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MASTER'S THESIS

CITIZEN ENGAGEMENT IN CLIMATE CHANGE ADAPTATION

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Master Thesis in Climate Change Management

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I confirm that the work is self-prepared and that references/source references to all sources used in the work are provided, cf. Regulation relating to academic studies and examinations at the Western Norway University of Applied Sciences (HVL), § 12-1.

Dedication

This thesis is dedicated to my late grandfather, Mian Muhammad Ashraf, and the people of Pakistan.

Acknowledgement

The last two years in Sogndal have been nothing short of magical for me. I feel I have grown as a human being and as an environmentalist. I found it hard to settle in during the first academic year because of Covid-19, but looking back I can only think of the good things. My experience at HVL has been amazing and I'm honoured to be a part of its alumni.

Thesis writing was by far the hardest thing I have ever been tasked with. The thesis journey was not easy. It was challenging and excruciating at times. Had I not been surrounded by amazing people who helped me academically and emotionally, I would not have been able to reach my goals. Thus, thanks are in order.

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Abstract:

Adaptation has developed as a significant topic of study and evaluation among researchers working in the field of climate change. According to the vast majority of scholarly research, the most important factor in determining adaptation is the availability of limited resources. Empirical research on adaptation has, for the most part, ignored the significance of observable and adaptable psychological elements in the process of deciding on adaptation up until this point. This thesis has been constructed upon a socio-cognitive Model of Private Proactive Adaptation to Climate Change (MPPACC) in an attempt to highlight and justify the research that has been done in the fields of behavioural psychology and economics. The applicability of MPPACC has been investigated for the process of explaining adaptation in Tipu Block, New Garden Town, Lahore. 10 residents were interviewed in order to determine the motivators behind climate change adaptation with regards to urban flooding. Results showed that motivators varied amongst respondents based on their perception of the level of risk posed by urban floods. The main motivators found through this study include damage to personal property and belongings, household monthly income, and extent of government involvement.

Keywords: *climate change adaptation, citizen engagement, urban flooding, MPPACC*

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Introduction:

The climate change issue has appeared very vigorously throughout the last two decades on a worldwide scale in perspective of its predicted consequences on the surroundings of vulnerable regions. Currently, there is a perilous need to initiate adaptation to climate change methods since it has become indeed very evident that progressively complicated worldwide obstacles cannot merely be settled by technological advances or governments alone. Adaptation measures for climate change are needed urgently. In addition to this, we need to establish innovative social behaviours and promote a larger cultural change toward preservation and sustainability (Wamsler, 2018). It is essential to prioritise citizen engagement as a crucial adaptation instrument for possibly dangerous implications of climate change because climate adaptation initiatives enacted by governments around the world are grossly inadequate for attempting to tackle the drastic consequences of climate change, particularly in urban territories (Brink & Wamsler, 2019). I aim to investigate factors that encourage young citizens to adapt to increased urban flooding resulting from climate change, as they are to face the brunt of climate change shortly. I expect my findings to enhance knowledge of young citizens' views on climate adaptation regarding urban flooding and bridge the gap between citizen engagement and climate adaptation policies, thus leading to better adaptation measures being implemented.

The ability to adapt to the consequences of climate change largely based on the joint efforts of local authorities and communities., i.e., people. Citizen engagement is essential for efficient climate adaptation because of this dependence (Wamsler & Brink, 2014). On the other hand, there is a lack of knowledge on the capabilities of individuals to adapt to climate change, particularly evidence addressing the adaptive behaviours taken by people who live in metropolitan areas (Carmin et al., 2012). For this reason, an in-depth examination of the adaptability of urban residents is essential. More particularly, there is a demand for investigation that is based on young people and focuses on the reaction of young individuals to different methods of citizen involvement since in the coming years, young people will take the burden of the effects of climate change (Maguire, 2019).

Flooding in urban areas is drawing the greatest focus among the many natural catastrophes that are emerging as a direct effect of climate change. This is mainly due to the detrimental effect

that flooding has on urban life in metropolises across the developing countries, notably in Pakistan (Zia & Shirazi, 2019). The rapid urbanisation that has taken place in Pakistan over the past 60 years has had a substantial impact on the climatic change that has occurred in urban areas. The significant increases in urban population, along with the vast investments made in urban structures, populated neighbourhoods, and industrial sites, as well as in transport networks, have led to significant changes in the mean temperature of the metropolis. (Sajjad et al., 2009). Pakistan is ranked fifth in the countries most affected by climate change (Eckstein & Kreft, 2020). In the past few decades, urban flooding has become a significant concern, particularly in large urban areas like Lahore. This research will play an important part in giving statistics on public participation to regional authorities around the world, which may help in the creation of appropriate adaptation strategies.

Insufficient information is provided by the existing body of literature about the elements that inspire engagement in and adaptation by citizens (Hegger et al., 2017). Studies on the acknowledgement of situational obstacles and the strong motivational influences for citizen engagement in climate adaptation persist in limited supply (Glaas et al., 2015, p. 57). Recent research has examined factors, such as feelings, attitudes, opinions, and viewpoints, that can either facilitate or impede the process of adaptation (Brink & Wamsler, 2019). These aspects will be considered while analysing citizen engagement for this study. To validate these arguments with empirical data, I have used MPPAAC Model to highlight the aspects that can encourage adaptation amongst young citizens. The key research question of my thesis is: ***What are the aspects that inspire citizens' engagement in and for climate adaptation with regards to urban flooding?*** This qualitative study aims to answer the aforementioned key question through interviews conducted through a door-to-door method. The target population for this study are individuals aged between 18 and 26 residing in New Garden Town, Lahore, Pakistan. This will function as a pilot study which can be scaled up to analyse citizen engagement on a provincial and national level and can also be implemented in areas particularly vulnerable to the impacts of climate change. It is expected that the results will provide valuable insight into which aspects can be targeted by local governments to ensure successful citizen engagement for climate change adaptation measures.

Thesis Plan:

The structure of my thesis is distributed into eight chapters.

The first chapter is the background, which deals with thorough information on geographical and climatic trends of Lahore, Pakistan where this study has been conducted.

The second chapter comprises of the literature review, which examines the literature that has been used in the entire thesis. It includes three sub-sections which are an extension of the literature review. The first sub-section includes literature on climate change adaptation, defining its types and importance. The second sub-section focuses on the key components of MPPACC along with its extension. The third sub-section defines urban flooding & citizen engagement towards adaptation. The second chapter ends with the research gap that is to be implored by this study.

The third chapter puts forward the research question and the theoretical framework

The fourth chapter is methodology, which explains the methods used in conducting the research.

The fifth chapter is results and discussion providing the result of the study conducted.

The sixth chapter is the conclusion of the study.

The seventh chapter ends with limitations of the study and future recommendations.

1. Background:

This chapter will illustrate the background information related to Lahore, the city of Pakistan, where this research has been conducted. This information will help fully understand the ongoing situation of urban flooding and highlight the factors that would lead to climate change adaptation by the citizens. By presenting the demographical, topographical and climatic conditions of Lahore, it would be easy to analyse the research question about the aspects that influences adaptation when such an event (urban flooding) may occur.

1.1. Geographical Situation of Pakistan:

Pakistan is situated in the western part of South Asia, approximately between the latitudes of 24-37 degrees North and the longitudes of 62-75 degrees East. The rainfall pattern in Pakistan is greatly fluctuational. The rain does not consistently fall during the whole year in Pakistan, even though monsoon winds and western disturbances are largely to blame for the country's very variable rainfall patterns. For instance, during the months of March, the provinces of Khyber Pakhtunkhwa and Baluchistan receive the greatest rainfall, while the provinces of Punjab and Sindh receive between 50 and 75% of rainfall from July through September (Pakistan Meteorological Department, 2012). Lahore is a city that is currently the prime focus of my thesis. It is the capital of the Punjab province and is between the latitudes of 31°15' and 31°43' north and the longitudes of 74°10' and 74°39' east. Being a developing region, it has emerged as one of the most important intellectual and cultural centres in Pakistan. The western part of Lahore is characterised by low-lying areas with grained soils, whereas the eastern part of the city is located in higher-lying districts that are near to the Indian border. Every year during the monsoon season, its western section, which includes the Ravi River, is inundated by floods with a risk ranging from low to medium (Zia & Shirazi, 2019).

