had previous flood experiences tended to have lower literacy on flood preparedness). It could be implied that the feeling of fear and previous flood experiences are not an obstacle that inhibit their ability to use and access information on flood preparation on online and offline platforms. Similar to the study of Kittipongvises et al., (2020) it was revealed that past flood experiences did not result in proactive flood risk management actions. Even though, laypeople may often distance themselves from certain information on climate related disasters (i.e., flood) to either avoid the feeling of fear or reduce their cognitive dissonance, especially when their behaviors are not in line with their cognitions.

4.5.3.2. Factors Influencing Flood Preparedness Actions

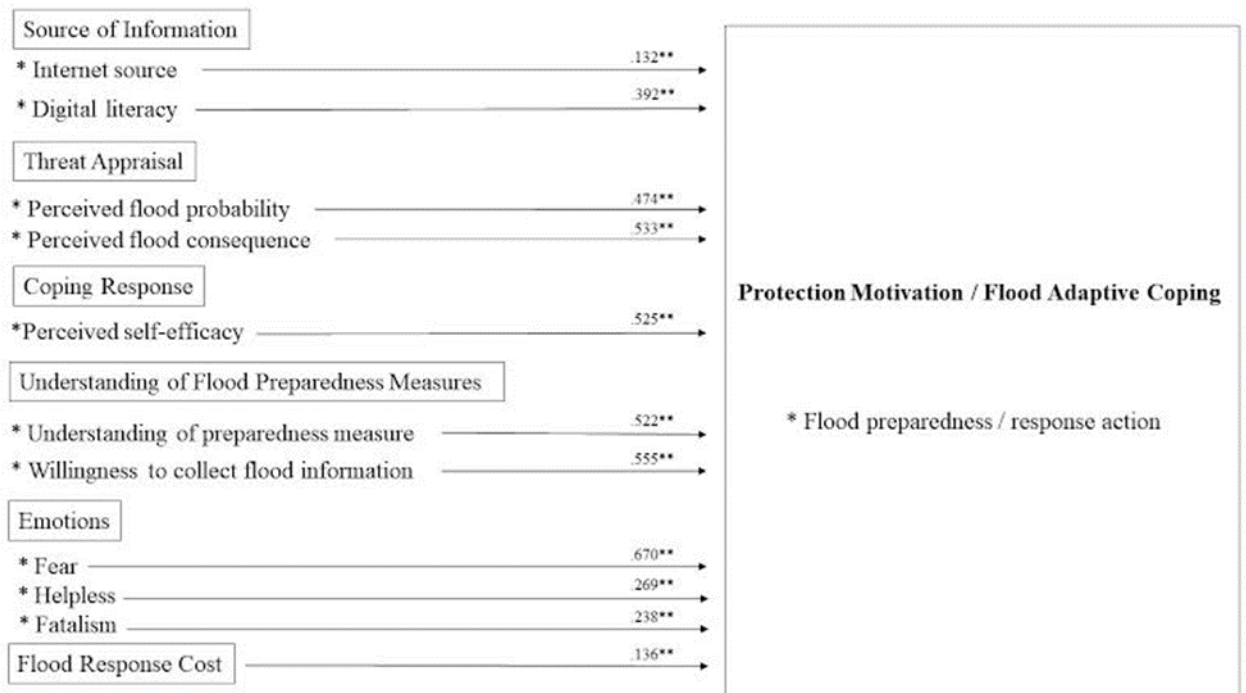
As shown in Figure 4.16(b), flood risk perception ($r = 0.522$), understanding of flood preparedness measures ($r = 0.522$), willingness to collect flood preparedness information ($r = 0.555$), perceived self-efficacy ($r = 0.474$), threat appraisal of both perceived flood probability ($r = 0.474$), and flood consequences ($r = 0.533$) showed significant positive correlations with ability to prepare for flood preparedness actions ($p < 0.01$). This link can be explained by flood risk perceptions and the PMT concept. With regard to flood engagement, perceived flood risk has been tied to enhanced flood coping appraisals and proactive actions. This is further explained by Oakley et al., who emphasized the significance of the two stages of the PMT as follows: i) threat appraisal or the perceived flood risk as the threat (i.e., perceived vulnerability: how likely is the flood threat to occur? and perceived severity: how bad will the effects of flood be?) and ii) coping appraisal or perceived self-efficacy (i.e., how are they able to respond to flood disaster?). This means that the elderly respondents not only have to perceive flood risk, but also feel that they can actually take action to deal with that risk. Similarly, Bubeck et al. argues that low self-efficacy (low coping appraisal) coupled with high threat appraisal can lead to non-protective behaviors, especially self-denial or avoidance. Thus, it is crucial to increase understanding and the perceived level of flood risk and perceived self-efficacy among elderly respondents to potentially reduce the number of respondents who neglect flood risk and increase preparedness against flooding.

Related to the extension of Theory of Planned Behavior, intention to the use of information and communication technology in order to enhance flood preparedness action, source of information, and flood preparedness action also showed a significant correlation with preparedness action of the elderly respondents ($p < 0.01$). This means that Hypothesis 3.2 is confirmed, i.e., the elderly who are more likely to perceive risks associated with flooding (both flood probability and consequence) and have a high level of flood preparedness literacy and an understanding of flood preparedness measures could take early preparedness actions before a flood disaster hits. In contrast, the elderly respondents who are less likely to perceive the risks of flooding in their community and who showed a low level of flood literacy tend to avoid their responsibility for flood preparedness actions. As highlighted by Oakley et al. (2020), both optimism bias and flood complexity are important in the perception of flood risk and their coping appraisal stage. The influence of bias, emotions, and complexity of flooding may potentially stop laypeople from engaging all proactive actions and taking a decision for flood

risk management.



(a)



(b)

Figure 4.16 Spearman's correlation coefficient analysis of factor influencing

(a) flood preparedness literacy, (b) flood preparedness action (n = 736)

However, Hypothesis 4.2 was somehow rejected as a significant positive correlation was observed between flood preparedness actions of the elderly and their negative feelings of fear ($r = 0.670$), helplessness, and fatalism ($r = 0.238$, $p < 0.01$). This means that elderly respondents who felt fear and believed in fate tend to prepare for proactive actions to cope with floods in the future. Similarly, in a study by Massazza et al. (2021), the majority of respondents living in Italy mentioned their feeling of fear (i.e., fear for one's own safety and fear for others) during disasters. In Germany, Becker et al. (2014) reported that 66% of respondents felt fear the consequences and the potential damage of flood events. The percentage of respondents who felt fear increased to about 80% of the total population for those who have been exposed to previous flooding. The feeling of fear about flood events has been considered to be a leading factor of flood threat appraisal. As the extended PMT, there was a significant positive relationship between flood response cost and preparedness to flood of the elderly ($r = 0.136$). These results implied that the elderly respondents who intended to pay for flood management, appeared to be more intended for flood preparedness actions.

