



Mopping the Floor Without Turning Off the Faucet

CLIMATE CHANGE, LAND SUBSIDENCE AND SPATIAL JUSTICE IN
THE COASTAL URBAN COMMUNITY OF TAMBAK LOROK,
SEMARANG.

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Climate Change, Land Subsidence and Spatial justice in the Coastal Urban Community of Tambak Lorok, Semarang.

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Foreword

A bachelor thesis is the apotheosis of three or four years of studying. Years in which one lives and learns fast. Everything of those years must then be delicately and precisely squeezed into the first research of a student's life. A challenge already, but I wanted to take myself out of my comfort zone a little farther. Nothing could have prepared me for the experience to travel half-way across the world to set foot on subsiding soil in Semarang. Seeing the problem with my own eyes, smelling the stench with my own nose and speaking with the people of Tambak Lorok in the middle of streets resembling canals, changed my perspective on the world. It put me into a new gear. The mental investment I put into this research is by far the most I have ever invested in something in my life. The experience filled me with awe. It added a new layer of perspective to my mind. Departing on the journey with three peers was something special and intimate. The adventure resulted in a return with three friends. Without Abe, Gina and Max, this research would not exist and I would have missed an experience of a lifetime. Leaving Semarang was harder than I would ever have expected. The people of Semarang have well and truly astounded me with their resilience, kindness, hospitality and diligence. My special and personal thanks go out to Liana, GeGe, Ray, Nola and Oely, without whom this adventure would have been impossible. They showed us love and friendship half way across the globe. Lastly I want to thank my parents for helping me to have a life in which I am blessed to partake in this special journey. I can't and won't imagine anything else than rounding off the most beautiful four years of my life with the most beautiful experience of my life to date. Semarang hebat, terima kasih.

Summary

The majority of human population is living along coastlines. In light of climate change, their location is becoming increasingly compromised by sea level rise. In Tambak Lorok, a coastal urban community in Central-Java, the soil is sinking due to ground water depletion. This adds to the environmental hazards of sea-level rise, resulting in daily floods. To understand the trials and tribulations the people of Tambak Lorok are facing, and to establish the occurrence of spatial injustice and its effects on impacts of environmental hazards, ethnographic participatory research was conducted. The main research question is; *How does spatial justice affect the impact of environmental hazards on the coastal urban community of Tambak Lorok, Semarang, Indonesia*. Through the conducting of interviews and observation, it was found that the people of Tambak Lorok raise their dwellings every three to five years to cope with floods. Moreover, it was found that the impact of environmental hazards is influenced by vulnerability. Vulnerability is unequally divided over space and is affected by income and behaviour. This spatial inequality is connected to spatial injustice, since the inequal division of income and subsequently vulnerability, results in larger impact of environmental dangers on poorer communities in the Global South. The answer to the main research question is that spatial justice, or rather the lack of it, affects the direction and severity of impacts of environmental hazards over spaces and peoples. The direction and severity of impact is based on vulnerability of spaces. Spaces which are the most vulnerable are impacted the most. Vulnerability is dependent on an area's geography, income, planning capabilities and behaviour practices. This means that the poor will structurally be impacted more severely by environmental hazards, due to spatial injustice.

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1. Introduction

Human kind has always favoured living in locations with plenty of access to water. It's the lifeblood of urban civilization (Bairoch, 1988). Mesopotamia, the Indus valley and Egypt all boast major rivers and river deltas. For major urban civilizations to develop and exist, a surplus of food is required (Nath, 2021). Therefore, it is no coincidence that the first major urban civilizations dawned in the 'Fertile Crescent'. Fertile land was essential for creating a surplus of food. Without enough water, the land is not fertile, which means no food, which means no people, which means no civilization. Thus, human kind needs water, and plenty of it to be able to live in large communities.

When taking a look at today's world, there is little difference. The majority of the world's population is found in coastal areas (C40 Cities, 2021). Globally, eight of the world's ten largest cities are near a coast (National Ocean Service, 2021). Population density is clearly influenced by the proximity to a coastline (Vernberg & Vernberg, 2001). This is attributable to the opportunities these areas offer to its inhabitants. Access to sea and water provides a myriad of benefits. Firstly, water ways have been a highway system throughout history. Access to open sea means a connection to this network, enabling trade with other civilizations and the spread of people (Paine, 2014). Secondly, access to the sea means access to a large pool of resources important for sustaining a growing civilization. Fish, minerals and fossil fuels beneath the seabed are vital parts of supporting coastal cities and communities (Fagan, 2017). Moreover, a growing population, well connected to maritime resources and to other coastal communities attract migrants and instigates economic growth, which in turn increases the attractiveness of a city. Thus, coastal areas and cities are more populated than landlocked ones, given the benefits of coastal locations to the livelihoods of its inhabitants and its attractiveness to migrants.

The population is disproportionally distributed over these coastal areas. Most of the large urban settlements on the coast are situated in Low Elevation Coastal Zones (LECZs). These are made up of the area which lies less than 10 meters above sea level. Overall, this zone covers 2 percent of the world's land area, but contains 10 percent of the world's population and 13 percent of the world's urban population (McGranahan, Balk & Anderson). In summary, These LECZs have the highest population density in the world.

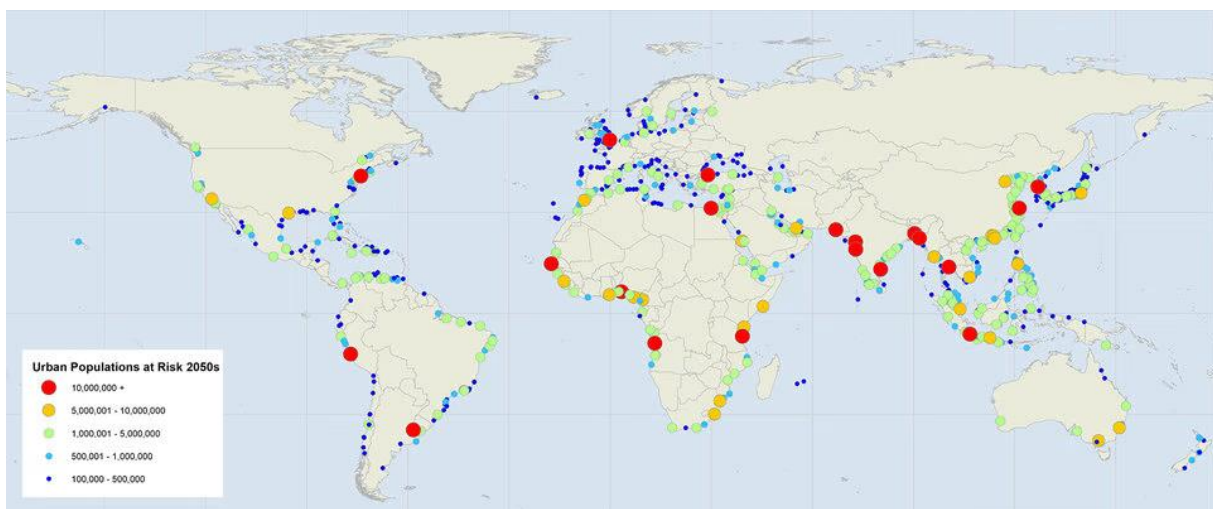


Figure 1: Cities at risk from sea level rise of 0.5 metres by 2050 [Cities projected to receive at least 0.5 metres of sea level rise by the 2050s under RCP8.5.] (C40 Cities, 2021).

There are many risks involved in inhabiting and cultivating coastal areas though. Quick development from a predominantly rural to predominantly urban society is leading to a rapid increase in urban land in parts of the world, mostly in the global south (Zhang, 2016). This increase in urban land has mainly occurred in river deltas and floodplains, exposing humans and their dwellings to flood hazard (Tierolf, de Moel & van Vliet, 2021). Due to rapid rising sea levels and climate change, these areas are under threat from sea level rise. Especially the LECZs are at risk of being swallowed whole by the rising sea. Since such a disproportionately large group of people lives less than 10 metres above sea level, the potential for worldwide disaster is growing (McGranahan, Balk & Anderson, 2007). By 2050, billions of people could be facing the highest sea level rise in recorded history (Barbier, 2015). Natural disasters and rising sea levels are becoming threats to the security and livelihoods of people living in LECZs all over the world.