Fig. 1 Map Showing Location of Pakistan and the District of Lahore

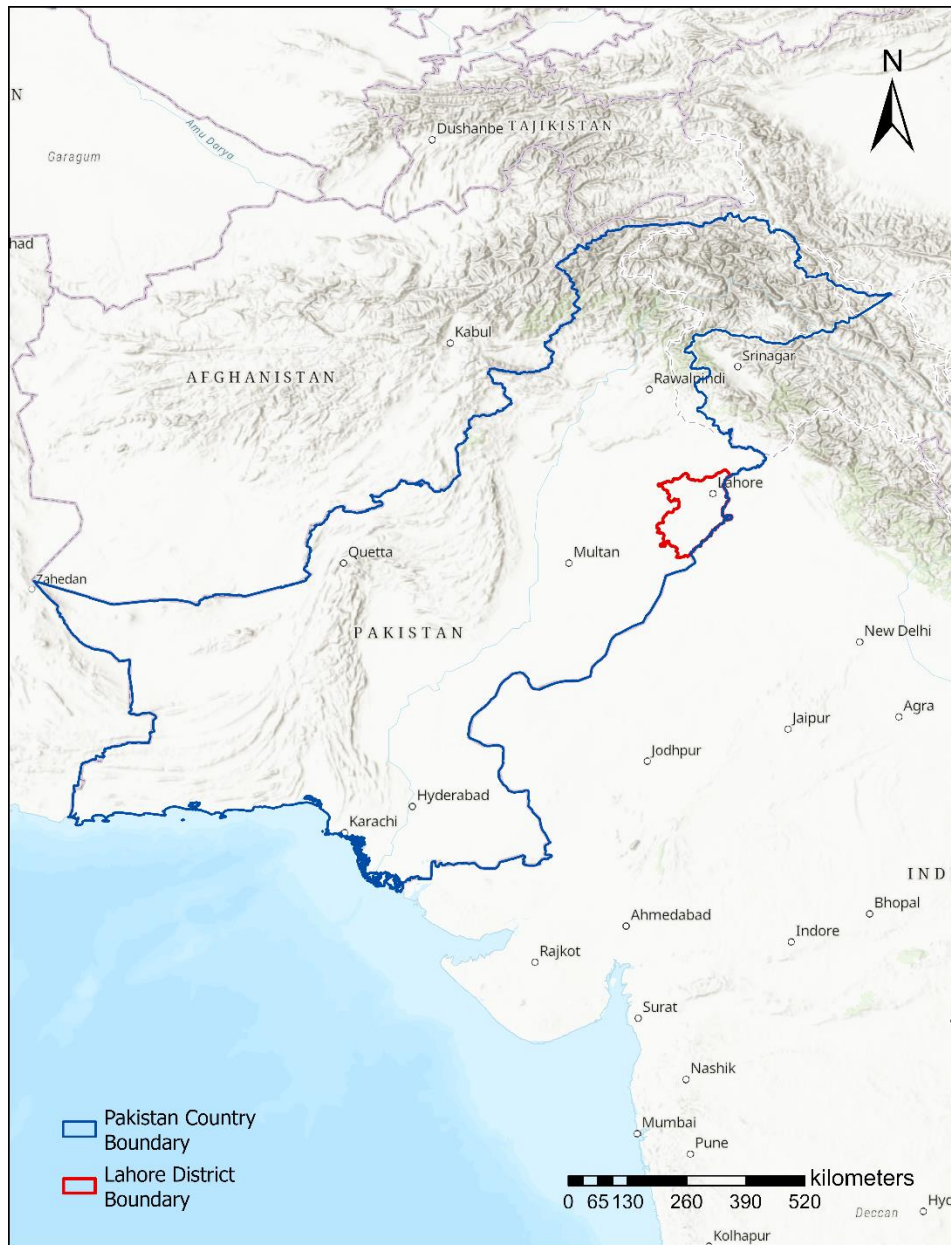
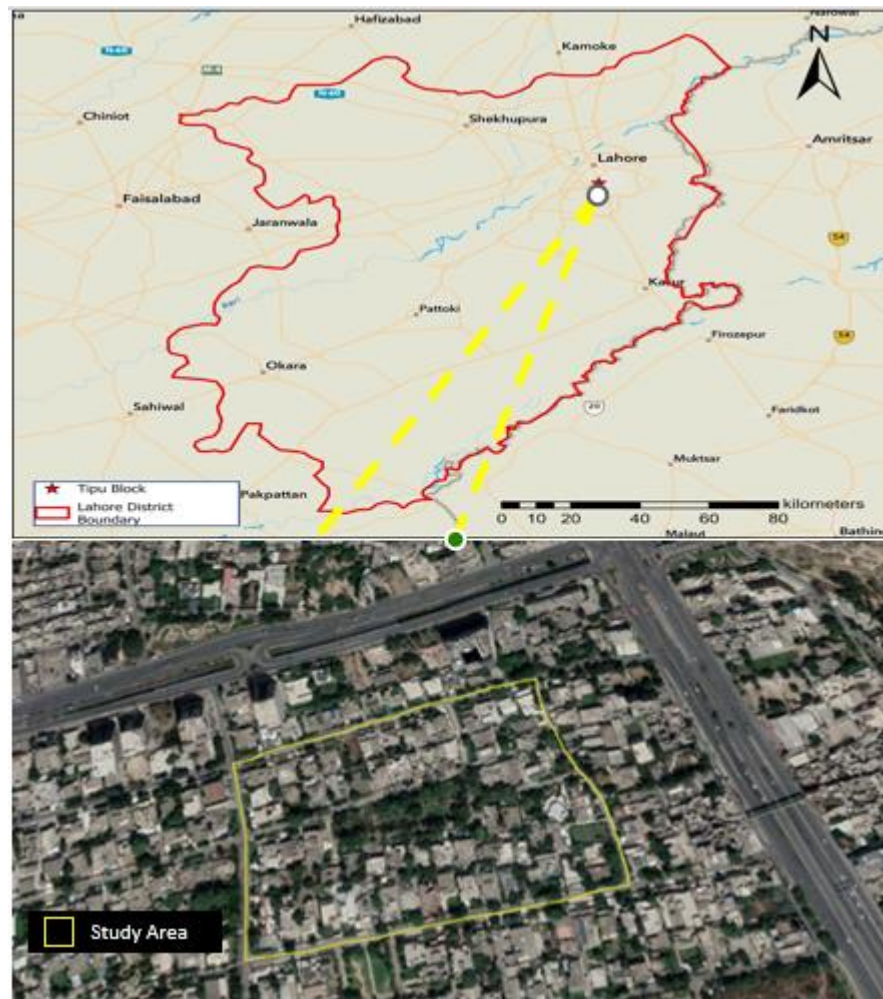


Fig. 2 Map Showing Tipu Block, Garden Town Lahore (Study Area)



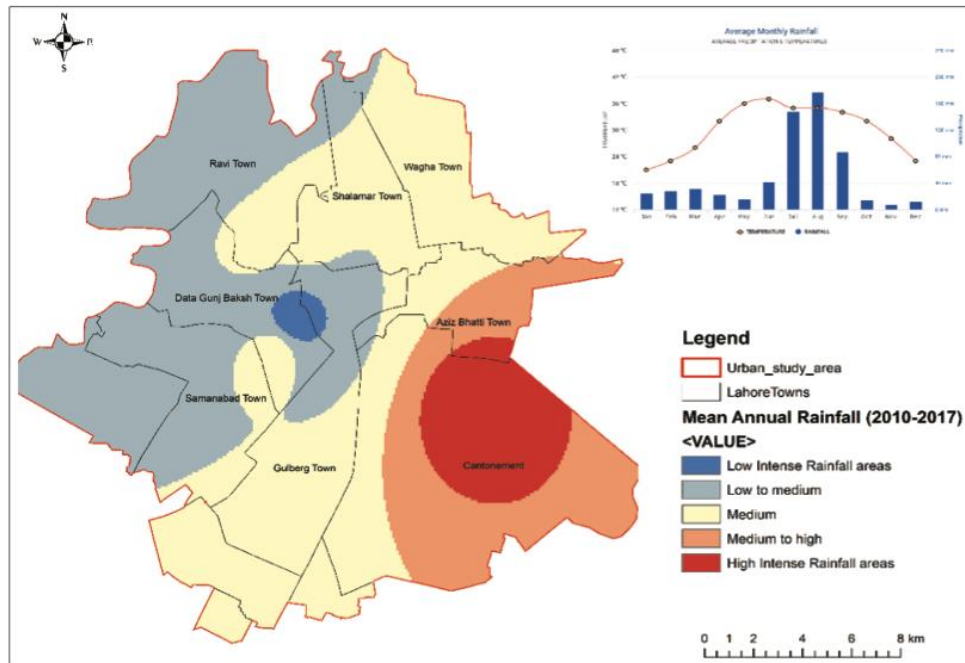
1.2. Climatic Trends in Lahore

The increasing dependence of people on agricultural produce and resource supplies, rapid population growth, deforestation, mistreatment of environmental assets, inappropriate collection of emissions and garbage, industrialization, and urban development all make people more responsive towards the consequences related to climate change (Werg et al., 2020).

The average rainfall is associated with the South Asian monsoon period that has increased tremendously over the past few decades, particularly over Pakistan's north-western monsoon fringes. This has led to more frequent and extreme hydro-meteorological ludicrous levels, which have impacted the agricultural growth in the economy, fresh produce, and water inspection of the country. Predicting the rainfall that will be brought by the southwest monsoon is thus required in order to establish efficient strategies that will encourage sustained development in Pakistan (Zia & Shirazi, 2019). See Fig.3 to understand the pattern of rainfall within the boundaries of Lahore.