CHAPTER 5

Conclusion and Recommendations

Climate related risks commonly poses a great challenge to global citizens, particularly vulnerable older adults. Not much is known about the perception and preparedness actions of the elderly in response to flood event. To build flood resilience, the literacy has been considered as one of the most important skills a person who can use, communicate, share, and access to flood information on online platforms. According to the SWOT analysis and expert interviews, many older people confront with many difficulties in using information and communication technology for flood risk reduction and management. Also, there is lack of effective integrated policy for ageing population and flood preparedness, limited training sessions on flood management, and flood warning system in the community. Although, low literacy skills of the older people were the key barriers of strengthening community flood resilience.

The overlay method by applying ArcGIS 9.3 was conducted to address the distribution of flood hazard in Bangkok by blending the characteristics of the following eight factors into hazard areas: annual maximum rainfall, land subsidence, past flood experiences, slope, sea-level rise, land-use types, road density, and drainage density. Each of the characteristics were combined by the relative weighting approach when the weighted averages of continuous criteria are standardized to a weighted average. For instance, flood hazard areas were classified as high, medium, and low hazard level.

This research investigated factors affecting flood preparedness literacy and preparedness actions of the elderly in Bangkok, Thailand ($n = 736$), which is one of the fastest aging countries in the world. The result highlighted the limitations of the elderly to use information and communication technology for flood preparedness and flood risk reduction. A clear majority of the elderly respondents residing in high hazard risk areas had never used, communicated on, or shared flood information and related preparedness actions via social network platforms. Most of the respondents felt fear and had fatalistic views about flood disasters. Demographically, gender, education, and income levels of the respondents significantly influenced their flood preparedness literacy and preparedness actions ($p < 0.05$). In the context of flood preparedness actions, a statistically significant positive correlation was found between

flood risk perception, perceived self-efficacy, and threat appraisal of both perceived flood probability and consequences and ability to prepare themselves for flood preparedness and response actions ($p < 0.01$). Based on the PMT, the following recommendations may enhance resilience in flood risk management and reduction: promote flood literacy skills, improving emotional well-being of the elderly population, enhancing flood disaster risk perception, and routine and sustainable promotion of flood preparedness digital literacy.

Overall, to answer objective 4, to provide recommendations to promote flood preparedness literacy and preparedness actions of elderly in Bangkok, the following discussions and recommendations were given to strengthen flood preparedness literacy and preparedness capacity to deal with flood hazard among the elderly population in Bangkok:

Flood Preparedness Literacy

Table 5.1 Recommendation for Flood preparedness literacy

Agenda	Stakeholder	Activities
Promoting flood literacy by using of information and communication technology in older adult	<ul style="list-style-type: none"> - Digital Economy Promotion Agency - Department of Disaster Prevention and Mitigation - Department of Older Persons - BMA - Chula Ari 	<ul style="list-style-type: none"> - Social media platform - Using of information and communication technology

<p>Promoting digital and information literacy on flood risk management for the elderly</p>	<ul style="list-style-type: none"> - Digital Economy Promotion Agency - - Department of Older Persons - Department of Disaster Prevention and Mitigation - BMA - Chula Ari 	<ul style="list-style-type: none"> - Raising awareness of flood disaster risk and preparedness - Enhancing technology acceptance about flood information and communication
<p>Ease-of-use and availability</p>	<ul style="list-style-type: none"> - Government Big Data Institute (GBDi) - Start-up company (private) - Ministry of Digital Economy and social 	<ul style="list-style-type: none"> - User-friendly in information and communication technology - Connectivity, availability and affordable

Promoting flood literacy by using information and communication technology in older adult: The use of social media is the most important key to enhance their collaboration on flood management and flood risk reduction and information sharing. Either tacit or explicit knowledge in regard to flood hazards is an important element in flood risk perception in the elderly. So thus, the use of information and communication technology, intellect can be acquired through chatting and discussion online. A study of Hashim et al. (2015) declared that

the respondents with high level of tacit knowledge would twist the information sharing task during disaster. The user-friendly in information and communication technology. Stakeholders include the Department of Economy Promotion Agency, Department of Disaster Prevention and Mitigation, Department of Older Persons, BMA, and Chula Ari.

Promoting digital and information literacy on flood risk management for the elderly: It is very important to raise awareness about flood disaster risk and preparedness, especially among vulnerable older adults, both in terms of content of message and mechanisms of delivery. In practice, application of mobile technologies to incorporate flood disaster learning into daily life is essential for engaging the elderly in preparedness behaviors, i.e., obtaining overall information about flood location and availability of preparedness service and disseminating early warnings of flood hazard. To tackle the above challenges, advanced media technologies, such as social media, internet, and mobile applications should be routinely promoted as channels for disseminating flood preparedness information to the vulnerable older population both pre disaster (i.e., Facebook, Risk Geo-Wiki, In a SAFE, and GPS Logger for Android devices) and post disaster (i.e., Facebook and Twitter). This research then highlights the potential to enhance technology acceptance and readiness about flood information and communication through appropriate training and educational campaigns of the vulnerable older population. Stakeholders include Department of Economy Promotion Agency, Department of Disaster Prevention and Mitigation, Department of Older Persons, BMA, and Chula Ari.

Ease-of-use and availability: More importantly, flood literacy requires technology devices. With a limited budget on the elderly, the price of the electronic devices should be affordable including the internet package charge. Wi-Fi and other network connection should be available and stable. The webpage or application design should be easy to use from the login stage. Content is not too complicated. A study of Lane and Coleman showed that the more ease of use technology with social networking media it is then more perceived with usefulness and effectiveness in using application. Stakeholders include Ministry of Digital Economy and Social, Government Big Data Institute, and Start-up Company.