These problems can be managed however. To show this we look upon the case of the Netherlands. 59 percent of The Netherlands' population lives within LECZs (Worldbank, 2010). This is the highest percentage in the world. Measures have been taken there to adapt the coast and river lands to flood risks throughout most of history (Lintsen, 2002). The case of the Netherlands shows that the economical and geographical centres of the country are situated in LECZs, and that the potential damage of floods to a country's economy and the livelihoods of its population, is unfathomable. It shows that risk management in coastal areas is paramount to ensure the wellbeing of the population and the prosperity of the country (Penning-Rowsell, Johnson, Tunstall, Tapsell, Morris, Chatterton & Green, 2005). Thus it is clear climate adaptation in coastal countries and areas is vital for the management of sea level-related problems. Climate adaptation is the transformation and modification of certain areas and assets to ensure they are able to withstand potential natural disasters triggered by climate change, protecting peoples and industries. Managing and adapting to climate change-related hazards cost large amounts of money. Not all countries find themselves in a position to develop climate adaptations and to thwart the growing risks, leaving their economy and population vulnerable to the dangers of the rising tides. The part of the population living within the LECZs is larger in developing countries (14 percent) than in developed countries (10 percent) (McGranahan, Balk & Anderson, 2007). This means that especially people in the global south are being threatened by the rising tides, while being less well equipped to tackle the growing risks.

All in all, this highlights a gargantuan problem which is growing every day. A great many countries in the global south are dealing with the hazards of rising sea levels (Fatti & Patel, 2013). Indonesia is an archipelagic country. In Indonesia, 2.78 percent of the land area consists of LECZs. All the while 7.37 percent of the population lives within these LECZs (Worldbank, 2010). This suggests high population density and urbanisation in LECZs. 56.64 percent of Indonesia's population lives in cities (Worldbank, 2020). Indonesia boasts a population of 273 million people (ibid.). This could mean that 20 million people find themselves with their feet in the water and their hands in their hair. The LECZs are under the most immediate threat from floods (Balk et al., 2009). Greater coastal areas outside the LECZs are not safe either. About 150 million people are living in greater coastal areas in Indonesia. Because of widespread and rapid land subsidence along the north-Java coast, these people are increasingly vulnerable to environmental hazards (Rudiarto, Handayani & Sih Setyono, 2018).

In central Java, climate change-related sea level rise is only one of a collection of water related problems. In addition to the sea level rise, the landmass of Java is subsiding, acting as a multiplier to the increasing risks triggered by climate change. It is one of the main reasons why Indonesia is currently moving its capital from Jakarta to Kalimantan (Takagi, Esteban, Mikami, Pratama, Valenzuela & Avelino, 2021). In the coastal city of Semarang, the capital of Central Java, data shows stable trends of land subsidence up to 100 mm/a. Combined with a sea level rise of 2.1 mm/a, the

sea is closing in on coastal dwellings with more than a decimetre per year (Bott, Schöne, Illigner, Haghighi, Gisevius & Braun, 2021). The northern region of Semarang along the coast exhibits higher rates of subsidence compared to its southern region. This goes up to 19 centimetres per year in the worst places (Abidin, Andreas, Gumilar, Sidiq & Fukuda, 2013). Subsidence is believed to be caused by the combination of natural consolidation of young alluvium soil, groundwater extraction and building constructions. The impact of land subsidence in Semarang can be seen in several forms. Mainly the wider expansion of (coastal) flooding areas, cracking and damage of buildings and infrastructure, and increased inland sea water intrusion (Ibid.). These impacts may have long-term effects on livelihoods and property value.

Evidently, the population of the coastal city of Semarang has to deal with a myriad of water related challenges. As a city in the Indonesian archipelago, this is not surprising. Indonesia has seen a steady increase in the share of its population living in cities (Mulyana, Setiono, Selzer, Zhang, Dodman & Schensul, 2013). A large urban population is bound to have a large impact on the water situation. With increasing urbanisation in Semarang, growing urban areas, population, and increasing population density, the potential damage of flooding to property and livelihoods, has been skyrocketing (Marfai & King, 2008). These problems are magnifying by the day.

These problems are not divided equally among the population. The people who find themselves lowest on the socio-economic ladder and/or closest to the shoreline are impacted the most. Tambak Lorok, a fishing community at the coast in Semarang is in the middle of the fray. With limited income, absence of formal waste management, deteriorating hygiene facilities, land subsidence and rising tides, the community of Tambak Lorok is impacted the most and is forced to deal with these problems in unconventional ways (Harwitasari & van Ast, 2011). Poorer people living near the coast of Semarang are forced to raise their houses and add additional floors to keep their feet dry (Evers, 2014). Those who cannot afford this are forced to live in flooded houses. Migrating from these areas is seldom an option financially and socially (Ibid.). Large amounts of less affluent people have to deal with the consequences of climate change and land subsidence, instigated by wealthier people in the west. This heavily implies the occurrence of spatial- and environmental injustice.

Environmental injustice occurs when minorities and the poor are have to bear the adverse consequences related to climate change disproportionately, while only contributing marginally to the cause of climate change (Boerner & Lambert, 1995). In Tambak Lorok, Semarang, the population is dealing with water related problems caused by climate change and groundwater depletion. Both of these are hardly their responsibility, considering the ecological footprint of the people in Tambak Lorok compared to the rich. However, they are impacted the most.

1.2. Existing Literature

Harwitasari & van Ast (2011) have zoomed in on the increase of common floods in the Semarang area. In their research they sought to analyse the way the local population deals with the water hazards. In both the existing and the predicted flood prone areas, most people appear to have no intention to leave the area, even when the floods become an everyday routine. People are connected to their dwellings in a way that abandoning is not a realistic scenario. This study provides relevant information on the way people in the affected areas perceive flood risks and adaptation opportunities. Amin & Rijanta (2019) look into the changing of livelihoods resulting from rising tides and climate change. The results showed that fishermen living on the coast of Semarang have to face tidal floods with an increasingly high inundation by an average of 1 m/10 years. The increasing height of tidal flood from year to year has forced the fishermen to renovate their houses, raising the building approximately every 10 years. The renovation certainly requires a lot of funds, thus encouraging the fishermen to seek alternative sources to obtain higher income. Most of the fishermen in coastal Semarang change their livelihood from fishing to cultivating green mussels. They utilize the coastal areas inundated by the tidal flood to cultivate green mussels.

Mehvar, Filatova, Syukri, Dastgheib and Ranasinghe (2018) have assessed three possible scenarios of coastal change due to climate change in the social, economic and environmental systems. They propose a coherent three-step framework and subsequently apply it to quantify potential sea level rise-driven alterations in the monetary value of ecosystem services in the coastal area of Semarang in Indonesia. Buchori & Sugiri (2016) aim to empirically examine the sustainable metropolitan development of Semarang City. The results show that the spatial development of Semarang City tends to be unsustainable. This opens a window for amelioration. The research analyses how the circumstances could be improved. Rakhmatulloh, Dewi, Nugraheni, Arab and Hassan (2021) delve into the different factors influencing land- and real estate value. This was done through the use of spatial data and regression models. The results show that geographical distances to the city centre and local suburban characteristics were the main factors influencing land value. However, they fail to delve into the effects of increasing risks of property damages resulting from floods and land subsidence. Saputra, Ariyanto, Ghiffari & Fahmi (2021) also try to find the factors establishing land value in Semarang. They find that the increase in natural disasters have no effect on the valuation of land. In these researches, the effects of climate change on city planning are recorded. Other researches elaborate more on the effects of climate change in a social geographical sense.

Wijaya (2015) writes about the vulnerabilities of Semarang on a social, economic and environmental level due to climate change. Furthermore he writes about the different practices of climate adaptation implemented in Semarang. The results show that current adaptation practices include an integration of climate resilience strategy into city planning and a physical adaptation strategy for the tidal flood hazard. It is found that the performance of each adaptation measure has different outcomes depending on the typology of adaptation. Cooperation and a strong commitment amongst stakeholders as well as building adaptive capacity of local people and authority are significantly required.

Pramono (2021) has conducted research into the possibilities of natural solutions for the myriad of water crises Semarang is facing. The results showed that land subsidence has occurred in Jakarta and Semarang. As a result of land subsidence, the flooding areas have increased due to the increase in lowlands, and therefore, it is difficult for the existing water to flow into the sea. Handling floods and land subsidence cannot be conducted locally but must be carried out in an integrative manner with a watershed and groundwater basin approach. One of the causes of land subsidence is excessive groundwater extraction. On the other hand, the groundwater must be increased. The increase in

groundwater supplies not only reduces land subsidence but also reduces flooding, seawater intrusion and prevents drought in the dry season. A nature-based solution for reducing flood and land subsidence can be achieved by increasing vegetation cover and constructing water conservation buildings in the upstream areas.

Lots of literature exists on the myriad of environmental problems of sea level rise and land subsidence in Indonesia. The disproportionality of the burden of climate change and land subsidence hitting the victims of capitalism heavier than its victors is relatively understated in academic literature (Schlosberg, 2013). The connection between growing environmental risks, spatial- and environmental injustice and international power structures is still somewhat overlooked. This research strives to fill this void. The case of Tambak Lorok will be used to explore the ways people are impacted by a cocktail of wicked problems, facing climate change, land subsidence and inequality.