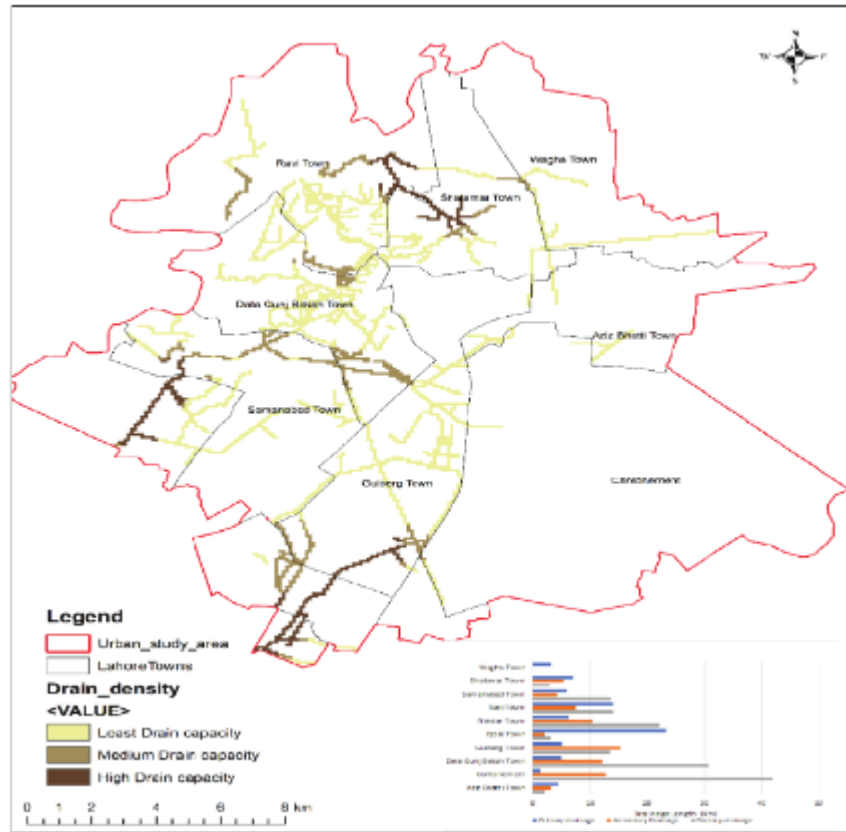
Lahore is the second most urbanized metropolitan area in Pakistan and has grown extremely susceptible to flooding caused by precipitation. The rain causes significant destruction to the infrastructure time after time (2015, 2018), and a great number of people lose their lives in disasters that are directly connected to the rain (Butt, 2019). The first case of urban flooding was recorded in July and August of 2010, when heavy monsoon rains wreaked significant havoc in the northern region of Pakistan. In what has been referred to as a slow-motion tsunami, the water eventually pushed south down the Indus River. Around one point, an area equally sized to England covered 1/5th of the country, which was submerged in water. And over 20 million people were impacted by the calamity when it occurred (*Pakistan Floods: Three Years on - Pakistan*, 2013).

Fig. 3 Spatial Precipitation Pattern of Study Area, Central Lahore.



Source: (Zia et al., 2021)

Fig. 4 Drainage Network Density, shows the capacity to hold and control flooding



Source: (Zia et al., 2021)

Multiple areas in Lahore are reportedly being looked at as potential solutions to the growing problem of urban flooding, as reported by various media outlets. According to an article that was published in the United Nations News on August 11, 2011, it was reported that the Pakistani province of Punjab was hit with heavy rains, which led to severe flooding in the municipalities of Kasur and Sialkot as well as urban flash floods in the central areas of Lahore as well as other substantial towns in Pakistan. An authorized source indicated in that year that urban floods were a key cause of the epidemic of dengue infection within the central area of province Punjab in September, 2011 (Zia et al., 2021).

2. Literature Review:

The literature review of my thesis solely focuses on what is climate change adaptation and how it influences citizens' engagement. The literature is separated into three chapters; the first chapter illustrates the prevalent research on climate change adaptation; which majorly is extracted from the book of Valkengoed & Steg (2019), '*The Psychology of Climate Change Adaptation*'. Moreover, multiple journal articles are cited to support the arguments provided with the help of empirical data. Majorly, this study is based on a publication by Brink & Wamsler (2019), titled '*Citizen engagement in climate adaptation surveyed: The role of values, worldviews, gender and place*'. The other chapter displays the characteristics of the model of MPPACC given by Grothmann & Patt (2005), and its extension as illustrated by Dang, Li, and Bruwer (2012). The model and its extension are employed to extract factors that contribute to climate change adaptation. It is essential to discuss the literary background of MPPACC to better engage it while analysing the results-driven from the interviews. Last chapter discusses the trends of urban flooding and how adaptation may occur to cope with such a situation, the major article used to illustrate factors that promote adaptation during urban flooding; is '*People at Risk of Flooding: Why Some Residents Take Precautionary Action While Others do not*' by Grothman & Reusswig (2004).

The literature of my thesis explores the role of socio-cognitive psychology or the mindfulness towards increasing risk and climate change adaptation, in order to understand how individual's behaviour is linked to climate change adaptation. This is done by employing the MPPACC model to identify the constraints to adaptation from physical to psychological or even institutional. The employed MPPACC model highlights the factors that participate towards climate change adaptation.

The three main topics are discussed within the literature review section. The first topic deals with climate change adaptation, which points out the types that helps to comprehend the significance of adaptation. The second topic defines the basics of MPPACC model and its extension which illustrate the factors that influence adaptive behaviour, which are to be used to

answer the research question. The third topic defines trends of urban flooding & citizen engagement towards adaptation.

2.1. Climate Change Adaptation

Climate change adaptation is defined as *'the process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities* (IPCC 2014).

2.1.1. Types of Adaptation:

Multiple types of adaptation can be observed, the term adaptation denotes the adaptive measures conducted in reaction to predicted climate-related dangers, whereas reactive adaptation denotes the adaptation which occurs as a reaction to climate-related risks that already happened previously (Smit et al., 2000). Second, we have the concept of autonomous adaptation, which speaks to the adaptive activities made by private actors independent of any involvement from government authorities or other public entities. Whereas, the planned adaptation helps in decision making on public policy that is taken by public institutions. (Tol, Klein, & Nicholls, 2008). Thirdly, the incremental adaptation approach discusses the adaptive efforts which attempt to sustain an established order and prevailing mode of living. On the other hand, transformational adaptation encompasses adaptive measures that strive to radically modify prevailing organizational, governmental, and belief systems. (IPCC, 2014). Differentiation may be drawn between adaptation and maladaptation, which is the fourth point. This latter term refers to *"activities, or inactions, that may contribute to a greater likelihood of bad climate-related consequences, elevated susceptibility to climate change, or lower welfare, either now or in the future."* (Valkengoed & Steg, 2019)

Table 1 - Definition of Different Types of Adaptive Actions

Type of Adaptation	Definition
---------------------------	-------------------

Reactive	It is only after climate-related risks have already happened that adaptations are taken..
Anticipatory	Adaptive measures are taken in reaction to climate-related dangers that are predicted.
Autonomous	Actions were taken by private individuals without the influence of the government or other public entities.
Planned	Decisions taken by public agencies in the public interest (Tol, Klein, & Nicholls, 2008)
Incremental	Efforts to preserve the status quo and the existing way of life.
Transformational	Changes the underlying organizational, governance, and viewpoints in essential ways (IPCC, 2014).

2.1.2. The Importance of Adaptation:

The temperature of the Earth has changed noticeably during the past century, and it is anticipated that this trend will continue into the next one in a significant way. The capability of ecosystem managers to preserve ecosystem stability and preserve species variety is being put in jeopardy as a direct result of change in climate (Jantarasami et al., 2010). As a result of the inevitability of climate change, there is no more sufficient time or resources to focus on controlling or reducing it. Because it is now a time for each person to take precautions to protect themselves against the consequences of natural disasters caused by climate change. In spite of the significance and efficiency of adaptation activities for preventing and reducing the harmful bearings of dangers related to the climate, many people persist in ignoring the measures necessary to guarantee their safety. This could be because they are oblivious of the dangers or

because they have no intention of adapting to the changing environment (Basolo et al., 2008). 2010).

2.1.3. Summary:

Due to the rising climate change, the need for generating a keen sense and importance of adaptability between individuals and communities is one of the most pressing issues of the day in the current era. Therefore, the main point of my research is to understand the main features which will help promote adaptation amongst young citizens. This will then help people to adapt more efficiently according to the changes in climate.