Flood Preparedness Action

Table 5.2 Recommendation for flood preparedness action

Agenda	Stakeholders	Activities
Promoting flood preparedness action in advance	<ul style="list-style-type: none"> - Department of Disaster Prevention and Mitigation - BMA - Community 	<ul style="list-style-type: none"> - Action procedure guidelines; before, during, and after flood
Strengthening emotional well-being of the elderly population to cope with flood	<ul style="list-style-type: none"> - Department of Older Persons - Department of Economy Promotion Agency - BMA - Chula Ari - Community 	<ul style="list-style-type: none"> - Promote the positive attitude about flood
Enhancing disaster risk perception among the elderly population	<ul style="list-style-type: none"> - Department of Disaster Prevention and Mitigation - Armed Force Department Command 	<ul style="list-style-type: none"> - Increasing flood threat perception - Providing probabilistic information

	- Community	
Empowering elderly integration into disaster and climate change related policies	<ul style="list-style-type: none"> - Department of Disaster Prevention and Mitigation - Department of Older Persons - Department of Economy Promotion Agency - BMA - Office of Environmental Policy and Planning - Chula Ari 	<ul style="list-style-type: none"> - Developing short-term and long-term plan related to climate change, community resilience, disaster risk reduction and management
Engaging the elderly in resilience activities, disaster preparedness and arranging flood - training program in the community	<ul style="list-style-type: none"> - Department of Disaster Prevention and Mitigation - Department of Older Persons - BMA - Chula Ari - Community - Senior Club 	<ul style="list-style-type: none"> - Raising awareness of flood risk - Organizing training activity on flood preparedness and response

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Promoting flood preparedness action in advance: Flash floods usually occur suddenly following a rainfall and also with some other factors. Ensuring that everybody will be secured and safe, the consequence and impact of floods are needed in order to boost up the awareness and benefit of preparation that was done in advance. The following guidelines were recommended to do before, during, and after floods to promote flood preparedness action in advance. For before the flood, downloading the emergency application for electronic devices in order to receive the warning, information and measure, and situation of flood in the community. Staying informed about the community's risk and response plans is important. It must be ensured that family members know how to get back in touch once they have been separated during an emergency. Creating a house evacuation plan and assembling an emergency preparedness kit is needed. During the flood, continuing to listen to radio, television, or social media platform for latest information and updates. For hygiene, avoid contact with flood water, it may be contaminated with sewage or any toxic. For after a flood, continue listening to radio, television, and review social media platforms for updated information and instruction. Return only when the authorities announce it is safe, in case of being evacuated. Reconnecting with family members and friends so that they know you are safe. Stakeholders include the Department of Disaster Prevention and Mitigation, BMA, and Community.

Strengthening emotional well-being of the elderly population to cope with flood: Not only cognitive mechanisms (i.e., likelihood and consequences), but also affective domains (i.e., emotions) directly influence preparedness intentions and actions of the local residents. Therefore, more positive emotions should be promoted among the Thai elderly in order to stimulate their thoughts and improve perceived coping behaviors in accordance with the broaden-and-build theory. Fredrickson et al. also confirmed the relationship between positive emotions in disaster crises and resilience. Stakeholders include the Department of Older Prsons, Department of Economy Promotion Agency, BMA, Chula Ari, and Community.

Enhancing disaster risk perception among the elderly population: Referring to a study of

Baker et al. (2014), both cognitive risk perception and perceived coping ability are important precursor factors to motivate flood prevention response. In the context of the augmented PMT, flood risk communication should aim to increase flood threat perception through updated information, without negative impacts on coping and threat appraisal. Providing probabilistic information on flood risks may affect understanding, risk perception, and flood preparedness literacy of the residents. It is then necessary to avoid communicating flood risk through terminologies used in meteorological monitoring and data, especially to the elderly population. Ramasubramanian et al. (2019) revealed that respondents receiving flood disaster communication via text only or text with visual aid demonstrated significantly better comprehension of flood risk than those who did not receive such information. Stakeholders include the Department of Disaster Prevention and Mitigation, Armed Force Department Command, and Community.

Empowering elderly integration into disaster and climate change related policies: The provincial master plans related to climate change that incorporate both community resilience and empowerment of the elderly in flood and climate extreme events, disaster risk reduction, and disaster management should be developed. More importantly, flood literacy such as digital and media literacy should be associate with both an emergency / immediate flood response and a long-term development plan. Stakeholders include the Department of Disaster Prevention and Mitigation, Department of Older Persons, Department of Economy Promotion Agency, BMA, Office of Environmental Policy and Planning, and Chula Ari.

Engaging the elderly in resilience activities, disaster preparedness and arranging flood training program in the community: To raise the awareness of flood risk, a study of Kittipongvises and Mino (2013) explained that the elderly who have flood experience should probably share their lessons learned to others who have not. The senior citizens club may play a potential useful role in order to increasing flood hazard awareness of vulnerability among the elderly. Moreover, local government agencies should collaborate with relevant stakeholders to build up training programs and activities to accessorize knowledge about flood disaster and their preparedness and response to the elderly population society. Information of flooding on the intensity or frequency and property protection should be available before flood, whereas

more information on health-related problems including water and food supply should be given during flood event. Stakeholders include the Department of Disaster Prevention and Mitigation, Department of Older Persons, BMA, Chula Ari, Community, Senior Club.

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Annex

Bangkok's Flood Risk Area

High risk

District	Area by District	Flood Risk Area (sq.km)	Risk by Area
	(sq.km.)	High	(%)
Ratchathewi District	7.17	7.16	99.88
Din Daeng District	8.47	8.44	99.70
Phaya Thai District	9.21	9.17	99.57
Wang Thonglang District	17.08	16.98	99.46
Chatuchak District	32.66	32.12	98.35
Huai Khwang District	16.32	15.59	95.51
Bang Sue District	12.95	12.31	95.04
Dusit District	11.33	10.72	94.63
Bang Kapi District	27.59	25.96	94.09
Lat Phrao District	21.27	19.88	93.50

Khan Na Yao District	25.38	23.69	93.36
Bueng Kum District	23.41	21.67	92.60
Bang Na District	14.10	12.91	91.55
Suan Luang District	24.11	22.06	91.48
Nong Chok District	234.72	214.56	91.41
Prawet District	52.02	46.63	89.64
Don Mueang District	36.21	31.57	87.18
Pathum Wan District	8.03	6.98	86.95
Khlong Sam Wa District	114.15	98.73	86.49
Saphan Sung District	28.07	23.59	84.05
Thawi Watthana District	50.68	40.47	79.84
Lat Krabang District	127.94	101.35	79.22
Vadhana District	13.00	10.28	79.13
Lak Si District	22.98	18.15	78.97