Since the increase of environmental hazards due to climate change and land subsidence, spatial injustice in the global south may have new found relevance. The relationship between spatial injustice and climate change is still unexplored. This gap in existing scientific knowledge should be filled. It may help to widen the concept of climate change and to show it may have destructive capabilities on communities and economies in the global south on a scale beyond that of current belief. It could highlight the issue of spatial and environmental injustice on a global scale. It could provide a critical note on the capitalist systems in the modern world by connecting capitalist power structures to the amplification of spatial injustices in environmental hazards. Furthermore, the research is enlarging the understanding of spatial injustice in the global south by directly interviewing the people of Tambak Lorok, as well as local experts, instead of relying on western-perspectives.

1.3. Societal relevance

Evidently the situation in Tambak Lorok is critical, but for some more so than for others. The people of Tambak Lorok are part of a group which embodies the losers of globalisation. The spread of capitalism and market-focussed politics over most parts of the world has had a great effect on social structures (Sproll & Wehr, 2014). Especially the countries in the Global South are showing signs of increased income disparities. These countries have less well established social welfare systems (Ibid.). This puts the victims of capitalism in a precarious position within society. The losers of global capitalism are often overlooked by politicians and academics (Wresch, 1996). Therefore their perspective must be highlighted. Moreover, environmental change has added a new degree of urgency to the precarious dynamic of income disparities in the global south (Islam & Winkel, 2017). Environmental hazards are increasingly destructive. This means inequalities of environmental hazards stack on top of the existing income disparities, impacting the less affluent people the hardest while being unequipped to deal with these increasing dangers. Thus it is imperative to the academic society to discuss the narratives of the losers of global capitalism, climate change and spatial injustice of the global south.

1.4. Research goals

In this research the effects of spatial justice on the impact of climate change and land subsidence on the livelihoods of the population of Tambak Lorok, Semarang, will be explored. This research aims to create a narrative of the socio-economic impact of climate change and land subsidence on the community of Tambak Lorok. The different coping strategies available for the people and the government will be set out. The nucleus of the problems according to both experts and inhabitants will be highlighted to point out ways to improve living conditions in Tambak Lorok. Furthermore, the justice of spatial equity will be explored. The inequalities of vulnerability to- and impact of environmental hazards will be connected to regional and global power structures.

The main research question is; *How does spatial justice affect the impact of environmental hazards on the coastal urban community of Tambak Lorok, Semarang, Indonesia?*

The sub questions are:

- What are problems perceived the gravest by inhabitants of Tambak Lorok?
- How do climate change and land subsidence impact livelihoods in Tambak Lorok?
- How are the impacts of environmental hazards connected with spatial justice?
- How do the inhabitants of Tambak Lorok perceive spatial justice?
- How does spatial injustice influence migration in Tambak Lorok?
- How does the community of Tambak Lorok cope with environmental hazards?

The first question is relevant to the creation of a narrative of the local community on the environmental situation. The second question is raised to assess the impacts of environmental hazards on the local community from its perspective. The third question is relevant to explore the relationship between spatial equity, spatial justice and environmental hazards. The fifth and sixth questions are relevant to explore the way how inhabitants are currently dealing with spatial injustice and environmental hazards.

1.5. Reading Guide

Following this introduction, existing academic literature will be discussed to create an image of the academic views and mindware of the research subject. After the literature review, the theoretical framework of the research will be discussed. Here, a plethora of socio-economic and geographic theories is set out to explain the nature of the problems the community of Tambak Lorok is facing and to explain the adaptation practices the community is adopting to deal with those problems. Thereafter the methodology will be discussed. The methods used in this research will be qualitative. More specifically interactive and participatory ethnographic research methods. In the methodology chapter it will be explained why this method was chosen, what it entails, which respondents were interviewed and how the data was collected. Thereafter the collected data will be presented and set out in the empirical chapter. Following the empirical chapter, the analytical chapter will delve into the empirical findings to discuss what they mean. Here, sub-questions will be answered. Following the analytical chapter, the main research question will be answered in the conclusion. Thereafter, the future of the community of Tambak Lorok will be expanded upon. Here, recommendations will be discussed on how conditions can be improved. Finally the research will be reflected upon in the discussion chapter. This will provide an opportunity for self-criticism and remarks on how future research could be conducted more soundly. Furthermore it will serve as a recommendation for further research in the future.

2. Theoretical Framework

To substantiate the subjects in this research the concepts have to receive some theoretical bearing and explanation. Climate change, human involvement and the causal effects of climate change on sea level rise will be conceptualized. To put emphasis on the duality of the growing problem, land subsidence is explained together with climate change and is conceptualised as the central problem. Climate change and land-subsidence are impacting the community of Tambak Lorok in different ways. The concept of impact will be discussed to show its importance in this research and to explain the way this concept is used in this research.

Human response to climate change-related problems and land subsidence will be categorised as climate mitigation, and adaptation. These concepts will be explained to create a better understanding of what kind of response is implemented and practiced in Tambak Lorok.

The theory of place attachment will be discussed and used to explain how the people are connected to Tambak Lorok and why they may or may not be willing to move. The theories of path dependency, lock-in and place attachment will be explained and used to theoretically map the impact of climate change and land subsidence on the population of Tambak Lorok.

Finally, the disparities in living conditions and exposure to climate change- and land subsidence related risks between spaces and people will be discussed using a Marxist approach to spatial equity and justice theory to explain that socio-economical differences are connected to spatial inequality and injustice. This will be connected to the environmental justice theory to pose a question of who should be bearing the responsibility of the climate- and land subsidence related hazards and what it could mean in light of the global capitalist system using the world systems theory of Wallerstein.

2.1. Livelihoods and Vulnerability

Livelihoods are defined by the cumulation of the abilities, possessions and activities necessary for a means of living. It is considered sustainable if it is able to withstand and recover from external impacts and sustain its abilities, possessions and activities now, and in the future. Still, ensuring a sustainable livelihood for possible future generations (Serrat, 2017). Of course, through climate change, land subsidence and environmental extremes, ecosystems will be degraded, ultimately threatening food security worldwide (Hammill, Leclerc, Myatt-Hirvonen & Salinas, 2005). Livelihoods and their sustainability are increasingly endangered all over the world. Developing countries are especially vulnerable (Musarurwa & Lunga, 2012; Ayeb-Karlsson, Van der Geest, Ahmed, Huq & Warner, 2016). In this research, the term livelihoods amounts to the definition above, related to the way of living and making a living in the coastal urban area of Tambak Lorok, which is mainly fishing. The environment of Tambak Lorok is rapidly changing due to climate change and land subsidence. Sea levels are rising, precipitation is becoming heavier, temperatures are rising, the weather is becoming more extreme and the soil is sinking into the Java Sea (Jha, Bloch & Lamond, 2012). All of this means that livelihoods in the community of Tambak Lorok are becoming more vulnerable to the hazards and disasters brought about by climate change and existing geological hazards in the Java area, such as earthquakes and volcanic eruptions. Java forms the spine of The Ring of Fire, lest not forget.

When talking about vulnerability, the concept of vulnerability must be explained to achieve a depth of understanding on how it works and what the ramifications can be. The theory concerns the extent to which a people or population in a certain area is vulnerable to certain hazards and disasters. Vulnerability is dependent on different variables of the environment and of the population. The

classification of the environmental variables of liability and capability form the backbone of vulnerability theory. Certain variables tell us how vulnerable a people is, such as economic- and planning capabilities (Zakour & Gillespie, 2012). The theory is often used and contested for the distribution of government funds to help victims of vulnerability against hazards and risks (Kohn, 2014). Assessment of vulnerability is hard to measure (Gallina, Torresan, Critto, Sperotto, Glade & Marcomini, 2016). Many scholars attempted to revise and enhance the theory. Kelly and Adger (2000) attempt to create a robust policy relevant framework by connecting the concepts of vulnerability and adaptation. They define vulnerability in terms of the capacity of individuals and social groups to respond to, to cope with and to recover from or adapt to, any external stress threatening their livelihoods and well-being. Their approach is centred around the social and economic well-being of people (Ibid.). Vulnerability is strongly intertwined with the concept of livelihoods. It is therefore important to use the term in the discussion around environmental hazards impacting the livelihoods of communities in coastal urban areas. Kelly and Adger (2000) explain how vulnerability of livelihoods can be kept to a minimum. They present four priorities to do so: poverty reduction, risk spreading through income diversification, respecting property management rights and promoting collective security (Ibid.). Moreover, they note the importance of addressing social vulnerability as a sustainable response, including the inequitable distribution of resources (Ibid.). Thus, sustainable livelihoods are preserved through the minimalization of vulnerability. This means utilising peoples and environmental capabilities, and coping and adapting to external liabilities. These are things to remember when taking a look at how the situation of Tambak Lorok can be improved.