2.2. The Model of Private Proactive Adaptation to Climate Change (MPPACC)

2.2.1. Factors That Promote Climate Change

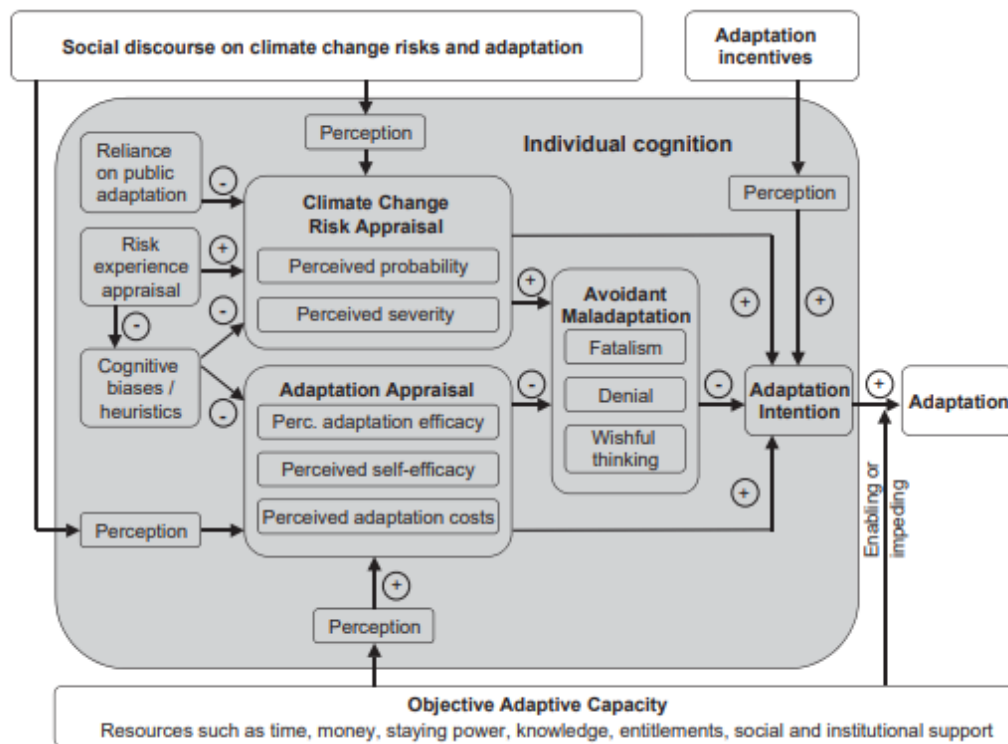
In this section, the Model of Private Proactive Adaptation to Climate Change will be introduced in this part, where I will evaluate the relevant psychological research (MPPACC; Grothmann & Patt, 2005, as illustrated in Figure 5). The MPPACC, which is based on protective motivation theory, says that risk perception, self-efficacy, outcome efficacy, and the perceived cost of adapting are the 4 important elements that influence adaptation behaviour. The model of MPPACC contains 3 more factors, including climate-related dangers, trust in government policies and perceived incentives to adapt to the climate change. There are 4 new components in the MPPACC model given by Dang and Li (2012): social standards, negative emotions, and various beliefs in climate change. (Valkengoed & Steg, 2019).

2.2.2. The Model of Private Proactive Adaptation to Climate Change:

MPPACC was designed to describe what aspects influence individuals and households to take part in adaptation behaviors (Grothmann & Patt, 2005). As a result of the fact that adapting to

climate change includes dealing with threats or dangers, the protection motive model appears to be an appropriate choice to describe which elements inspire adaptive behaviour. The protective motive framework that is used in health psychology was adapted into the MPPACC so that it could be used to describe how adaptation might occur in response to climate change. The MPPACC suggests that individual's adaptive behaviour may be predicted by four factors: risk perception (threat appraisal), outcome efficacy, self-efficacy and perceived adaptation costs (altogether referred as coping appraisal) (Valkengoed & Steg, 2019).

Figure 5. Process Model of Private Proactive Adaptation to Climate Change



Source: (Grothman, 2004)

2.2.3. Risk Perception:

Individual's personal assessments of the possibility and implications of a danger causing harm to them or either someone or something they respect, such as individuals of their families, close friends, belongings, or environment, are examples of the concept is characterised as risk perception. (Paek & Hove, 2017). The unease that comes with the perception of elevated

dangers is something that drives individuals to look for ways to relieve it. Therefore, people's perceptions of risk are likely to inspire them to adopt preventative and protective measures. The majority of studies came to the conclusion that increased amounts of risk perceptions are connected with rising amounts of adaptive behaviour (Grothman & Reusswig 2005; Liu et al., 2013). On the other hand, studies reveal that there is an adverse association between adaptive behaviour and risk perception; individuals who reported a higher level of risk were less inclined to engage in adaptive behaviour (Thaker et al., 2016).

The link between an individual's adaptation behaviour and risk perception may as well be contingent on restraining factors. An evaluation of the relevant literature points to three possible explanations for what restricts or hinders risk perception to always transform from risk perception to adaptive conduct or behaviour (Wachinger et al., 2013). First, there is the possibility that some people may just shrug their shoulders and accept the danger. The reason behind that is the advantages of participating in adaptive behaviour will not justify the expenses. Secondly, there is the possibility that some individuals are conscious of the dangers, but they may sense that it is not their duty to take action to mitigate the effects of climate-related threats. Third, there is the possibility that some individuals may not possess the resources necessary to behave effectively in reaction to the risk that they perceive, or that they do not possess the information necessary to determine which behaviours are suitable (Valkengoed & Steg, 2019). The main premise underlying this concept, that is supported by the model of MPPACC as well, is that risk perception is a required precondition for adaptive behaviour, but is not a necessary prerequisite for it (Grothmann & Patt, 2005).

Indicators of Coping Appraisal

2.2.4. Self-Efficacy:

Self-efficacy refers to an individual's awareness of their capability to get involved in adaptive behaviour (Burnham & Ma, 2017). Some believe adaptive behaviour is more likely when individuals feel they can participate in the relevant behaviour (Valkengoed & Steg, 2019). A study conducted on Chinese farmers found that self-efficacy was the most advantageous predictor of adaptive behaviour compared with other variables like risk perception (Burnham & Ma, 2017). On the other hand, some research studies do not find an essential connection

between adaptation behaviour and self-efficacy. An example of this is a study that investigated intentions to adapt by farmers to global climate change (Roesch-McNally, Arbuckle, & Tyndall, 2017).

According to another study (Richert et al., 2017), both participants with high self-efficacy and participants with low self-efficacy were unwilling to be involved in adaptive behaviours. A considerable degree of self-efficacy is mostly descriptive towards the desire to participate in adaptive behaviour, which implies that it could be a rounded link between adaptive behaviour and self-efficacy (Valkengoed & Steg, 2019).

2.2.5. Outcome Efficacy:

The term outcome efficacy relates to individual's views of the efficacy or value of a certain policy or performance in shielding those individuals from the risks associated with climate change (Samaddar et al., 2014). This is anticipated that the belief according to which an activity is helpful in giving protection will be a key determinant of behaviour since it gives individuals a motivation to engage in a certain action. A stronger perceived result efficacy of activities is connected with participating in more adaptive behaviour, according to the research, which largely validates the concept that this association exists (Demuth et al., 2016). In most situations, it has been discovered that outcome efficacy is one of the strongest indicators of adaptation behaviour than self-efficacy (Valkengoed & Steg, 2019).

2.2.6. Perceived Adaptation Costs:

The term perceived adaptation costs refers to the expenses that individuals believe are connected to the performance of adaptive behaviours. There are a lot of adaptive activities that come with high expenditures, whether those costs are financial or in terms of effort and time. Adaptive interventions, particularly those aimed at prevention, can incur large costs in terms of both time and money. According to the findings of studies, the presence of significant perceived costs acts as a hindrance to participating in adaptive behaviour (Brody et al., 2017). On the other hand, a comparable amount of research has arrived at the conclusion that perceived costs are not connected with adaptive behaviour. A study by Terpstra & Lindell (2012) found that the perception of costs leads towards the reduction in the quantity of individual who purchased

flood insurance, however, the perception of costs was not highly linked to the adoption of other, less expensive, adaptive measures. These initiatives include keeping a spare kit for emergency purposes and mounting a strategy for your resident in the event that flooding occurs. Thus, the perceived costs may mainly influence adaptation choice and behaviour when adaptive measures are substantially expensive (Valkengoed & Steg, 2019).

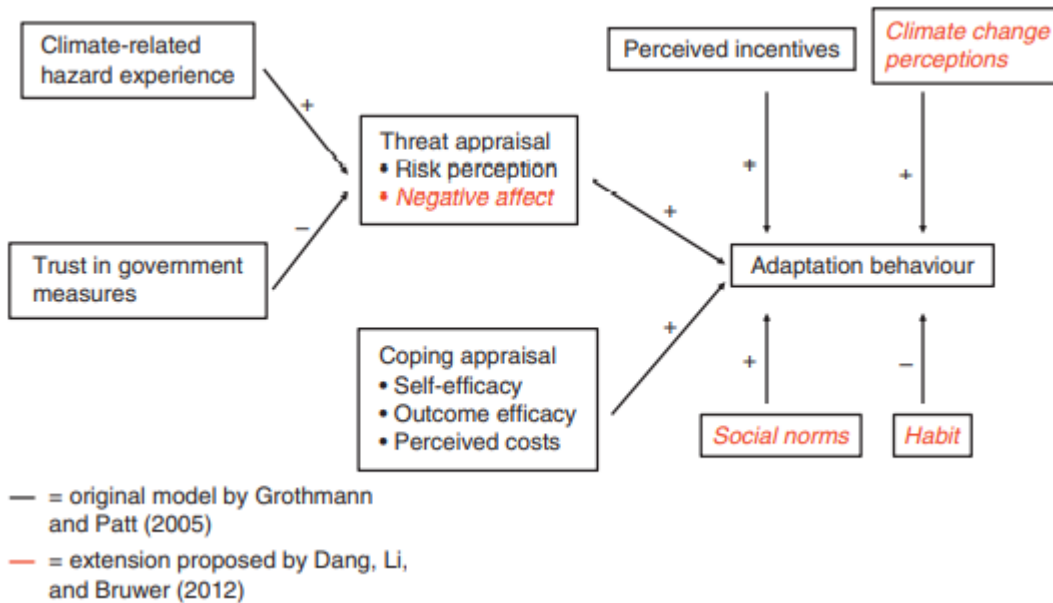
2.2.7. Summary:

According to the MPPACC, risk perception serves as a catalyst that activates or initiates the indicators of coping, which then dictate adaptive behaviour (Grothmann & Patt, 2005). Instead, the perception of risk will only lead to adaptive behaviour if the elements of the coping assessment, which include perceived outcome efficacy, adaptation costs, and self-efficacy, are all at high levels (Grothmann & Patt, 2005). When people perceive that they have high levels of self-efficacy and outcome efficacy, and low levels of adaptation costs, risk perception is more likely to lead to behaviour (Bubeck et al., 2012).