Bang Phlat District	11.92	9.34	78.34
Bang Khen District	40.96	31.09	75.91
Phra Khanong District	13.51	10.01	74.05
Min Buri District	61.12	42.92	70.22
Bang Khae District	47.89	33.27	69.47
Bangkok Yai District	6.30	4.27	67.74
Sai Mai District	43.09	28.40	65.91
Bangkok Noi District	12.32	7.31	59.32
Phasi Charoen District	19.18	10.16	52.94
Taling Chan District	35.83	18.49	51.61
Pom Prap Sattru Phai District	2.50	1.24	49.60
Nong Khaem District	36.00	16.57	46.04
Bang Bon District	34.53	13.24	38.36
Khlong Toei District	12.74	4.32	33.92

Phra Nakhon District	5.36	1.33	24.76
Samphanthawong District	1.39	0.30	21.59
Khlong San District	5.97	0.98	16.42
Thon Buri District	8.46	1.14	13.45
Bang Rak District	4.01	0.37	9.27
Bang Khun Thian District	127.46	11.10	8.71
Yan Nawa District	11.48	1.00	8.70
Sathon District	7.26	0.36	4.95
Chom Thong District	23.17	1.00	4.30
Rat Burana District	11.81	0.48	4.03
Bang Kho Laem District	8.31	0.33	3.92
Thung Khru District	32.57	0.53	1.63

Moderate risk

District	Area by District (sq.km.)	Flood Risk Area (sq.km)	Risk by Area (%)
		Moderate	
Sathon District	7.26	6.80	93.71
Chom Thong District	23.17	21.52	92.89
Bang Rak District	4.01	3.53	87.94
Rat Burana District	11.81	10.31	87.30
Thung Khru District	32.57	27.80	85.34
Yan Nawa District	11.48	9.59	83.57
Bang Kho Laem District	8.31	6.84	82.26
Thon Buri District	8.46	6.88	81.25
Bang Khun Thian District	127.46	95.57	74.98
Khlong San District	5.97	4.32	72.41
Phra Nakhon District	5.36	3.53	65.93
Samphanthawong District	1.39	0.91	64.99

Khlong Toei District	12.74	8.11	63.67
Bang Bon District	34.53	17.93	51.93
Pom Prap Sattru Phai District	2.50	1.18	47.17
Taling Chan District	35.83	15.86	44.28
Nong Khaem District	36.00	15.84	44.00
Phasi Charoen District	19.18	8.40	43.78
Bangkok Noi District	12.32	4.43	35.93
Sai Mai District	43.09	12.38	28.73
Bangkok Yai District	6.30	1.81	28.70
Bang Khae District	47.89	12.58	26.27
Phra Khanong District	13.51	3.25	24.04
Min Buri District	61.12	14.15	23.14
Bang Khen District	40.96	8.76	21.38
Vadhana District	13.00	2.46	18.92

Lak Si District	22.98	4.30	18.72
Lat Krabang District	127.94	23.37	18.27
Thawi Watthana District	50.68	8.60	16.97
Bang Phlat District	11.92	1.61	13.53
Saphan Sung District	28.07	3.52	12.53
Pathum Wan District	8.03	0.97	12.04
Don Mueang District	36.21	3.96	10.93
Khlong Sam Wa District	114.15	12.31	10.78
Prawet District	52.02	5.01	9.62
Suan Luang District	24.11	1.84	7.64
Lat Phrao District	21.27	1.38	6.47
Nong Chok District	234.72	14.73	6.27
Bueng Kum District	23.41	1.33	5.67
Khan Na Yao District	25.38	1.28	5.04

Bang Na District	14.10	0.66	4.69
Bang Kapi District	27.59	1.12	4.06
Huai Khwang District	16.32	0.50	3.06
Bang Sue District	12.95	0.15	1.17
Wang Thonglang District	17.08	0.07	0.44
Chatuchak District	32.66	0.03	0.08
Din Daeng District	8.47	0.00	0.00
Dusit District	11.33	0.00	0.00
Phaya Thai District	9.21	0.00	0.00
Ratchathewi District	7.17	0.00	0.00

Low risk

District	Area by District	Flood Risk Area (sq.km)	Risk by Area
	(sq.km.)	Low	(%)
Bang Khun Thian District	127.46	20.78	16.31
Bang Kho Laem District	8.31	1.15	13.83
Samphanthawong District	1.39	0.19	13.41
Thung Khru District	32.57	4.24	13.02
Khlong San District	5.97	0.67	11.18
Nong Khaem District	36.00	3.58	9.96
Bang Bon District	34.53	3.36	9.72
Phra Nakhon District	5.36	0.50	9.31
Rat Burana District	11.81	1.02	8.66
Bang Phlat District	11.92	0.97	8.13
Yan Nawa District	11.48	0.89	7.72
Min Buri District	61.12	4.05	6.63

Dusit District	11.33	0.61	5.37
Sai Mai District	43.09	2.31	5.36
Thon Buri District	8.46	0.45	5.30
Bangkok Noi District	12.32	0.58	4.75
Bang Khae District	47.89	2.04	4.26
Taling Chan District	35.83	1.47	4.11
Bang Sue District	12.95	0.49	3.79
Bang Na District	14.10	0.53	3.77
Bangkok Yai District	6.30	0.22	3.56
Saphan Sung District	28.07	0.96	3.42
Phasi Charoen District	19.18	0.63	3.28
Pom Prap Sattru Phai District	2.50	0.08	3.22
Thawi Watthana District	50.68	1.62	3.19
Chom Thong District	23.17	0.65	2.81

Bang Rak District	4.01	0.11	2.79
Khlong Sam Wa District	114.15	3.11	2.73
Bang Khen District	40.96	1.11	2.71
Lat Krabang District	127.94	3.22	2.51
Khlong Toei District	12.74	0.31	2.42
Nong Chok District	234.72	5.43	2.31
Lak Si District	22.98	0.53	2.30
Vadhana District	13.00	0.25	1.95
Phra Khanong District	13.51	0.26	1.91
Don Mueang District	36.21	0.68	1.88
Bang Kapi District	27.59	0.51	1.85
Bueng Kum District	23.41	0.41	1.73
Khan Na Yao District	25.38	0.41	1.60
Chatuchak District	32.66	0.51	1.57

Huai Khwang District	16.32	0.23	1.43
Sathon District	7.26	0.10	1.34
Pathum Wan District	8.03	0.08	1.01
Suan Luang District	24.11	0.21	0.88
Prawet District	52.02	0.38	0.74
Phaya Thai District	9.21	0.04	0.43
Din Daeng District	8.47	0.03	0.30
Ratchathewi District	7.17	0.01	0.12
Wang Thonglang District	17.08	0.02	0.11
Lat Phrao District	21.27	0.01	0.04