2.2. Climate Change and Land Subsidence

A place's climate is the usual weather of a place. The average of weather patterns in a place measured over the course of decades. Earth's climate is all the climates around the world altogether. Climate change is a change in the usual pattern of the climates of Earth (Nasa, 2017). Over the past 250 years significant changes are observed in the climates patterns (Change, 2007a). According to the data from measurements over the centuries and measurements from ice extracted from the poles and Greenland, climate is changing (Ibid.). The planet is warming up due to increased concentrations of carbon dioxide, methane and nitrous oxide in the planet's atmosphere (Ibid.). Because of these greenhouse gasses, the heat radiating from the sun onto Earth cannot escape the Earth's atmosphere. This results in rising temperatures. The global increases in carbon dioxide concentration are due primarily to fossil fuel use and land-use change, while those of methane and nitrous oxide are primarily due to agriculture (Ibid.). The increased concentrations of greenhouse gases in the atmosphere due to the usage of fossil fuels is not the only problem. Deterioration of water quality due to dumping plastics, chemicals and waste into the Earths water ways has been happening for centuries as well.

Climate change is a process happening on its own, and it has been happening throughout the planet's lifespan for approximately 4 billion years. Concentrations of greenhouse gasses have been changing throughout the earths geological lifespan, far before humans dawned upon our planet's surface. However, the past 250 years humans have stimulated climate change at an alarming rate. Human activities are having increasing impact on the Earth's environment, outcompeting natural processes and causing changes not naturally occurring on the earth (Crutzen, 2006). One could say humans in the 21st century are living during the Anthropocene, a geological time in which humans are the biggest factor in the geology of the Earth. Starting around 1784, it is no coincidence this epoch coincides with the invention of the steam engine. In summary, through unprecedented human

activities stemming from the industrial revolution, the Earth's climate is irreversibly being changed at a rate beyond the naturally occurring climate change (Urry, 2015).

The effects of climate change are increasingly influencing life on earth, including human life. If temperatures will continue to rise in the next 100 years by 2 to 6 degrees Celsius, animal (human) and plant life will be transformed (Ibid.). In 2007 the authoritative Intergovernmental Panel on Climate Change (IPCC) stated that the evidence of humans changing climate is 'unequivocal' (Change, 2007b). Due to the rising temperatures on earth, weather will become more extreme. An increase in magnitude and frequency of hurricanes, precipitation are leading to environmental damage. Rising temperatures are leading to sea level rise and increasing flood risk. As mentioned in the introduction already, humans are experiencing the grave effects of climate change and those in coastal areas are most vulnerable to climate change-related risks (McGranahan, Balk & Anderson, 2007). Tambak Lorok is an example.

Complimentary to the effects of climate change, Tambak Lorok is faced with land subsidence. As mentioned in the introduction, land subsidence causes the soil to sink. Therefore, structural flooding is much more common. Therefore living conditions and livelihoods are exposed to rising tides on a daily basis. This means that response to water exposure is imminent. Tambak Lorok could well be an example of the future of human settlements on the coast around the globe. The problems of rising tides due to climate change, and subsiding soil due to depletion of groundwater reserves are complimentary to each other, meaning they both strengthen the effects they cause. An anti-symbiose causing rapid deterioration of living standards. A large amount of academic literature writes about the two problems, often separately, but seldom in conjunction. This research pleads for the latter. This anti-symbiose must be conceptualised as one wicked problem conceived of many rigid problems, causing crises in Tambak Lorok.

2.3. Impact

In this research, the concept of impact is used as a way to show the severity of the effects of certain problems. To achieve an understanding of the impact of environmental hazards on livelihoods of the people of Tambak Lorok, we must conceptualize how impact is measured and how it is perceived. Impact of environmental hazards and climate change can be measured in many ways. No one way of assessing the risks and impact of climate change and creating a comprehensive multi-risk assessment overview is universally accepted (Gallina, Torresan, Critto, Sperotto, Glade & Marcomini, 2016). Therefore there is little clarity on how to assess this impact. To understand how climate change and land subsidence impact the community of Tambak Lorok, it is important to conceptualize different meanings of impact. First of all, the impact across different temporal scales varies. Impacts of environmental hazards on the short term can include direct risk to human life, damages to real-estate and destruction of vital infrastructure. On the medium term, contaminated and stagnant water increases health risks and the spread of diseases. On the long term, the disrupting force of spatial destruction can have consequences on the economy, crippling societies (Hammond, Chen, Djordjević, Butler & Mark, 2015). Impacts vary, but is mostly measured by means of monetary value. However, this does not tell the whole story. The social and psychological impacts on the lives of people are often overlooked (Grothmann & Patt, 2005). The perceived impacts tell us imported narratives in studying the environment. These are connected to place attachment theory (Devine-Wright & Quinn, 2020), more on that later in this chapter. In this research, the perception of environmental impacts on the community of Tambak Lorok will be explored. Impacts on the community of Tambak Lorok will be measured less by using monetary value, but rather by zooming in on social and spatial integrity within the community. Furthermore, the focus is on the perceived risk

and impact of environmental hazards. This is done by conducting interviews with both experts and inhabitants of Tambak Lorok.

2.4. Climate Mitigation and Adaptation

Evidently, climate change is an intricate and complex problem with many different factors causing and stimulating the process, and subsequently has many implications for flora, fauna, and many more. It is a case of a wicked problem (World bank group, 2020). Wicked problems are complex problems with different, interwoven causing factors and many implications, without a clear solution. Therefore, many different actions and theories have been adopted over the decades addressing different facets of the problem. Climate mitigation and climate adaptation are collective concepts of two distinct ways of tackling climate-change related factors. Mitigation is focussing on reducing the effectiveness of change-stimulating factors. This mainly consists of the reduction of greenhouse gas emissions (IPCC, 2014a). Climate adaptation is 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. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects (IPCC, 2014b). In Tambak Lorok, the problems are many. They are all intertwined with rising sea levels and land subsidence. Due to the acute nature of tidal floods in Tambak Lorok, climate mitigation will be too little too late. The people of Tambak Lorok are not keen to move. This leaves them with few options, building or drowning. They chose building. In this particular area, climate adaptation is essential to thwart existing and future climate change and land subsidence-related problems. Therefore, the most prevalent strategy used in Tambak Lorok is climate adaptation (Harwitasari & van Ast, 2011).

The imminence of the danger to which Tambak Lorok is exposed is quite clear however. It may or may not be as clear to the people of Tambak Lorok. Certain is that they are impacted by these dangers, thus their daily life and the choices they make on how to deal with these dangers are impacted too. Explaining the choices of practice of the people of Tambak Lorok, a few theories are used from both behavioural economics and social-geography, which will be discussed in the following paragraphs.

2.5. Path Dependency and Lock-In Theory

Path dependency is a phenomenon which explains the continued use of a practice based on historical preference or use, even though better or newer alternatives are available. It occurs when it seems easier or cheaper to use a certain practice based on historical choices, existing behavioural patterns and economic considerations (Barnes, Gartland & Stack, 2004). This results in sub-optimal courses of action. This can be caused by many different factors. Most of the time, especially in the use of products, it depends on the popularity of the product, becoming 'mainstream' and dominant. It is applicable to the use of other things than products as well, such as languages. The more it is used, the higher the probability of an increase in its use. The English language is not necessarily the optimal Lingua Franca compared to, say, Esperanto. A language designed to be as easy to learn as possible for as many different nationalities as possible. However, English still is the mainstream international language, due to the historical use through the global British colonial dominance.

This is connected to the Lock-in phenomenon. Lock-in within economics is conceptualised in different varieties. Technological Lock-in means that users of a product or practice must adopt certain structures which excludes the use of other products or practices. An example is in the information industry in which the full functionality of a product often requires the adoption of a platform which

are incompatible with software from competitors. As a result, a user is locked-in. thus, technological lock-in is well known. The majority of academic literature about path dependency and Lock-In is about technological Lock-in. There is, however, another dimension to Lock-in which does not rely on technological networks. This is behavioural Lock-in (Ibid.). Behavioural Lock-in centres around consumers or users of a product or practice becoming familiar with it, decreasing the probability of the use of using different products or practices. Behavioural Lock-in occurs when the behaviour of an individual is determined by a tunnel vision focussed on the use of practices known to him, to which one has become accustomed to and familiar with. Often this results in sub-optimal and inefficient choices (Ibid.). The use of the QWERTY keyboard, which is still very popular to this day, is probably the most well-known example. David (1985) famously used it to explain Lock-in. Because of the prevalent technological systems and limitations at the dawn of the first typing machines, the QWERTY keyboard was invented so that the probability of the hooks containing the letters, repeatedly lunged at the paper getting stuck was minimised. With today's technological limitations, a far more efficient keyboard layout is possible however. Based on the learning and habituation with that system, humanity locked itself in the use of a sub-optimal, inefficient practice. Behavioural Lock-in emphasizes David's concept of irreversibility and habituation.