2.3. Other Factors Specified in the MPPACC

Adding to the previously mentioned 4 factors, the MPPACC includes 3 other variables that expand the model's framework. Additional components that extend the basic protective motivation framework include experience with climate-related dangers and trust in government adaptive actions, as well as perceived incentives for adaptation. An extended MPPACC was presented by Dang, Li, and Bruwer (2012) to incorporate several theoretical viewpoints on adaptation behaviour.

Figure 6 MPPACC (adapted from Grothmann & Patt, 2005) and its extension suggested by Dang, Li, and Bruwer (2012) in red font.



Source: (Valkengoed & Steg, 2019)

2.3.1. Experiences with Climate-related Hazards

Experiences with climate-related risks, in conjunction with a person's perception of the associated hazard, is the determinant of adaptive behaviour that is studied most often. The way we interpret events and the consequences of those events may be shaped and influenced by our experiences, and these experiences have a direct bearing on our behaviour. In keeping with the principles of operant conditioning, research has shown that individuals are more probable to modify their behaviour in response to an unpleasant experience in the terms of preventing a similar event in the future (e.g Haselhuhn et al., 2012). People's prior knowledge of climate change may be brought to the forefront by their previous encounters with climate-related risks, which also serves to bring home the realities and interpretations about climate change (Demski et al., 2017). Because of this, early studies (for example, Laska's work from 1990) made the assumption that direct exposure with risks relating to the climate would become as one of the

key drivers of adaptation. On the other hand, there are several potential grounds because experience can have a detrimental impact on individual's ability to adapt. For instance, an experience of a climate-related hazard might convince people that they are able to deal with climate-related risks and that they, therefore, do not require to make any preparations for such hazards. This is especially true if the climate-related hazards were not a particularly traumatic event (Bihari & Ryan, 2012). Alternately, people may develop a fatalistic attitude after experiencing a climate-related danger. This might lead them to assume that there is merely anything they can attempt to safeguard oneself from the effects of changes in climate, making adaptation more difficult (Ejeta et al., 2018). Alternately, people may develop a fatalistic attitude after experiencing a climate-related danger.

2.3.2. Trust in Government-issued Adaptive Measures

The implementation of extensive range of protective procedures attempted by governments, such as barriers and floodwalls, is an essential component in ensuring the public's safety from the effects of climate change. Adaptive measures that are already issued by the government are essential, but there is a possibility that they might have a significant disadvantage. If individuals have the impression that the government is taking action against the risks posed by climate change, then they may assume that they do not need to take any personal steps to adapt to the changing environment. The term levee-effect refers to the phenomenon where individuals are expected to be equipped in a lesser amount, if people will believe more than government-issued adaptive capacity would be effective in mitigating the effects of a natural disaster (Anderson & Kjar, 2008).

Cost-benefit evaluations serve as the foundation for the risk management methods developed by governments (Baan & Klijn, 2004). Such evaluations also demonstrate that people's activities to adapt according to climate change may become extremely successful in lowering the number of consequences of risks relating to climate during the generation of comparatively minimal costs. This is something that can be accomplished by taking comparatively simple actions (Valkengoed & Steg, 2019). According to the findings of a research, the financial loss caused by floods might be decreased by as much as 80 percent by individual measures of adaptation, such as rearranging furnishings or temporary blocking gaps in the house with

sandbags (Grothmann & Reusswig, 2006).

2.3.3. Perceived Incentives to Adapt:

People may contemplate adapting to climate change because of perceived incentives for example exemptions of tax, financial advantages along with the risk perceptions according to the MPPACC framework (Valkengoed & Steg, 2019).

2.4. Summary:

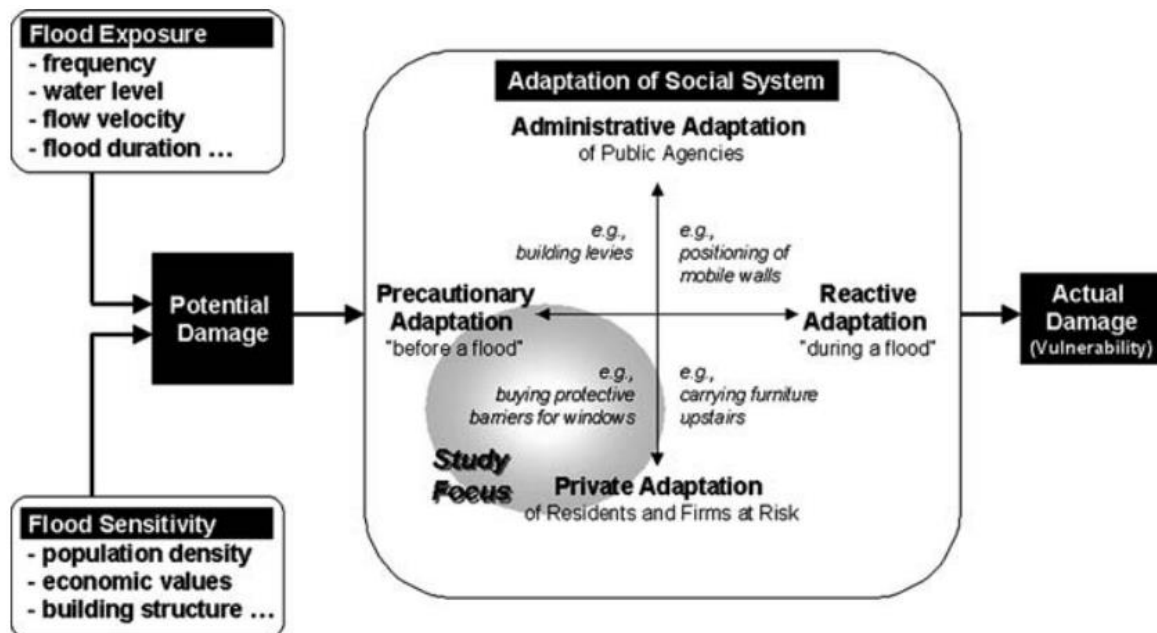
This model was chosen to understand the psychological and social aspects that motivates an individual towards adaptation to climate change. MPPACC model and its extension will help me deduce the results from the interviews regarding which factors participated to perceive risks and highlight the indicators that contributes in coping with risks. By adopting this method, I will be able to explain the factors specified by the model that will contribute towards adaptive behaviour against climate change.

2.5. Trends of Urban Flooding & Citizen Engagement Towards Adaptation

Urban flooding is defined as the "*inundation of property and land in a constructed environment, particularly in more densely populated places*" (Grothmann & Reusswig, 2004), which is primarily caused by rainfall that exceeds the capacity of drainage systems. It has been increasingly recognized for a number of years that individuals who live in locations that are highly vulnerable to natural dangers frequently do not take any action, or undertake very little action, to decrease their risk of mortality, damage, or destruction to their property. Natural disasters due to climate change have been extensively monitored for a long time, yet many individuals living in places at danger don't do anything to reduce their risk of harm, illness or destruction to assets or possessions (Kunreuther, 1978; Peek and Mileti, 2002). However, recent research has shown that people of metropolitan areas vulnerable to flooding may decrease the financial harm caused by flooding by up to 80 percent through self-protective behaviours, hence reducing the necessity for public risk management. As can be seen in Figure 1, Grothmann identifies the following three primary factors as being the primary contributors to flood damage and susceptibility. The first factor is a region's susceptibility to flooding, which may be

evaluated using parameters such as the regularity of flooding, the height of the water, the rate at which it flows, and the length of time it lasts. The second factor is a region's susceptibility to flooding, which may be evaluated using parameters such as the density of population, economic values, and structural system of the vulnerable areas. The potential harm is established by exposure and susceptibility taken together, however this estimation typically exceeds the actual damage. The capacity of individuals to avoid part of the potential penalties by making modifications in social, ecological or economic systems in response to existing or projected floods and their repercussions or impacts is represented by the third element, which is called adaptation. One can make a distinction between governmental and private adaptation for social systems (such as cities), as well as between reactive adaptation throughout a flood and preventative adaptation before a flood, depending on the circumstances. These many forms of adaptation need to be accounted for in vulnerability assessments in order to adequately interpret and forecast actual damage (Grothmann & Reusswig, 2004).

Figure 7. Determinants of Potential and Actual Flood Damage



Source: (Grothmann & Reusswig, 2004)

There is a large variety of preventative adaptation seen among flood-prone families, from hardly nothing at all to significant. Some of these households have taken no precautions at all. Strong feelings, most prominently dread, are likely to motivate people to take preventative measures in the case of flooding. These people may have had previous experience with floods; they may not rely on public flood protection; or they may be motivated by other potential motivators. It is likely that people's self-protective behaviours reflect a stronger sense of danger; alternatively, it is conceivable that people's precautionary activities are influenced by ideas regarding the efficacy and workability of private harm prevention. It's possible that private families' preparedness for the possibility of flooding may be predicted based only on socioeconomic factors, such as people's ages, genders, incomes, levels of education, and whether or not they are owners or tenants of their homes (Grothmann & Reusswig, 2004).