Certificate of Research Approval



Office of the Research Ethics Review Committee for Research Involving Human Subjects:
The Second Allied Academic Group in Social Sciences, Humanities and Fine and Applied Arts
Chamchuri 1 Building, Room 114, Phayathai Road, Wang Mai Sub-district,
Pathum Wan District, Bangkok 10330
Telephone number 0 2218 3210-11 E-mail curec2.ch1@chula.ac.th

COA No. 120/2564

Certificate of Research Approval

Research Project Number 095/64 DIGITAL LITERACY FOR ENHANCING PREPAREDNESS
CAPACITY TO CLIMATE RELATED RISKS AMONG AGEING POPULATION IN BANGKOK,
THAILAND

Principal Researcher Mr. Chandhit Sawangnate

Office Environment Development and Sustainability, Graduate School, Chulalongkorn University

The Research Ethics Review Committee for Research Involving Human Subjects: The Second Allied Academic Group in Social Sciences, Humanities and Fine and Applied Arts at Chulalongkorn University, based on Declaration of Helsinki, the Belmont report, CIOMS guidelines and the Principle of the international conference on harmonization – Good clinical practice (ICH-GCP) has approved the execution of the aforementioned research project.

Signature Theraphan Luangthongkum
(Emeritus Prof. Theraphan Luangthongkum, PhD.)
Chairman

Signature นงนุช รังปณสมริต
(Asst. Prof. Nunghatai Rangponsumrit, PhD.)
Secretary

Research Project Review Categories: Expedited Review

Date of approval: 2 June 2021

Expiry date: 1 June 2022

Documents approved by the Committee

1. The research proposal
2. The researcher CV
3. The information sheets for research participants
4. The informed consent form
5. The questionnaire and guide questions for in-depth interview



Protocol No.	095 / 64
Date of Approval	- 2 JUN 2021
Approval Expiry Date	- 1 JUN 2022

Conditions

1. The researcher has acknowledged that it is unethical if he/she collects information for the research before the application for an ethics review has been approved by the Research Ethics Review Committee
2. If the certificate of the research project expires, the research execution must come to a halt. If the researcher wishes to reapply for approval, he/she has to submit an application for a new certificate at least one month in advance, together with a research progress report.
3. The researcher must conduct the research strictly in accordance with what is specified in the research project.
4. The researcher must **only** use documents that provide information for the research sampling population/participants, their letters of consent and the letters inviting them to take part in the research (if any) that have been endorsed with the seal of the Committee.
5. If any seriously untoward incident happens to the place where the research information, which has requested the approval of the Committee, is kept, the researcher must report this to the Committee within five working days.
6. If there is any change in the research procedure, the researcher must submit the change for review by the Committee before he/she can continue with his/her research.
7. For a research project of less than one year the researcher must submit a report of research termination (AF 03.13) and an abstract of the research outcome within thirty days of the research being completed. For a research project which is a thesis, the researcher must submit an abstract of the research outcome within thirty days of the research being completed. This is to be used as evidence of the termination of the project.
8. A research project which has passed the Exemption Review, must observe only the conditions in 1, 6 and 7.

Questionnaire



แบบสอบถามเรื่อง

การรู้ดิจิทัลเพื่อเสริมสร้างศักยภาพในการรับมือกับความเสี่ยงจากการเปลี่ยนแปลงสภาพภูมิอากาศ:

กรณีศึกษากลุ่มผู้สูงวัย ในกรุงเทพมหานคร

คำชี้แจง: แบบสอบถามชุดนี้เป็นส่วนหนึ่งของวิทยานิพนธ์ระดับดุษฎีบัณฑิตกิตติมศักดิ์ของนิสิตหลักสูตร
สิ่งแวดล้อม การพัฒนาและความยั่งยืน (นานาชาติ)/(สหสาขาวิชา) บัณฑิตวิทยาลัย จุฬาลงกรณ์มหาวิทยาลัย
มีวัตถุประสงค์เพื่อ ศึกษาสถานะการณปัจจุบัน นโยบาย และกิจกรรมต่างๆ ของผู้สูงวัย และทำการศึกษาถึง
ปัจจัยที่มีอิทธิพลต่อการรู้เทคโนโลยีเพื่อพัฒนาศักยภาพในการรับมือต่อการเปลี่ยนแปลงของสภาพภูมิอากาศ
ประโยชน์ที่คาดว่าจะได้รับการวิจัยนี้คือ เพื่อเป็นการส่งเสริมการรู้ดิจิทัลเป็นลดความเสี่ยงต่อการเกิดภัย
พิบัติในกลุ่มผู้สูงวัย ในเขตกรุงเทพมหานคร โดยแบบสอบถามชุดนี้มีคำถามทั้งหมด 44 ข้อ ประกอบไปด้วย
เนื้อหา 5 ส่วน ได้แก่ ส่วนที่ 1 ข้อมูลส่วนบุคคล 12 ข้อ ส่วนที่ 2 ความตั้งใจและการปฏิบัติตนต่อการ
เหตุการณ์น้ำท่วม 13 ข้อ ส่วนที่ 3 การรับมือกับเหตุการณ์น้ำท่วม 15 ข้อ ส่วนที่ 4 การรู้เทคโนโลยี 4 ข้อ และ

ส่วนที่ 5 ข้อคิดเห็น/ข้อเสนอแนะอื่นๆ (หากมี) โดยผู้วิจัยขอให้ท่านใส่เครื่องหมาย ✓ ลงในช่องคำตอบทุกข้อ คำถามที่ตรงกับความเป็นจริงมากที่สุด ทั้งนี้ท่านอาจรู้สึกอึดอัด หรืออาจรู้สึกไม่สบายใจอยู่บ้างกับบางคำถาม ท่านมีสิทธิ์ที่จะไม่ตอบคำถามเหล่านั้นได้ รวมถึงท่านมีสิทธิ์ถอนตัวออกจากโครงการนี้เมื่อใดก็ได้ โดยไม่ต้องแจ้งให้ทราบล่วงหน้า และการไม่เข้าร่วมวิจัยหรือถอนตัวออกจากโครงการวิจัยนี้ จะไม่มีผลกระทบต่อท่านแต่อย่างใด ข้อมูลที่ได้จากการตอบแบบสอบถามนี้ ใช้เพื่อนำเสนอขั้นตอนในการทำวิจัยนี้เท่านั้นและจะดำเนินการทำลายข้อมูลตลอดจนข้อมูลอื่น ๆ ทั้งหมดที่เกี่ยวข้องกับท่านภายหลังเสร็จสิ้นการวิจัย เป็นเวลา 1 ปี หากมีข้อสงสัยในประเด็นข้อคำถามโปรดติดต่อ นายฉันทิต สว่างเนตร โทรศัพท์ 02218-3518 เพื่อซักถาม ในข้อสงสัยดังกล่าว ผู้วิจัยขอขอบพระคุณท่านที่สละเวลาในการร่วมตอบแบบสอบถามครั้งนี้เป็นอย่างสูง