Sub-optimal lock-in behaviour often is inescapable for the individual alone, especially when this behaviour is socially embedded in the individuals social vicinity (Wilson, 2014). Behavioural choices of practice are deeply influenced by social surroundings. Communal networks ensure that behavioural lock-in is especially rigid due to Social Resilience. Communities can get stuck in structural lock-in effects. This means that changing individual and community behaviour, which is socially locked-in can be characterised by transitional ruptures (Ibid.).

The relevancy of path dependency and lock-in theory within economics is well documented. However, it extends far beyond economics. It is very much applicable in the social sciences and human geography to attempt to explain certain practices and behavioural patterns of peoples, communities and cultures (Barnes, Gartland & Stack, 2004). The behavioural tendencies of the people of Tambak Lorok show clear similarities to the path dependency and lock-in phenomena.

Given the limited amount of economical capabilities of the people of Tambak Lorok, times are hard. Their coping strategies consist of buying soil to heighten the foundation upon which they build their houses. In some cases they add a floor to their house. They end up having to pay for the materials and the engineer costs. They have to do this about every 5 years if they wish to keep their feet dry. They invest nearly all their savings into this endeavour. Solving the flooding problem only temporarily. Effectively investing nearly their entire income into preserving the status quo. Locked in this endless cycle, the problem is not addressed, but perpetuated. Leaving the inhabitants stuck in their position (Harwitasari & van Ast, 2011). Opting for sustainable solutions seems impossible, resulting in sub-optimal pathways in which none of their actions deal with the flooding problems long-term.

2.6. Sunken-Cost Bias

Sunken-cost bias is a form of cognitive dissonance, which means there's a distance between one's chosen course of action and the cognition of rational behaviour. It results in making sub-optimal, irrational economical choices (Haita-Falah, 2017). People are no homo economicus. By no means can people reach the most optimal economic outcome every time. This is due to a number of different cognitive dissonances. Sunken-cost bias is one of these. It is the bias or tendency to persist in a course of action due to prior investments of effort, money or time (Magalhães & Geoffrey White,

2016). A state of mental discomfort can stem from this cognitive dissonance. A common mechanism which reduces this discomfort is a post hoc rationalisation of past courses of action by continuing to pour resources into this course (Staw, 1976). The people of Tambak Lorok may be making the same mistakes in choosing their economical courses of action. Investing resources into sinking land may be a case of sunken-cost fallacy in the most literal sense ever. It would mean they are unable to deviate from this adaptation strategy. It could also be a reason why some people are reluctant or unable to migrate out of the area. They could be financially shackled to Tambak Lorok.

2.7. Place Attachment theory

The people may not only be financially shackled. Place attachment theory describes the social and emotional bonds humans develop with a place. It is a main concept in environmental psychology. Schroeder (1991) differentiates between meaning and preference. It depends on a reciprocal relationship between the human and the place based on behaviours and experiences. Shared emotions and experiences between places and people may lead to a sense of solidarity, familiarity, connection and community. This may provide an explanation on why the people of Tambak Lorok want, or do not want to move out.

Place attachment can be operationalized in different spatial ranges and dimensions. Hidalgo & Hernandez (2001) carve them up in three spatial ranges, namely house, neighbourhood and city, and two dimensions, namely the physical and social dimensions. It is important to differentiate between these concepts because place attachment may only occur to a certain extent. These will be connected to the willingness to move out of Tambak Lorok in the empirical findings.

The impact of climate change-related disasters and land subsidence on the community of Tambak Lorok can be characterised and shown using place attachment theory. If people are connected to a place emotionally, what happens to that place can have impact on the mental wellbeing of its populace. Solastalgia, a form of emotional and existential distress caused by the environmental change of the land is a relatively new concept in place attachment theory. There has been a rise in ecosystem distress syndromes, correlating with a rise in human distress syndromes. Environmental challenges worldwide play a role in these rises (Albrecht, et al. 2007). It is connected to nostalgia or homesickness. The latter occurs when people are separated from the place to which they are attached, while in turn solastalgia occurs while people are not separated from that place. In a way, seeing the mutation or destruction of their land is the same as departing from it. It can be quite like losing a loved one. The feeling of emotional and existential distress is influenced by a sense of powerlessness. It can be understood as an ontological trauma. People identify with their living space. Its destruction would mean the destruction of their identity. This is because the identity of the people is based on memory and the lived experiences within a place. Solastalgia means the damaging of the link between the feeling of belonging and feeling at home. This impacts the means to connect to the past through place-embedded memories and to the imagination of the future (Askland & Bunn, 2018). If and to what extent the people of Tambak Lorok are suffering from solastalgia will be discussed in the empirical chapter.

2.8. World Systems Theory

In order to explain the discrepancies between areas in vulnerability to environmental hazards, the world systems theory (WST) is used. This is to attempt to find a connection between global environmental hazards, vulnerability and global power structures. In the following chapters, the WST will be connected to spatial- equity and justice.

The WST was introduced by Immanuel Wallerstein. He delves into the existence of three kinds of systems which encompass large parts of human societal history. Namely mini-systems, world-empires and the modern world system. The WST is a multidisciplinary approach which underlines the global system as the main unit of social analyses, and not nation states (Wallerstein, 2000). In this research the third will be discussed. In this world system, the nations of the world are divided in three blocks. Core countries, semi-periphery countries and the periphery countries. This division is based on the inter-regional and transnational division of labour. Core countries consist predominantly of the service sector, while periphery countries mostly host a natural resources based labour sector and semi-periphery is in between with a large industrial sector. The division of labour sectors in countries places countries on the ladder in the world system. The modern world system creates a political superstructure. The modern world system emerged in the early modern age and marked the beginning of the first steps towards the incorporation of the entire world into the global system. This political superstructure showed to be a strong foundation for the global spread of capitalism (Martins, 2019). The world system's consistency is based upon power structures from history.

The WST helps explaining the existing power structures between nations and nation-blocks, based on economic power. WST shows the relative positions of countries is determined based on trade relations within the global capitalist system, for which the world system is a foundation.

The equity of distribution of wealth and power in the world is strongly connected to the modern capitalist world system (Rice, 2007). These existing power structures influence the rate of affluence within blocks and countries, and subsequently the exposure of social groups to environmental hazards, since affluence so strongly influences vulnerability to these increasing environmental hazards (Kelly and Adger, 2000). This means that the inequalities already present between the global north and the global south will only increase due to growing environmental risks in the coming decades. In this research the connection between the relative position in the global capitalist world system and the exposure to increasing environmental risks is explored, using the case of Tambak Lorok as an example.

2.9. Spatial Equity

Across the globe, space is inhabited by people. Not all space is divided equally. Furthermore, not all spaces are equal in their characteristics. Space refers in this sense to the physical environment. Space is uneven in its utility for human activities. Some spaces have positive effects and some have negative effects on the lives of the people inhabiting them. Throughout history, people have struggled for spaces which held value to them. Millions of people fought and died in wars over spaces. The Hundred Years' War, WW1 and the Yom Kippur War to name a few (Mckay et al., 2014). To this day countries fight for the occupation and preservation of spaces and influence over them. Nowadays, countries do this by exerting power based on financial means (Ibid.). Through these financial power structures, space is divided unequally.

Spatial equity concerns the unfair distribution of well-being of individuals and communities across space (Morril, 2001). These effects can be marginal, but can also have the influence to change the evolution of societies (Ibid.). Space can influence many aspects of human life. The socio-spatial distribution influences human health and is apparent for most measures of mortality (Curtis, 2004). Spatial equity influences mobility and accessibility (Dadashpoor & Rostami, 2017). This includes the accessibility to education, which has an effect on the equality of opportunity and income (Pizzol, Giannotti, Tomasiello, 2021; Schütz, Ursprung & Wößmann, 2008). Spill over effects such as crime,

violence, spread of infectious disease, and concentrations of alcohol and drug use affect all of society (Woodward and Kawachi, 2000). Spatial planners and policymakers advocate efforts to thwart the high degrees of spatial inequality. Urban planners attempt to increase spatial equity by desegregation. Class mixing seems unable to match the superior societal forces for segregation and spatial inequality however (Pratt and Hanson 1994).