2.5.1. Summary:

Urban flooding is amongst the most prominent calamity produced due to the change in climate. Therefore, to avert the damages of urban flooding every citizen has to individually engage in reducing the severity of damage caused by it. Therefore, the literature on this topic helped me to distinguish the key elements that work as preventive measures and speeds up the process of adaptation.

2.6. Research Gap:

I conclude my literature review by providing the research gaps that influence me to explore this domain of my research. The majority of the research that has been done on adapting to climate change has concentrated on planned adaptation, which refers to the adaptation practices that have been put into place by governments. In contrast, my research focuses on how individuals and households are adjusting to climate change. Moreover, fewer journal articles are present that demonstrate the validity of MPPACC on adaptation, by showing citizen engagement within major cities of Pakistan. Therefore, being aware of the situation of urban flooding in Lahore, Pakistan, I have set out a questionnaire through which I tried to extract the factors that influence the climate change adaptation amongst citizens.

3. Research Question and Theoretical Framework:

Analysis of the literature on climate change adaptation in relevance to urban flooding by using the MPPAAC Model has helped me frame a research question that will be the sole focus of my thesis. The research question that I will be addressing throughout my thesis is:

Q. What are the aspects that inspire young citizens' engagement in and for climate adaptation with regards to urban flooding in Lahore, Pakistan?

The purpose of this thesis is to locate the aspects/factors that work as an influential force to bring in adaptation amongst the citizen as a result of climate change. My research evaluates the key points that contribute to climate change adaptation, with the aid of the MPPACC Model and the implement it on the interviewees. To draw out the analysis, I have created a set of questions which address the interviewees regarding their adaptation techniques and what aspects have inspired them take precautionary measures; either reactive or proactive to understand which factors are the primary influencers and what can be categorized as secondary factors. This research fills the void by providing justification for MPPACC by giving off empirical data necessary to understand how can adaptation be promoted amongst the young citizens.

4. Research Methodology:

4.1. Introduction to this Chapter:

The methodology section of my thesis aims to better understand how citizen engages in climate adaptation, specifically focusing on the situations caused by urban flooding, within Lahore, Pakistan. This chapter will further explain the choice of my methodological approach in relevance to the research question posed. I employed the qualitative research method in my study. Within the framework of qualitative research, I have employed ethnographic research, a type of qualitative research that involves researchers observing and/or interacting with participants of a study in the natural context in which they live. To understand the implications of the result collected from interviewing, I have provided MPPACC Model to explore the validity of explaining adaptation by extracting analysis from my case study.

NSD Approval and Informed Consent:

There are a number of ethical considerations that must be taken into account when doing research. It is necessary to enrol with the Norwegian Center for Research Data (NSD) while doing practical research that involves the processing of personal data (Jacobsen, 2015, p. 51). I got it approved before I started my project.

Secondly, informed consent is one of the principal regulations of research and study ethics. It intends that, informants participate voluntarily with complete knowledge about what it means to get involved and that they give permission before joining the research (Jacobsen, 2015, pp. 47-48). This research, I believe, meets all of these requirements. NSD's template was used for all participants' permission forms. In addition, they were given information regarding their obligations as study volunteers. They were able to make the decision to participate in the research based on this knowledge (Dowling, 2016, p. 33).

Thirdly, protecting the privacy of the informants is another key aspect of research ethics (Dowling, 2016, p. 31). I assured the participants that their personal information would be protected by keeping everything confidential and anonymous.

The accumulated data, such as personal information and recorded interviews, were stored on a password-protected computer to protect the participants' privacy. The data collected for this research study does not have information about private subjects. I decided to do this because people are more likely to give honest answers when they know their identity will not be exposed.

Lastly, correct data presentation is required in the research study. This means trying to demonstrate the data in its proper context and avoiding any results falsification (Jacobsen, 2015, pp. 49-3550). To ensure I fulfilled this most advantageously, I answered all the queries during interviews and explained what I understood from their responses to avoid ambiguity.

4.2. A Scientific Approach to the Research:

A qualitative approach was selected for this study as it makes an effort to understand the perspectives of the people being examined, with the rationale being that this is required if we are to comprehend and evaluate their behaviour in an effective manner (Gaber, 1993). The ethnographic research approach relies heavily on participant observation as its primary source of data. Informal talks, in-depth interviews, concentrated discussion groups, and documentary resources are also employed as secondary sources of knowledge by the ethnographer (Shaffir, 1999). Similar to contextual definition, in-depth interviews were conducted with residents of Tipu Block, Garden Town, Lahore to anticipate individuals' intentions and their respective conduct regarding climate adaptation in the case of Urban Flooding.

My research is based on the Model of Private Proactive Climate Change Adaptation (MPPACC), as I have primarily highlighted the factors that influence the risk appraisal and then pave the way towards risk adaptation, as well as the overall factors that drive adaptation behaviour. This helped me create an interview guide (see Appendix 1) that incorporated the key components of the MPPACC, as found in the literature review, along with additional cognitive or adaptive characteristics from previous studies that are thought to reflect why certain people exhibit self-protective behaviour while others have no intention for adaptation.

The MPPACC examines the thinking process that the general public goes through when confronted with concerns about climate change, and it focuses largely on cognitive components

that reflect and anticipate an individual's intentions and behaviour with regard to climate change. This model's two primary contributors to its ability to explain this phenomena are the climate change risk assessment and the adaptation assessment (Abbas et al., 2018).

The distinction between these two significant perceptual methods is as follows: the first process, known as "risk appraisal," assists a person in evaluating a threat's probability and the potential amount of harm it could cause to things that the individual values, under the assumption that the individual will not change the way that they behave. The second method, known as "adaptation appraisal," assists an individual in evaluating his or her capacity to avoid being damaged by the danger, as well as the costs associated with taking such actions. In contrast to the outcome of the cognitive process of risk appraisal, which is a unique perception of risk, the outcome of the cognitive process of adaptation appraisal is a particular assessment of one's adapting potential (Grothmann, 2004).

4.3. Selection of Area:

For this study the area of Tipu Block, New Garden Town, Lahore, Pakistan was selected. Varying meteorological and geographical circumstances, and the exposure to local commodities, were the influential factors in selecting the location for research. Prior to conducting interviews for this study background knowledge of the study area was obtained, such as topography, climate, and changes in average precipitation and temperature to enable a deeper comprehension of the place under survey. This data was acquired from the *Global Change Impact Study Centre (GCISC)* of the Pakistan Meteorological Department.

4.4. Sample and Survey Method

Face-to-face interviews were carried out with citizens residing in Tipu Block, New Garden Town, Lahore. In order to investigate the motivators of climate change adaptation regarding urban flooding, analyse the relationship between characteristics considered to impact people's probability of adopting self-protective precautions (independent variables) and practical execution of measures, MPPACC and its extension were used. For this pilot study, a random sample of 10 respondents were interviewed in February, 2022. Interviews were only conducted in one block i.e., Tipu Block in order to gauge the motivators regarding climate change

adaptation amongst residents experiencing similar consequences of urban flooding. This research displays the thought-action of young individuals aged 18-27 who are expected to face the brunt of climate change in the near future. The interview questionnaire was developed in English and converted into regional vernacular if the interviewees' English was insufficient to fully grasp the question.

4.5. Impact on My Research Question:

By interviewing the citizens of Tipu Block, New Garden Town, Lahore I was able to collect data on their views regarding what extent they have perceived the risk of urban flooding and what precautionary measures to adapt to according to the circumstances faced. This methodology helped me to point out the most influential factors which motivate each resident to cope with the prevailing situation caused by urban flooding.

As per my research question, I aim to highlight the aspects that encourage young citizens to adapt to climate change, in order to understand the motivation behind their adaptive behaviour. MPPACC informs about the factors which may occur as a primary force towards adaptation therefore, by using this model I put forward the aforementioned key aspects that motivate individuals to adopt adaptive behaviour.

4.6. Variables/Metrics Included in the Interview

Keeping in view the two dimensions of the MPPACC Model; risk appraisal and adaptation appraisal, I formulated my interview guide in such a manner that it helped unfold the major factors that instigate the need to adapt to the abrupt climatic condition, i.e., urban flooding. For instance, to get a hold of factors relevant to risk appraisal, I built my interview guide around the questions that elaborate on the perceived prior climate trends, perceived probability of such changes in future, perceived occurrence with its level of severity, dependence on public adaptation, livelihood dependency on the environment and perceived risk knowledge of residents of Tipu Block, New Garden Town, Lahore.

In a similar vein, in order to identify the primary elements that are responsible for the appraisal of adaptation, I designed the interview guide in such a way that it would give me access to the residents' perceived adaptation knowledge, perceived feasibility of self-protective measures,

perceived protective measures by others, data from diverse source materials on climatic changes and safety precautions, and trust in various information sources.

5. Results & Discussion: The Hypothesized Metrics Regarding the Interviews and Relation to the Research Question

Following the MPPACC model, the interviews I conducted were able to put forward the aspects that contribute to both risk and adaptation appraisal. Moreover, I observed the inverse relationship between risk and adaptation. Along with this relationship, I was able to deduce a few metrics that paved the way to fully grasp their essence concerning risk appraisal and adaptation appraisal.

5.1. Risk Perception:

Risk perception is the foremost step towards the adaptation as illustrated in MPPACC.

5.1.1. Awareness of ‘Urban Flooding’:

To perceive risk, the first step is to clearly understand or have the knowledge of the change one has to adapt to. When asked from the interviewees about the knowledge regarding urban flooding, some of the responses recorded were as follows:

“The time when rainfall occurs in urban areas, because of lack of planning, water remains stagnant on roads and comes into houses is urban flooding.”