ส่วนที่ 1: ข้อมูลส่วนบุคคล

1.1 เพศ

ชาย

หญิง

1.2 อายุ

60-69 ปี

70-79 ปี

80 ปีขึ้นไป

1.3 เขตที่พักอาศัย

- | | | | |
|---|---|--------------------------------------|--|
| <input type="checkbox"/> เขตสัมพันธวงศ์ | <input type="checkbox"/> เขตป้อมปราบศัตรูพ่าย | <input type="checkbox"/> เขตบางรัก | <input type="checkbox"/> เขตพระนคร |
| <input type="checkbox"/> เขตบางกอกน้อย | <input type="checkbox"/> เขตสาทร | <input type="checkbox"/> เขตวัฒนา | <input type="checkbox"/> เขตบางพลัด |
| <input type="checkbox"/> เขตดุสิต | <input type="checkbox"/> เขตคลองสาน | <input type="checkbox"/> เขตบางซื่อ | <input type="checkbox"/> เขตบางกอกใหญ่ |
| <input type="checkbox"/> เขตบางคอแหลม | <input type="checkbox"/> เขตธนบุรี | <input type="checkbox"/> เขตปทุมวัน | <input type="checkbox"/> เขตตลิ่งชัน |
| <input type="checkbox"/> เขตดินแดง | <input type="checkbox"/> เขตจตุจักร | <input type="checkbox"/> เขตราชเทวี | <input type="checkbox"/> เขตหลักสี่ |
| <input type="checkbox"/> เขตพระโขนง | <input type="checkbox"/> เขตยานนาวา | <input type="checkbox"/> เขตลาดพร้าว | <input type="checkbox"/> เขตจอมทอง |
| <input type="checkbox"/> เขตภาษีเจริญ | <input type="checkbox"/> เขตทวีวัฒนา | <input type="checkbox"/> เขตพญาไท | <input type="checkbox"/> เขตราชบุรีบูรณะ |
| <input type="checkbox"/> เขตห้วยขวาง | <input type="checkbox"/> เขตบางนา | <input type="checkbox"/> เขตคลองเตย | <input type="checkbox"/> เขตบางแค |
| <input type="checkbox"/> เขตวังทองหลาง | <input type="checkbox"/> เขตบึงกุ่ม | <input type="checkbox"/> เขตบางกะปิ | <input type="checkbox"/> เขตสวนหลวง |
| <input type="checkbox"/> เขตคันนายาว | <input type="checkbox"/> เขตสะพานสูง | <input type="checkbox"/> เขตบางเขน | <input type="checkbox"/> เขตทุ่งครุ |
| <input type="checkbox"/> เขตดอนเมือง | <input type="checkbox"/> เขตหนองแขม | <input type="checkbox"/> เขตประเวศ | <input type="checkbox"/> เขตสายไหม |
| <input type="checkbox"/> เขตบางบอน | <input type="checkbox"/> เขตบางขุนเทียน | <input type="checkbox"/> เขตมีนบุรี | <input type="checkbox"/> เขตลาดกระบัง |
| <input type="checkbox"/> เขตหนองจอก | <input type="checkbox"/> เขตคลองสามวา | | |

1.4 การศึกษา

- | | |
|---|---|
| <input type="checkbox"/> ไม่ได้เรียนหนังสือ | <input type="checkbox"/> ประถมศึกษา |
| <input type="checkbox"/> มัธยมศึกษา | <input type="checkbox"/> อนุปริญญา |
| <input type="checkbox"/> ปริญญาตรี | <input type="checkbox"/> ปริญญาโท หรือสูงกว่า |
| <input type="checkbox"/> อื่นๆ..... | |

1.5 รายได้ส่วนบุคคลปัจจุบัน (บาท/เดือน)

- | | |
|--|--|
| <input type="checkbox"/> ไม่มีรายได้ | <input type="checkbox"/> ต่ำกว่า 10,000 บาท |
| <input type="checkbox"/> 10,000 – 30,000 บาท | <input type="checkbox"/> 30,001 – 50,000 บาท |
| <input type="checkbox"/> สูงกว่า 50,000 | <input type="checkbox"/> อื่นๆ..... |

1.6 อาชีพปัจจุบัน

- | | | |
|--|--|--|
| <input type="checkbox"/> รับราชการ/รัฐวิสาหกิจ | <input type="checkbox"/> บริษัทเอกชน | <input type="checkbox"/> เจ้าของกิจการ |
| <input type="checkbox"/> ว่างาน | <input type="checkbox"/> พาร์ทไทม์ (Part time) | <input type="checkbox"/> เกษียณอายุ |

1.7 สถานะภาพครอบครัว

- | | |
|-------------------------------|--------------------------------|
| <input type="checkbox"/> โสด | <input type="checkbox"/> สมรส |
| <input type="checkbox"/> หย่า | <input type="checkbox"/> หม้าย |

1.8 ท่านมีโรคประจำตัวหรือไม่

ไม่มี

มี

1.9 ท่านไปโรงพยาบาล หรือศูนย์บริการสุขภาพ (ครั้ง/เดือน)

ไม่เคย

1-3 ครั้ง

4-6 ครั้ง

มากกว่า 6 ครั้ง

1.10 ที่พักอาศัย

อาศัยอยู่ที่บ้านของตัวเอง

อาศัยอยู่กับครอบครัว

อาศัยอยู่ที่สถานบริการสุขภาพ

1.11 ท่านมีส่วนร่วมในกิจกรรมการส่งเสริมความรู้ เพิ่มความชำนาญ การเผชิญเหตุเมื่อมีเหตุการณ์น้ำ

ท่วม?