One of these forces for spatial inequality could be capitalist societal systems. Marxist geographers argue, that the social inequalities, endemic to capitalist societies, result in spatial inequalities, regional and local differences within and between societies (Peet, 2001). Spaces with unfavourable properties will thus most likely be inhabited by those who occupy a less powerful position within capitalist society. In short; the poor live in the 'bad' neighbourhoods, with all the negative effects mentioned above, influencing every facet of life. Due to the changing of the climate and the effects on coasts, the 'bad' areas typically include coastal areas with higher vulnerability to environmental hazards. The concept of spatial equity must therefore be connected to vulnerability and impact. And it should be posed that, within capitalist society, the poorer people will find themselves in the most vulnerable positions to environmental hazards.

The situation the community of Tambak Lorok finds itself in seems to confirm this hypothesis. Indonesia has inequalities in income similar to the United States (World Economics, 2021). The city of Semarang is known for its height differences. All of the coastal parts of Semarang have been dealing with growing flood risks the past decades (Nugraha, Santosa & Aditya, 2015). It is no surprise that people in the high income segment live in the higher parts of Semarang, far away from sinking and flood-prone areas. The poorer community of Tambak Lorok is exposed to far more serious environmental hazards to their livelihoods than wealthier neighbourhoods, thus they are impacted unequally compared to other inhabitants of Semarang.

Given the capitalist system the world is soaked in, the Marxist view on spatial equity goes farther than regional inequalities. The situation of the community of Tambak Lorok moreover feeds the suspicion of spatial inequality occurring on a global scale within the modern world system (Wallerstein, 1990). Given the increasing pressure on the environment due to global warming, globally people are impacted. However, the haves of the world are seemingly impacted less drastically. Connecting spatial inequality of environmental impact with the WST of Wallerstein, a pattern could emerge (Rice, 2007). It shows us that the rich countries are impacted less drastically, both because of their geographical position and existing power structures, because of their economic advantages within the world system (Robinson, 2011). Some might say the richer countries are impacted more in economic sense, since the deterioration of the environment impacts their economies as well. Since their economies are larger, the impact measured in dollars, is larger also. But as mentioned earlier, this perspective does not tell the whole story of potential impacts. The owner of a distribution company may see his market share plummet due to unforeseen environmental hazards, but will still be able to cuddle up in a comfy chair with a roof over his head and a pair of dry feet nested into his loafers at the end of the day. Many are not so lucky however. The victims of global climate change find themselves in a position of constant fear of floods threatening their livelihoods. The people of Tambak Lorok could present an example of this overlooked part of human society.

2.10. Environmental and Spatial (in)Justice

An unfair or unequal distribution of space, wealth, power and vulnerability gives rise to the issue of justice. There are two terms of justice relevant in this discussion; environmental justice and spatial justice. These terms are distinct from spatial equity since they dabble into the morals of spatial and environmental equity.

Environmental justice, as defined by the Environmental Protection Agency, is “the fair treatment and meaningful involvement of all people regardless of race, colour, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies” (United States Environmental Protection Agency, 2015). In short, it means that everyone, disregarding race, class and country of origin, should be able to profit from their environment equally. In a capitalistic world system, unequal profit from resources is inherent (Harlan, Pellow, Roberts, Bell, Holt & Nagel, 2015). This goes for local, regional, national and also international scales (Kurtz, 2003). The unequal profit from resources globally, based on race, colour, national origin, or income means environmental justice within western society is not self-evident. Thus, we can pose that not everyone is able to benefit from his environments equally. Environmental injustice is the opposite of justice, which is the more relevant term given the above. We can extend the concept of Environmental injustice even further. Not only should the boons of the environment be distributed equally, but the banes as well. Is it justice that people are impacted unequally by a global problem for which they are only marginally responsible? Morally speaking it is wrong, but it is happening every day. The global environment is a common good, which is openly accessible and everyone is able to use it and profit from it. It's deterioration is a tragedy of the commons, for which no one entity is responsible. Within capitalist society, the poor draw the shortest straw and pay the bills of the deterioration of the global environment. This is Environmental Injustice.

In recent years, the call for an increased focus on environmental justice gained in strength. There is however little attention to what the term ‘justice’ within the concept of environmental justice refers to precisely. As mentioned in the previous paragraph, most scholars define environmental justice as an issue of equity and equality. This is incomplete however (Schlosberg, 2004). The term ‘Justice’ refers to the concepts of spatial- and social justice. Both of which are strongly related to the effects of the deterioration of the environment. Communities, dwellings and NGOs are socially and spatially impacted (Marcuse, 2019). These concepts go beyond equality of distribution of wealth. The conception of global environmental justice should therefore really be threefold. Firstly, equity in the distribution of environmental risk. Secondly, recognition of the diversity of the participants and experiences in affected communities. And thirdly, participation in the political processes which create and manage environmental policy (Schlosberg, 2004).

Spatial injustice occurs in two major forms: the involuntary confinement of social groups to a limited space, and the allocation of resources over space unequally (Marcuse, 2019). The first revolves around the involuntary segregation of people within society. This is the unfreedom argument. The second revolves around the unequal distribution of wealth, social status, access to opportunities, jobs and facilities. This is the called the unfair resources argument. This inequality applies to the distribution of negative externalities over space as well. This includes spatial vulnerability to increasing environmental hazards and impacts of climate change. These forms of spatial injustice are based on societal segregation forces, income, social status, ethnic origin and power structures. There are numerous cases of these forms of spatial injustice occurring around the globe. These power structures find their origin in the WST (Rice, 2007). In This research a relation between spatial injustice and WST is explored using examples. An infamous example is the unequal impact of hurricane Katrina in New Orleans on the black community. Tambak Lorok could be another Example

2.11. Conceptual Model

Implementing the theoretical concepts from this chapter and tying them together, the following conceptual model appears:

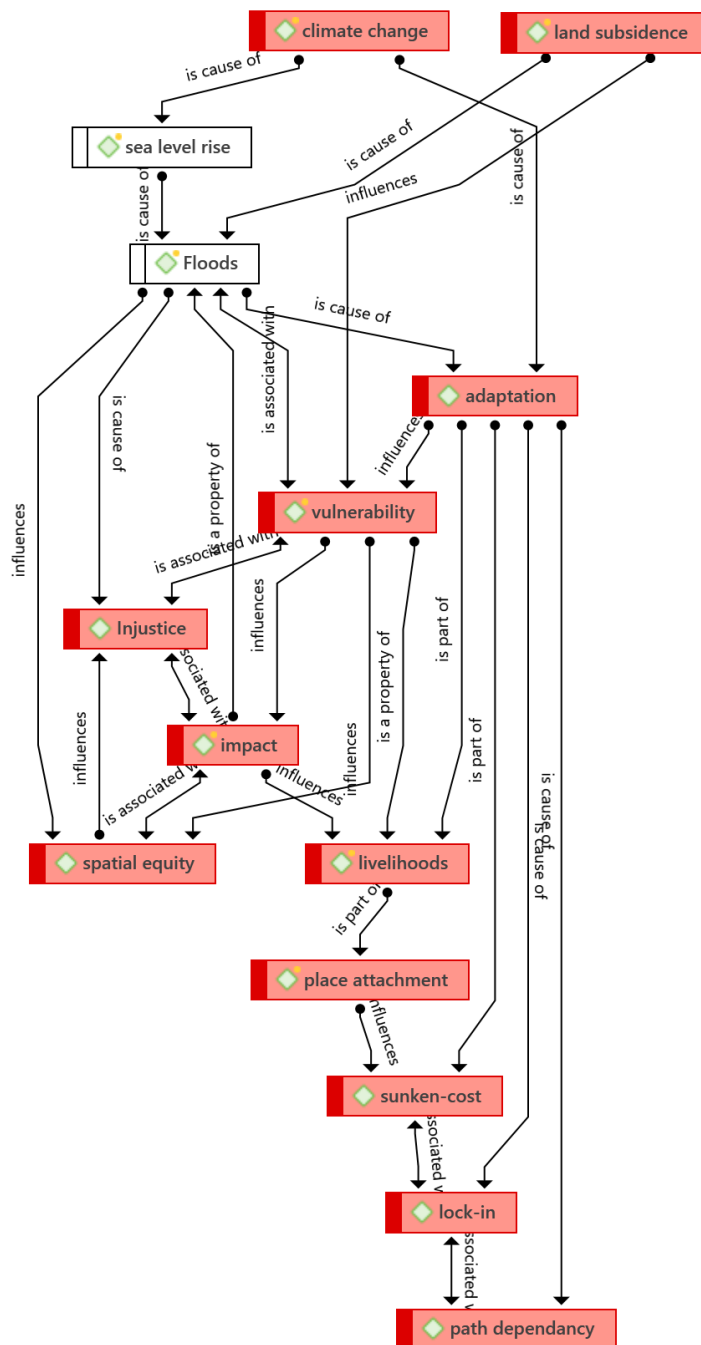


Figure 2: Conceptual model of the Theoretical framework.