“Urbanized areas that have concrete or impervious surfaces like roads, when met with

rainfall and water gets accumulated, leads to urban flooding.”

It was evident from these responses that the interviewees were well aware, and possessed comprehensive knowledge of urban flooding. To determine the interviewees’ awareness of urban flooding, they were asked if they were aware of the term urban flooding and were asked to elaborate on it. All of the interviewees were familiar with the term and showed significant knowledge of the matter. Impervious surfaces, climate change and excessive rainfall were identified as the main drivers of urban flooding.

Additionally, each individual was aware of the damage caused by urban flooding and perceived it as risk towards household, office and school activities, as flooding would prevent residents from leaving their houses. As one interviewee stated;

“Rain days are perceived as holidays. 10 days minimum. Whenever there is rain, I do not leave the house. I check the news and see the situation of the whole city. I normally don’t go out as you don’t know if you’ll make it back to your house as cars break down. No one comes to work if it’s raining. The economy suffers a lot. When I was in Canada, there were excessive snowfall events but work suffers for just one or two days, but here it’s really bad. Missing school is a given thing during this time.”

On the other hand, each individual was asked about the loss and damage they have to face each year due to the urban flooding to understand the motivators that compelled them to take adaptive measures. Some interviewees stated:

“We faced repair and maintenance costs almost every year due to damage caused to the exterior and interior of the house. This included repair of structures broken or damaged due to floods (outdoor sheds, wooden railings, garden, etc.) as well damage to walls, furniture, flooring, etc. Moreover, the floods cause damage to vehicles parked outside which incur great costs – therefore it was important for us to take some measures to prevent or at least minimize the severity of damage caused by urban flooding.”

“It’s a huge cost because such flooding incidents used to happen every monsoon season. Because of flood water, house exterior and interior like walls, wooden flooring etc got

affected and they required yearly maintenance like treatment of dampening on wall and replacement of wooden flooring cost a lot. Initially when we used to discharge flood water manually then it's a herculean task as whole family involved in this process. Some family members had to take leave from job for some days which led the financial loss. Taking services of external providers like suction pump operators isn't economical either because one has to pay for taking such services."

Individuals are well aware of the risk of urban flooding. Responses have indicated that residents have experienced urban flooding for several years and are aware of its severity. Consequently, they have taken adaptive measures accordingly.

5.1.2. Relationship Between Risk Appraisal and Adaptation Appraisal

When asked about the perceived trends of such extreme weather events, the respondents mentioned that they are well aware and start taking measures from the beginning of the monsoon season. The measures taken by one respondent are as follows:

"Whenever the monsoon season is upon us, we hire professionals to clear out debris from the drains installed in our house to avoid flooding."

Prior experience instigated the sense of discomfort and forced the respondents to take solid measures. This can be seen by another interviewee's response:

"Since our family experienced major losses in finance, health, social and education, such adaptation measures were essential to address the flooding incidents in the future."

From this response, it can be inferred that individuals do not take measures to adapt if they perceive the risk of urban flooding to be low. Adaptive measures are initiated when a high-risk assessment is also accompanied by a high adaptability assessment. When a person's risk assessment matches their ability to adapt, they may resort to avoidant maladaptation, such as fatalism or denial of the risk. Maladaptation avoidance is a way to lessen the unpleasant effects of feeling helpless when confronted with an imagined threat. The objective adaptive capacity (e.g., assets like time, money, and expertise) that enables or impedes the performance of the desired self-protective behaviour is also included in the MPPACC as an extra variable.

Misjudgements of the dangers or the adaptation choice might result from cognitive biases that distort the perception of respondents regarding their ability to adapt.

5.2. Self-Efficacy:

To efficiently prevent oneself from climatic hazards by adopting individual self-protective measures is the key point of self-efficacy. I observed most people portrayed self-efficacy as they assumed that self-protective measures can help them to lessen the losses incurred from urban flooding. For example, one respondent stated:

“We have constructed additional drains, built slopes near entrances, and have reduced the area of impervious surfaces, and we believe it has significantly reduced the effects of urban flooding.”

Additionally, a range of self-protective measures were followed by individuals, showing that they consider themselves as efficient in reducing the severity of urban flooding and have somehow adapted depending on the available resources and set priorities.

“We have constructed additional drains, built slopes near entrances, and have reduced the area of impervious surfaces.”

“We have installed an electric motor in the basement. A sensor turns on the motor when the water reaches a certain level.”

Also, it was observed that each individual may fail in preventing the harm produced by their choice of adaptation, this won't stop them from further adopting the measures rather they try their best by incorporating multiple types of adaptation procedures to lessen the effects of urban flooding:

“You have to build your house higher than the street. We built a slope in front of the house gate. Cleaning the drains of our house (on the roof). Check if there is garbage or leaves in the drains. We had sky roof/lights to let sunlight into the house but because of urban flooding the water started seeping through. We had to shut them off with the help of cement which again raised our energy costs. Emergency pumps also in place. We also sometimes manually get the water

out using wipers, tubs, mugs etc.”

“When I was younger, we used to put sandbags in front of your house gate. We used to have a pump which is also called a “donkey pump” which did not have a lot of power but the water it used to drain was less as well. That was when I was younger/little but when I grew up instead of sandbags, we started using bigger barriers like we now have a rectangular barrier we put in front of the gate which does not allow or restricts the floodwater to enter our property. The pump we use now is a submersible pump which is much powerful than the donkey pump we used before. One additional point is that our house is a bit lower than the level of the street outside so these measures are put in place to help reduce our vulnerability and safeguard us from the damages caused by urban floods. I live with my paternal uncle and he lives on the ground floor. I know that he got this thing done where he got some kind of chemical injected into the ground which would stop groundwater seeping in through the floors of the house.”

These answers illustrate how people over time keep switching towards different adaptation procedures and prove themselves as self-efficient in preventing the damages caused by flooding.

However, when asked if adaptation measures were put in place, one respondent stated:

“No. We just wait for the flood water to disperse.”

This response suggests that the respondent was found to be avoidant maladaptive. This showed that the respondent did not perceive the risk to be as high as perceived by the other respondents.

As we studied above about the self-protective measures adopted by individuals helped to prove the self-efficacy works as a driving force towards the adaptation, each individual runs their own adaptive measures according to their own concerns.

5.3. Outcome Efficacy:

With regards to the perception of respondents towards the effectiveness of the measures they have adopted, the extent to which they believe their adaptive measures can be efficient needs

to be analysed. This may include the reactive and proactive nature of adaptive measures as they contribute in defining if the precautions are workable or not.

When asked from the interviewees about the validity or level of effectiveness of their adopted measures, they stated:

“The solutions are merely short term as there is no other universal solution. Non-expensive and fastest available solution is adopted.”

On the other hand, some individuals seemed to be satisfied about their adopted precautionary measures and believed that it has produced greater preventive outcome. When asked about their reason behind their choice of adaptive measures, respondents replied:

“The adaptive measure I have chosen is a long-term solution and cost effective as well. My previous measures, suction pump and manual discharging of water, were not the effective adaptive measures as both required recurring costs and manual labour.”

“Our driveway is a bit deeper than the street level, so we installed the small drains to prevent water from entering our property. The electric motor was installed after we experienced the driveway getting flooded and it has helped to keep away maximum amount of water from entering.”

Alongside the effectiveness, I extracted the types of hindrances and their effect on outcome efficacy of the precautionary measures as adopted by individuals. The respondents identified different types of hindrances as stated below:

“Embracing change isn't an easy job. My family members were used to doing the old practices which gave us temporary solutions. Initially, to convince them for the long-term solutions were tough but when I spoke about the importance of time and proved them that the approach would be cost effective, they agreed and we implemented it.”

“Loadshedding is the prime hindrance. Garden Town is an old town. There is no underground wiring. Our UPS cannot support the pump. Only when the electricity comes back, we can use the pump.”

“Our diesel engine is prone to malfunctioning as it is not used regularly or all year round. The cost of maintenance and fuel is high.”

It is important to highlight the hindrances encountered by respondents in order to establish that each adaptive measure can be useful. However, due to the susceptibility of urban flooding in the area, the effectiveness of the measures may be lost. Therefore, to adapt using such measures one has to consider potential hindrances that may indirectly affect adaptive behaviour.

5.3.1. Nature of Measures (Proactive or Reactive):

The respondents reported their previous experiences which *“forced them to take temporary measures or old practices”*. However, heavy monsoon rainfall has proved to them that no temporary precautions can hold the rain for a long period:

“We always try to use temporary solutions at first but when it doesn’t work out, we go with a permanent and long-term solution.”

It is evident from the data collected from the respondents that each of their families subject themselves to measures that are cost-effective, temporary and easy to manage. This illustrates that the respondents are primarily dependent on short-term solutions as a response to urban flooding. It is important to note that after acknowledging the failure of these reactive approaches, respondents set a long-lasting and permanent solution for resolving the issue.

Therefore, it was analysed from the answers stated by the respondents that after the cost-effective adaptive measures the feasibility and effectiveness were identified as the main drivers regarding the question of why they chose the adaptation measure(s).