ไม่มี

มี

1.12 ท่านสนใจหรือมักติดตามข่าวสารด้านใดที่เผยแพร่ในโทรทัศน์ วิทยุ หนังสือพิมพ์ รวมถึง สื่อออนไลน์ต่างๆ (โปรดเลือกและระบุ 3 อันดับแรกที่ท่านมีความสนใจมากที่สุด โดยใส่ตัวเลข 1-3 โดย 1 หมายถึงสนใจมากที่สุด รองลงมาคือ 2 และ 3 ตามลำดับ)

- | | |
|---|--|
| <input type="checkbox"/> ข่าวเศรษฐกิจ | <input type="checkbox"/> ข่าวบันเทิง/ดารานักแสดง |
| <input type="checkbox"/> ข่าวสังคม/สภาพความเป็นอยู่ | <input type="checkbox"/> ข่าวจราจร/ยานยนต์ |
| <input type="checkbox"/> ข่าวสุขภาพ | <input type="checkbox"/> ข่าวสิ่งแวดล้อม/พลังงาน |
| <input type="checkbox"/> อื่นๆ (โปรดระบุ.....) | |

ส่วนที่ 2: ความตั้งใจและการปฏิบัติต่อการเหตุการณ์น้ำท่วม

ทัศนคติต่อเหตุการณ์น้ำท่วม	มากที่สุด	มาก	ปานกลาง	น้อย	น้อยที่สุด
ท่านเห็นด้วยกับข้อความต่อไปนี้มากน้อยเพียงใด					
1 ท่านมีความสนใจเกี่ยวกับผลกระทบจากการเกิดน้ำท่วมในพื้นที่ของท่าน					

<p>2 ท่านต้องการทราบและรับรู้เกี่ยวกับแนวทางการป้องกัน และการเตรียมพร้อมในการเผชิญเหตุการณ์น้ำท่วม</p>					
<p>3 ท่านมักสนทนาหรือซักถามข้อมูลจากสมาชิกในครอบครัว หรือกลุ่มเพื่อนของท่านเกี่ยวกับมาตรการในการเตรียมตัวเมื่อเกิดเหตุการณ์น้ำท่วมฉับพลัน</p>					
<p>4 ท่านคิดว่าดิจิทัลเทคโนโลยี (การมีคอมพิวเตอร์ สมาร์ทโฟน รวมถึงการเข้าถึงอินเทอร์เน็ต) สามารถช่วยเหลือท่านในการเตรียมตัวกับการเกิดน้ำท่วม</p>					
<p>อิทธิพลจากบุคคลรอบข้าง</p>	<p>เห็นด้วย อย่างยิ่ง</p>	<p>เห็นด้วย</p>	<p>ไม่แน่ใจ</p>	<p>ไม่เห็นด้วย</p>	<p>ไม่เห็นด้วย อย่างยิ่ง</p>
<p>1 ท่านได้รับข้อมูล ข่าวสาร เกี่ยวกับการป้องกันและการเตรียมพร้อมรับมือกับปัญหาน้ำท่วมจากครอบครัวของท่านเสมอ</p>					
<p>2 ท่านได้มีการพูดคุยกับเพื่อน คนสนิท เกี่ยวกับการป้องกันและเตรียมพร้อมรับมือกับปัญหาน้ำท่วม</p>					

3 ท่านได้รับรู้ข้อมูลเกี่ยวกับการป้องกันและการเตรียมพร้อมรับมือกับปัญหาน้ำท่วมจากสื่อมวลชนเสมอ					
4 ท่านได้รับรู้ข้อมูลเกี่ยวกับการป้องกันและการเตรียมพร้อมรับมือกับปัญหาน้ำท่วมจากหน่วยงานภาครัฐเสมอ					
การรับรู้ความสามารถในการควบคุมพฤติกรรม	เห็นด้วย อย่างยิ่ง	เห็นด้วย	ไม่แน่ใจ	ไม่เห็น ด้วย	ไม่เห็นด้วย อย่างยิ่ง
1 ท่านมีเชื่อมั่นในความสามารถและศักยภาพของตนเองในการเตรียมพร้อมเพื่อรับมือเมื่อเกิดน้ำท่วมในชุมชนของท่าน					
ความตั้งใจ	เห็นด้วย อย่างยิ่ง	เห็นด้วย	ไม่แน่ใจ	ไม่เห็น ด้วย	ไม่เห็นด้วย อย่างยิ่ง
1 ท่านมีความตั้งใจที่จะเตรียมตนเองให้พร้อมในการรับมือและเผชิญกับเหตุการณ์น้ำท่วม					

2 ท่านมีความตั้งใจที่จะปฏิบัติตามมาตรการการรับมือและเผชิญกับเหตุการณ์น้ำท่วม จากภาครัฐ เมื่อเกิดเหตุน้ำท่วม					
การปฏิบัติ	เห็นด้วย อย่างยิ่ง	เห็นด้วย	ไม่แน่ใจ	ไม่เห็น ด้วย	ไม่เห็นด้วย อย่างยิ่ง
1 ท่านใช้มาตรการในการเตรียมตัวในการรับมือและเผชิญกับเหตุการณ์น้ำท่วมจากภาครัฐ ในชีวิตประจำวันอย่างสม่ำเสมอ					
2 ท่านปฏิบัติตามมาตรการการรับมือและเผชิญกับเหตุการณ์น้ำท่วมจากภาครัฐ เมื่อเกิดเหตุการณ์น้ำท่วมอย่างสม่ำเสมอ					

ส่วนที่ 3: การรับมือกับเหตุการณ์น้ำท่วม

ที่มา/ แหล่งข้อมูล	เห็นด้วย อย่างยิ่ง	เห็นด้วย	ไม่แน่ใจ	ไม่เห็น ด้วย	ไม่เห็นด้วย อย่างยิ่ง
--------------------	-----------------------	----------	----------	-----------------	--------------------------

<p>1 ท่านมีความเชื่อถือต่อข่าวสารเกี่ยวกับสถานการณ์น้ำท่วม และมาตรการการรับมือกับเหตุน้ำท่วมจากแหล่งข้อมูลจากอินเทอร์เน็ต</p>					
<p>2 ท่านเห็นด้วยว่าการรู้เทคโนโลยีสามารถช่วยให้การได้รับข้อมูล ข่าวสาร เกี่ยวกับมาตรการการรับมือกับเหตุการณ์น้ำท่วมได้มาก และง่ายขึ้น</p>					
<p>3 ท่านเห็นด้วยว่าการรู้เทคโนโลยีสามารถช่วยให้รับมือกับเหตุการณ์น้ำท่วมได้ดีขึ้น</p>					
<p>การประเมินภัยคุกคาม</p>	<p>เห็นด้วย อย่างยิ่ง</p>	<p>เห็นด้วย</p>	<p>ไม่แน่ใจ</p>	<p>ไม่เห็นด้วย</p>	<p>ไม่เห็นด้วย อย่างยิ่ง</p>
<p>1 ท่านคิดว่าชุมชนที่ท่านพักอาศัยอยู่มีความเสี่ยง/แนวโน้มเกิดน้ำท่วมเป็นประจำ</p>					
<p>2 ท่านรับรู้ถึง ผลลัพธ์หรือความรุนแรงของเหตุการณ์น้ำท่วมจะเกิดขึ้นกับที่พักอาศัย และพื้นที่ที่ท่านอาศัยอยู่</p>					