All the concepts marked in red are theoretical concepts directly derived from the theoretical framework. Concepts marked in white are connecting concepts. Climate change causes sea level rise. This anti-symbiose of sea level rise and land subsidence cause floods. Land subsidence also increases the vulnerability of livelihoods to these floods, as the probability of flooding increases when the ground sinks closer to sea level.

Due to the floods and climate change, people of Tambak Lorok are forced to protect their livelihoods. Therefore, adaptation is part of livelihoods. Adaptation influences the vulnerability of livelihoods to floods. Furthermore, adaptation is a part of sunken-cost, since investing in adaptations means inhabitants are pouring resources into their environment, making them more likely to fall to the sunken-cost bias. Subsequently this means adaptation causes the lock-in effect, which is associated with sunken-cost, and path dependency, which is associated with lock-in. These three concepts are closely linked. Place attachment influences sunken-cost, since people are emotionally attached to their environment and thus are more encouraged to pour resources into adaptation. Furthermore, place attachment is part of livelihoods, since the livelihoods of the people of Tambak Lorok make that they are bound to their place to be able to provide for themselves.

The impact of floods is influenced by the vulnerability of livelihoods to floods. The concept of spatial equity is influenced by the floods and vulnerability, and is associated with impact, because floods, vulnerability and impact may or may not be spread equally over space. Spatial equity influences injustice, because of the same three variables; the impact of- and vulnerability to floods. In essence, Spatial equity influences injustice and are both influenced and associated with the impact of- and vulnerability to floods.

3. Methodology

In this chapter the chosen methodological considerations and decisions made in the research process will be discussed. Firstly, The research design will be presented. Here, the aim of the research will briefly be stated. The data collection method which best suits the research, what this method entails and why this was chosen specifically will be discussed. Secondly, the collection of data and methodological choices will be explained and legitimised. The course of the research process is explained step by step. Thirdly, the method of analyses will be described. Finally, the validity and reliability of the chosen method will be discussed.

3.1. Research Design

This research aims to create a narrative of the effects of spatial justice on the impact of environmental hazards, climate change- and land subsidence, on the coastal urban community of Tambak Lorok, Semarang, Indonesia. This research is explorative and descriptive of nature. Since the subject delves into differences in culture, perception and experience rather than numbers and centimetres, the research goal is best achieved through the use of qualitative methods. Tambak Lorok was chosen as a place to conduct research because of the living conditions. They are abnormal to say the least. Tambak Lorok is dealing with a plethora of problems, the largest of which are floods. This is exactly why it is a good location for social and environmental research. Tambak Lorok is a case of extreme circumstances. Hence, its inhabitants have a special perception of their living conditions and their lives.

Although the use of numbers is essential to give a measurable view of the problems in Tambak Lorok, they are used to present the problem only. The main focus is on highlighting and analysing the narrative the community of Tambak Lorok tells about the impact of climate change and land subsidence and their perception on spatial justice. The main scope of data collection entails in-depth interviews.

A mix of field research and desk research is implemented to most holistically approach the case of Tambak Lorok as a social group and as coastal urban community (Berg, Lune & Lune, 2004). The emphasis of this research is on field research. Desk research is conducted for acquiring background knowledge, conceptualizing the theoretical framework and finding relevant numbers regarding land subsidence. The narrative this research aims to create is made up of two important concepts, namely spatial justice and impact. The impact of environmental hazards on livelihoods will be researched by interviewing the people of Tambak Lorok directly. More specifically, their perception on the impact environmental hazards impose on their lives will be researched. Subsequently their perception on spatial justice will also be researched. Their perception is most important. However, the concept of spatial justice and its occurrence in Semarang, Indonesia, is better determined through the narrative presented by local experts on the subject. Therefore not only will the population of Tambak lorok be interviewed, but local experts on the subject as well.

Interactive and participatory ethnographic research methods were chosen specifically because of the cultural and participatory focus of said methods. The researcher is an outsider to the community and is relatively inexperienced in researching the problems in Tambak Lorok, therefore it is detrimental for the researcher to submerge himself into the subjects world. Ethnographic methods can be used to great effect in the study of cultural groups, how they work and what issues may be clogging them (Mathur, 2021). This is because the research can be conducted in the natural setting of the subject. Ethnographic researchers describe their experience of social groups and cultures with as much neutrality as possible. They treat their subjects as the people they are without judging them (Ibid.).

Ethnographers typically strive for as much data as possible to try to create a holistic and complete image of the subject entity, which is collected over an elongated period of time. Some consider ethnography an art rather than science. However, a certain degree of freedom in interpreting the subject entities' reactions and perceptions is required to gain an advanced depth of understanding (Mathur, 2021). In this method, the researcher engages in observation and dialogue. It relies on systematic inquiry, asking, observing and immersing the researcher and subject entity into the research (Merriam & Tisdell, 2015). The asking within this method was be done by conducting interviews with inhabitants of Tambak Lorok and with local experts. This approach will contribute to the acquisition of new knowledge and understanding because it entails a bottom-up perspective, not highlighted earlier.

3.2. Data Collection

Prior to traveling to Indonesia for the collection of the data, literary research was conducted to gain background knowledge and the theoretical framework was laid. When reviewing existing literature on the situation of Tambak Lorok, mainly research was viewed written by Indonesian academics. When laying the theoretical framework, mainly critical reviews of the used theories were chosen together with the original works.

The interview guides were drafted while in Semarang. The in-depth interviews were semi-structured so there was plenty of room for elaboration, additional questions and probing questions. Two semi-structured interview guides were created to separate the interviews with the people from Tambak Lorok and the experts. This is important because the wording and nature of questions we asked in the interviews are different. The data from the people in Tambak Lorok was collected through observing, asking questions, partaking in activities and conducting interviews. The data was collected between the 11th of May and the 3rd of June in Tambak Lorok and Semarang, Indonesia. The interviews with inhabitants were conducted in the public park central in Tambak Lorok and in respondent's front yards. The expert interviews were in the offices of the respondents. The interviews with the inhabitants took between 26 and 35 minutes. The experts' interviews were longer and took between 35 and 50 minutes. All respondents were interviewed individually in the presence of translators. One expert interview was done with two respondents, of which one was also the translator. All were asked permission to be interviewed and recorded prior to the interview in order to transcribe, code and analyse the interviews at later date. All respondents were given the certainty that they would join the research anonymously so they would not feel impeded to answer questions differently or untruthfully because of their names or functions.

In order to cross the language barrier, Unika Soegijapranata assigned students to translate during our time in Indonesia, without whom this research would have been impossible. The connections of Unika and LPUBTN, an NGO operating in Tambak Lorok, were used to find respondents. Ten respondents were found in total. Four experts and six inhabitants. Two experts work for LPUBTN, one works for the city government as a spatial planner, and one works as a lecturer and researcher at Unissula University in Semarang. Among the inhabitants five women were interviewed and one man. Three young women between the ages of 19 and 21, two middle-aged women between the ages of 50 and 52 and one middle-aged man of unknown exact age were interviewed. The man was the chief of the local neighbourhood RT 4. Tambak Lorok is divided in four different RWs, which are comparable to districts. These RWs are in turn divided in RTs. Each RT represents about 400 people. The whole of Tambak Lorok is home to about 8.500 people (Sunarti, Rahdriawan, Mardri, Dewi & Widiarta, 2018). All interviews with inhabitants were held within the boundaries of RW 15. Subsequently, all respondents lived in said RW.

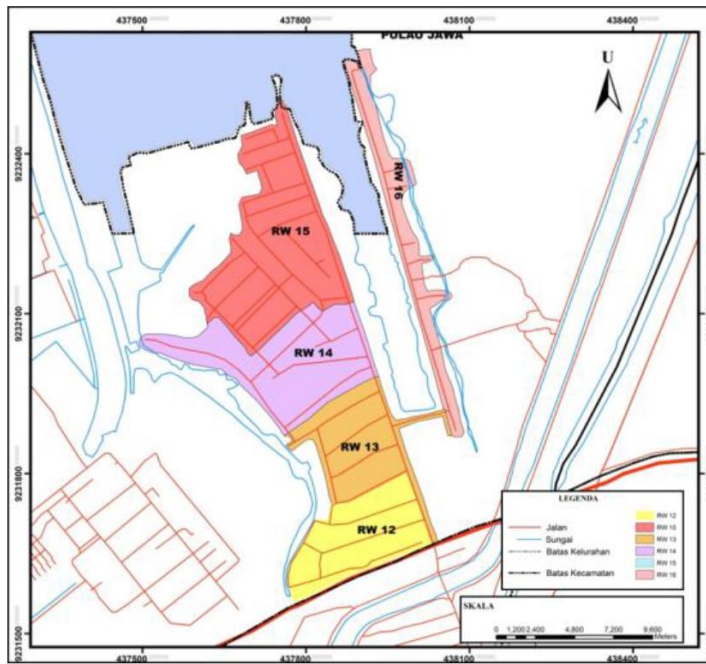


Figure 3: Administrative Map of Tambak Lorok (Sunarti, Rahdriawan, Mardri, Dewi & Widiarta, 2018).