5.4. Perceived Adaptation Costs:

Finance plays a vital role in the citizens’ willingness to adapt. Adger (2003, p. 29) argues, for individuals, that their capacity to adapt to climate change ‘is a function of their access to resources. To put it in simple words, if a resident has money to spare, he/she is more likely to invest it in adaptation strategies.

“We do not have the money to build excessive structures like other people in the neighbourhood have done.” One of the interviewees replied when he was asked if they had any adaptation measures in place to protect themselves or their property from urban floods.

On the other hand, another interviewee told how he and his family redesigned their house because of their financial capacity and also pointed out how other people in the surrounding area do not have the financial capacity to deal with urban flooding.

“It was expensive but we did it to protect ourselves and the house. Not everyone has the financial ability to protect themselves. For example, if you just go a bit outside of our block there’s a big slum. It’s terrible for them when these floods occur. But all we can do is protect ourselves.”

Through the interviews conducted, it can be deduced that respondents with a higher monthly household income were more likely to engage in adaptation practices as compared to respondents with a lower monthly income.

5.5. Other Factors from Extension

5.5.1. Experience with Urban Flooding:

Having been exposed to the risk in the past increases the perceived level of danger. On the other hand, relying on public adaptability reduces the perceived level of danger. In the past, people's perceptions of shifting weather patterns have been connected to their expectations about the probability of weather occurrences in the future, which, in turn, is essential for people's perceptions of risk.

All of the respondents have experienced similar adverse effects of urban flooding due to their prior experiences, which motivated them to take stricter measures towards climate change adaptation.

“Initially we started using it to help mitigate the effects of urban flooding as our house is a bit

lower than the street level. We have a tank that collects sewage which we then pump out into the government provided sewage pipes. During the monsoon season, these tanks get filled up with sewage waste and stormwater which then leads to flooding on our property. Thus, after experiencing losses from these types of floods, we now use a very strict adaptation strategy.”

“8-9 years ago we just used to use towels but no pumps. But after seeing the loss e.g., damage to walls, wood furniture getting damaged, we installed a pump as a precautionary measure.”

“Since our family experienced major losses pertaining to finance, health, social and education as well. Therefore, such adaptation measures were essential to address the flooding incidents in future.”

It was deduced from the respondents’ statements that previous experience of personal losses was the primary driving force which encouraged them to first try multiple adaptive solutions in order to determine the most effective measure to be taken against urban flooding.

5.5.2. Trust in Government-issued Adaptive Measures

The presence of local authorities may also contribute to a sense of diminished danger, which in turn may discourage individuals from taking precautionary steps to protect themselves. People are likely to take fewer preventive measures if they trust the ability of the government or administrative agencies to effectively manage urban flooding and its consequences. However, results from the interviews conducted suggested otherwise. As all of the respondents stated, there was no aid guaranteed from the government. Therefore, they have no choice but to take personal precautionary measures. Nevertheless, they expect the government to come up with *“better planning strategies and improve stormwater discharge systems.”*

While explaining the involvement or contribution of the government to urban flooding, one respondent stated:

“The government steps in when the damage is already done. Preplanning is never done, so that is one main point. In the last few years, this has increased. The population in recent years has put pressure on the government which has led them now to somehow justify the damage that is

done during these urban flooding events using historical data and using phrases like “The rainfall this year was unprecedented and it rained more than it ever had.”

While explaining the reason behind taking personal safety measures, another respondent said:

“The drainage systems constructed by the municipality are not sufficient.”

As the government fails to provide any sufficient preventive long-term solution to the people suffering from urban flooding, each individual has developed a solution according to their financial ability and available resource. This condition was elaborated by one respondent as:

“The drainage systems constructed by the municipality are not sufficient. Slopes that we have constructed prevent water from entering our house, and pervious surfaces allow water to be absorbed by the ground which prevents water from accumulating. These measures were cost effective and feasible to be done without involving the local authorities.”

The residents of Tipu Block have little reliance on the local government, as minimal measures are taken to ensure their safety and welfare. Thus, a lack of trust in the authorities has motivated people to take self-protective measures against urban flooding resulting from annual monsoon rainfall. This is reflected through the following response:

“I don’t even know who the Union Council Chairman is. You only get to see government officials right before elections are to be held.”

6. Conclusion:

According to the findings, it is critical to conduct an adaptation evaluation that takes into consideration aspects such as the perceived feasibility of self-protective measures, the perceived level of adaptation knowledge, and, if applicable, the reported activities of neighbours or friends. A majority of the respondents seemed to perceive the risk and therefore intend to adopt it. However, they are fully aware that the solutions are inconsistent and insufficient still they use multiple adaptation techniques ranging from temporary to permanent to cope with the prevailing circumstances of urban flooding.

It can be concluded that due to extensive experience with urban flooding, respondents are well aware of the potential risks that they may face. Respondents tend to take protective measures if the risk of urban flooding is perceived to be high. Results indicate that respondents that perceived risks to be low were found to be avoidant maladaptive.

When analysing self-efficacy in respondents it was found that adaptive measures resulted in reduced losses due to urban flooding. It can be concluded that personal losses are a major motivator for the adoption of adaptive measures. Another motivator is monthly household income, with higher income resulting in a greater willingness to take such measures. Additionally, a lack of initiative taken by the local government has motivated respondents to adopt adaptation practices. However, it is important to identify potential hindrances in order to assess their influence on adaptive behaviour.

The findings of this research demonstrate that the respondents were aware of changing weather patterns which is crucial for risk assessment. Respondents were also able to differentiate between transitory and permanent solutions, which is relevant to adaptation appraisal.

It can be concluded that motivators for adaptation vary amongst individuals on the basis of their perception regarding urban flooding and climate change. As established through the responses

obtained through interviews, it can be said that citizen engagement is crucial for undertaking effective measures for climate change mitigation and adaptation. For a country like Pakistan where government officials cannot be relied upon to cope with the consequences of climate change, it must be ensured that citizens are made aware of and engaged in initiatives taken to prevent further damage from extreme weather events such as heavy rainfall and urban flooding.

Our findings are significant because they imply that a well-defined model of human decision-making, MPPACC, may lend predictive ability to the job of measuring an individual's ability for adaptation. It is essential to incorporate socio-cognitive variables, like perceived adaptive capability, in order to improve one's ability to generate accurate forecasts regarding future adaptation and susceptibility.

7. Limitations & Future Recommendations:

Climate change adaptation is a vast topic that may cover multiple social, political and economic factors that may contribute towards the influence of adaptive behaviour. However, my research solely focused upon the socio-cognitive concerns that pave the way towards adaptation. Amongst multiple models and extensions other than MPPACC need to be employed to produce a framework that influences the behaviour towards adaptation.

During my research, I highlighted the hindrances that are caused during the adaptation process are also the influential factors that may motivate or demotivate an individual from adapting to climate change. These hindrances come from a wide array of group choice that needs to be addressed as they contribute equally as an influence toward climate change adaptation.

Lahore, being the most famous urban cities of Pakistan was taken as the reference for climate change adaptation, however, there has not been a lot of research done on how well this city is able to adapt to the effects of climate change. More research on political structure, culture, economics, and development is necessary in order to get a deeper insight into, and gain an understanding of the factors that lie behind the surface of this occurrence.

As this research was a pilot study, a major limitation of this study was the limited number of

interviews conducted. Further research can be conducted with a more representative sample size in order to accurately interpret the motivation behind taking adaptive measures for the consequences of climate change. Moreover, a larger study area consisting of various regions of Lahore can be included in the study for more representative results. For further improvement of data analysis, a quantitative approach can also be employed.

The findings of this research study can be used by the government to develop effective strategies to combat climate change. Measures taken by the respondents provide insight into the requirements of the area with regards to measures that need to be taken against urban flooding. It is recommended to ensure public participation and citizen engagement for better policy making and implementation.

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Appendix 1

Interview Guide:

This research project aims to bridge the gap between the government and the citizens with regard to climate change adaptation. It seeks to understand what motivates citizens living in Tipu Block, New Garden Town, Lahore, Pakistan, to adapt to urban flooding in the area.

A) Citizens' prior knowledge:

1. How long have you been living here?
2. How many members are there in your household?
3. What is the level of your education? (No education, primary, middle, high school, graduate, masters or higher)
4. What is your household's monthly income? (Up to 25,000 PKR, 25,000-100,000 PKR, 100,000-300,000 PKR, 300,000 PKR and higher)
5. Are you aware of the term "urban flooding"?
6. What are the factors that affect urban flooding?

B) Adaptation measures taken by the citizens

7. What is your experience with urban flooding in your area?
8. What are the periods or month(s) in which urban flooding is prevalent in your area?
9. What is the change that you observed in recent years with regard to the occurrence and intensity of urban flooding in your area?
10. What kind of adaptation measures have you put in place to protect yourself/ your property from urban flooding?

11. Why did you choose this specific measure? Please elaborate.
12. Did you take these steps as a precautionary measure or were you forced to take these steps after experiencing losses from the flooding?
13. Have you changed your adaptation strategy since you first implemented a measure for urban flooding?
14. What kind of hindrances did you face when you implemented the adaptation measure?
15. In monetary terms what was the cost of the damages that you incurred because of urban flooding?
16. Have you or anyone in your household had to miss work and or school due to urban flooding?

Approximately how many days?

C) Citizen-government expectations:

17. Have you received any aid from the government in case of an urban flood?
18. What are your expectations from the government with regard to urban flood adaptation?
19. How do you think the government can help reduce the damages caused by urban flooding?