ความรู้สึก	เห็นด้วย อย่างยิ่ง	เห็นด้วย	ไม่แน่ใจ	ไม่เห็น ด้วย	ไม่เห็นด้วย อย่างยิ่ง
1 ท่านมีความรู้สึกกลัวเมื่อเกิดเหตุการณ์น้ำท่วม					
2 ท่านคิดว่า ท่านเป็นภาระเมื่อเกิดเหตุการณ์น้ำท่วม					
3 ท่านเชื่อว่าผู้สู้งัยเป็นผู้เปราะบางเมื่อเกิดเหตุการณ์น้ำท่วม					
ประสบการณ์ในอดีต	เคย			ไม่เคย	
1 ท่านเคยประสบเหตุน้ำท่วมรุนแรงในพื้นที่ชุมชนของท่าน					
การรับรู้ความเสี่ยง	เห็นด้วย อย่างยิ่ง	เห็นด้วย	ไม่แน่ใจ	ไม่เห็น ด้วย	ไม่เห็นด้วย อย่างยิ่ง
1 ท่านตระหนักกว่าที่พักอาศัยและชุมชนที่ท่านอาศัยอยู่ อยู่ในพื้นที่น้ำท่วม					
การตอบสนองการเผชิญปัญหา	เห็นด้วย อย่างยิ่ง	เห็นด้วย	ไม่แน่ใจ	ไม่เห็น ด้วย	ไม่เห็นด้วย อย่างยิ่ง

1 ท่านมีความมั่นใจในความสามารถของตนเองในการเตรียมตัวเมื่อเกิดเหตุการณ์น้ำท่วม					
2 การเตรียมถุงยังชีพ และอุปกรณ์ที่จำเป็น ก่อนที่จะเกิดภัยน้ำท่วม เป็นสิ่งจำเป็นที่ควรทำ					
3 ท่านได้รวบรวมข้อมูลการเตรียมตัวในการเผชิญกับเหตุการณ์น้ำท่วมอยู่เสมอ					
4 ท่านมีความเข้าใจเป็นอย่างดี เกี่ยวกับมาตรการป้องกันภัยจากเหตุการณ์น้ำท่วม ซึ่งต้องกระทำก่อนเหตุการณ์น้ำท่วมจะมาถึง (เช่น การติดตามข่าวสาร เข้าร่วมกิจกรรมฝึกอบรม การเก็บสัมภาระในพื้นที่ปลอดภัย)					
5 ท่านคิดว่าการค่าใช้จ่ายในการเตรียมตัวรับมือและเผชิญกับเหตุการณ์น้ำท่วม อยู่ในระดับใด	สูงมาก	ค่อนข้างสูง	ปานกลาง	ค่อนข้าง ไม่สูง	ไม่สูง

ส่วนที่ 4: การรู้เทคโนโลยี

(1) ท่านตอบแบบสอบถามชุดนี้ (ออนไลน์) ด้วยอุปกรณ์ส่วนตัวของท่านเอง (สมาร์ทโฟน

คอมพิวเตอร์)

ใช่

ไม่ใช่

(2) ท่านใช้แอปพลิเคชัน หรือเว็บไซต์ใด ในการค้นหาข้อมูลเกี่ยวกับการเตรียมตัวก่อนเหตุการณ์น้ำ

ท่วม


ไม่เคยใช้ (ข้ามไปที่คำถาม 4 และ 5)

 เฟซบุ๊ก


 ไลน์

 ทวิตเตอร์

 กูเกิล

 กรุงเทพมหานคร
BANGKOK METROPOLITAN ADMINISTRATION กรุงเทพมหานครเว็บไซต์ BMA www.bangkok.go.th

 กรมบรรเทาสาธารณภัยเว็บไซต์ www.disaster.go.th

-  Chula ARI* จุฬารารี โครงการบูรณาการศาสตร์เพื่อรองรับสังคมสูงวัย
www.chulaari.chula.ac.th

-  รายงานสถานการณ์น้ำท่วม Thai Flood Reporter

- อื่นๆ (โปรดระบุ.....)

(3) ท่านใช้แอปพลิเคชัน หรือเว็บไซต์ใด ในการค้นหาข้อมูลเกี่ยวกับการเตรียมตัวขณะเกิด

เหตุการณ์น้ำท่วม

- ไม่เคยใช้ (ข้ามไปที่คำถาม 4 และ 5)


-  เฟซบุ๊ก


-  ไลน์


-  ทวิตเตอร์

-  กูเกิล

-  กรุงเทพมหานคร
BMA กรุงเทพมหานคร
BANGKOK METROPOLITAN ADMINISTRATION กรุงเทพมหานครเว็บไซต์ BMA www.bangkok.go.th

-  กรมบรรเทาสาธารณภัยเว็บไซต์ www.disaster.go.th

-  Chula ARI* จุฬารารี โครงการบูรณาการศาสตร์เพื่อรองรับสังคมสูงวัย
www.chulaari.chula.ac.th

-  รายงานสถานการณ์น้ำท่วม Thai Flood Reporter

- อื่นๆ (โปรดระบุ.....)

(4) จากข้อ 2 และ 3 เมื่อเกิดเหตุน้ำท่วม หรือกำลังจะเกิดเหตุน้ำท่วม ท่านได้ติดต่อ แลกเปลี่ยน

ข้อมูลกับครอบครัว เพื่อน ผ่านสังคมออนไลน์

ใช่

ไม่ใช่ (เพราะเหตุใด โปรด

ระบุ.....)

ส่วนที่ 5: ข้อคิดเห็นหรือข้อเสนอแนะอื่นๆ (หากมี)

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Data Collections: Community visits













VITA

Ms. Chandhit Sawangnate was born in Thailand on 18 January 1977. She got bachelor's degree in business administration from Assumption University, Thailand in 1999. He received a Certificate in Finance and Banking from University of California, Berkeley in 2002, Master's Degree in Economics from California State University, Hayward in 2003, and Master of Arts in Korean Studies from Chulalongkorn University in 2019. Currently, he has been studying in the Doctor of Philosophy Program in Environment, Development, and Sustainability (EDS) at Chulalongkorn University. His Main research interests include demographic changes, climate related risks, and digital literacy. During the study, he has received the 100th year Anniversary Chulalongkorn University for Doctoral Scholarship.