The experts gave much information, but occasionally contradicted each other, or held different opinions on the situation. The inhabitants repeated each other for the most part, which meant data saturation was reached relatively quickly after around four interviews. Their opinion on migration proved the most diverse. The public location of the interviews was sub-optimal as crowds and mosques produced some noise. The language barrier proved a challenge in asking probing questions and receiving deeper answers. Moreover, because the translator asked the questions and received the answers, she had quite some influence on the interviews. She translated the answers from respondents and had to summarize them. That way the coded text is only a collection of short answers, already interpreted. Because of this, there is a larger distance between the researcher and the source of the data (Squires, 2009). An overview of interviews is listed in table 1.

Date:	Type:	Translator present:	Occupation:	Gender:	Age
27-05-2022	Expert	No	Spatial planner at Kota Semarang	male	?
27-05-2022	Expert	Yes	CEO and Employee at LPUBTN	female	?
27-05-2022	Inhabitant	Yes	Housewife	female	50
27-05-2022	Inhabitant	Yes	Electrician and chief of RT 4	male	?
28-05-2022	inhabitant	Yes	Housewife	female	52
28-05-2022	Inhabitant	Yes	Student	female	19
28-05-2022	Inhabitant	Yes	Student	female	21
28-05-2022	Inhabitant	No	Student	female	21
30-05-2022	Expert	No	Lecturer at Unissula University	female	?

Table 1: overview of interviews

3.3. Method of Data Analyses

The method of analyses used in this research was a combination of qualitative coding of interviews, categorising responses and observations. The responses were compared to each other to spot hiatuses between perceptions and narratives. The data was recorded using a telephone microphone and transcribed in Word. Thereafter the data was coded using Atlas t.i. A combination of grounded theory and framework analyses. In grounded theory the theory emerges from the data. Coding is open and unstructured beforehand. In framework analyses a researcher already has some theoretical ideas of what can be expected to be found in the data. For this the theoretical framework is used. this means a mixed approach of inductive and deductive coding was implemented. Deductive codes were used to ascertain and establish theories, discussed in the framework, in the data. Also called a priori codes. Inductive codes were used to find unexpected results in the data. In vivo coding was used to stay as close to the perception of the respondents as possible. In vivo coding is a form of qualitative data analyses citing the actual words used by the respondent to stay as close to the subject as possible using the meaning of words derived from respondents themselves (Manning, 2017). This is important because meanings may differ from the perception of respondents and the researcher given the cultural differences (Saldaña, 2014). The coding started with in vivo coding. Thereafter, all the theoretical concepts presented in the theoretical framework, which weren't already mentioned by the respondents, were added as codes to apply more focus on these theories. This is the framework analyses. The in vivo coding together with the framework coding created 200 codes. All the corresponding codes were merged based on their similar meaning, irrelevant codes were deleted and codes were grouped using category codes, Following the in vivo coding, these served as axial codes. In vivo coding and axial coding make up the stages of grounded theory, some unexpected results were found through this method. After the merging, grouping, categorising and deleting of the codes, 59 consolidated codes remained, listed in figure 4 on the following page. In this list, 'Grounded' means the amount of times it is coded in the transcript and 'Density' is the amount of times the code is related to another code. All the codes representing key concepts from the theoretical framework were given the colour red to make it easier to segregate them during analyses from other codes.

Following the coding and consolidation, correlating codes were connected based on how they relate to each other. The connections were found through analysing the coded data to 'ground' the connections in the empirical data (Walker and Myrick, 2006). The connections between correlating codes were used to construct a code network derived from the empirical data and the theoretical framework. This code network will be used as the basis for the findings in the analytical chapter.

Name	Grounded	Density
● ◊ adaptation	57	11
▷ ◊ Age	5	3
◊ awareness	8	3
◊ behavior	11	13
● ◊ climate change	20	5
◊ community	35	4
◊ complexity	4	1
◊ corruption	2	4
◊ cost of adaptation	2	3
◊ cost of water	1	3
◊ dependancy	5	2
◊ discrimination	7	4
◊ education	5	4
◊ environment	6	7
◊ extreme weather	1	4
◊ faith in government	30	3
◊ family	37	6
◊ future problems	20	3
▷ ◊ Geography	10	2
◊ government	56	5
◊ ground water usage	8	4
◊ Habituation	3	3
◊ health	2	7
◊ Heightening of Houses	2	3
◊ Hygiene	11	6
● ◊ impact	33	9
◊ Improvement	62	10
◊ income	56	7
◊ inheritance	4	1
● ◊ Injustice	52	10
▷ ◊ Interventions	199	4
● ◊ land subsidence	23	5
● ◊ livelihood	33	7
◊ Location	1	2
● ◊ lock-in	6	4
◊ LUBTPN	4	3
◊ Migration	63	6
◊ Mobility	3	7
◊ NGO	5	3
◊ Noise pollution	2	3
● ◊ path dependancy	7	4
◊ PDAM	2	2
▷ ◊ Perception on life	79	9
● ◊ place attachment	43	5
◊ port	11	3
◊ poverty	9	6
◊ promise	3	1
◊ real-estate market	6	2
◊ responsibilities	2	1
◊ Rob	104	15
◊ sea level rise	12	4
◊ Short-term focus	3	3
● ◊ spatial equity	34	10
● ◊ sunken-cost	3	5
◊ tourism	5	2
◊ Vermin	6	4
● ◊ vulnerability	21	13
◊ Wickedness	67	15
◊ willingness to change	7	4

Figure 4: list of codes mentioned by inhabitants and experts

3.4. Validity and Reliability

Validity is achieved because the same interview guides are used per respondent type, the researchers conducting the interview are the same and the translator is the same. Meaning the measuring tool is the same at every moment of data collection. One could make a case against the validity of the interviews because they were not held in an isolated environment. However I would argue that this only increases the validity, because the interviews were held within the contexts of the research subject, literally amidst the floods. In some recordings people are audible slugging through the flooded streets. The reliability is weaker, since ethnographic research methods strive to collect as much data as possible over a more elongated period of time. However, one month was all the time available for data collection. Different focus groups of inhabitants and experts were chosen to provide a bottom-up perspective.

Semi-structured interviews do not necessarily provide a generalizable basis of data beyond the sample group. However, they provide a far superior depth of understanding of the participants' perceptions (Harrell and Bradley, 2009). Furthermore, respondents were found using the contacts of the Unika Soegijapranata University and LPUBTN, and the respondents were mostly female and of relatively unmixed ages. Therefore the sample is not random decreasing generalizability. However, these people were chosen by local participating inhabitants based on their willingness to partake in an interview, making them much more likely to provide deeper answers and more data.

4. Empirical Findings

In this chapter the results of the research done with interviews will be presented. This will be done by presenting the found codes. The findings on the theoretical concepts and mentioned codes by inhabitants and experts will be set out. Furthermore, unexpected results emerged through the use of grounded theory will be discussed. This chapter focusses on answering the descriptive part of the sub-questions in the data analyses.

4.1. Perceived Problems

To achieve an understanding of problems existing in the community of Tambak Lorok, the sub-question; *what are problems perceived the gravest by inhabitants of Tambak Lorok?* Was asked. Based on the empirical findings this question will be answered.

Speaking to the inhabitants about what problems are the most pressing in their opinion, by far the most mentioned were the codes; 'Rob', 'Flood', 'Flooding' and 'Inundation'. These codes were merged to 'Rob'. Rob is the local word for the floods. This word was used predominantly during the interviews by the respondents and its use was adopted during interviews. 'Rob' was mentioned a total of 104 times and five out of six respondents mentioned it as their most pressing problem. This may indicate the flooding severely impacts daily life in Tambak Lorok.

Show codes in group **Perceived problems**

Name	Grounded	Density
○ awareness	8	3
○ corruption	2	4
○ extreme weather	1	4
○ Rob	104	15
○ health	2	7
○ Hygiene	11	6
● Injustice	52	10
○ Mobility	3	7
○ Noise pollution	2	3
○ Vermin	6	4

Figure 5: list of codes of code group 'Perceived problems'

'Waste' was mentioned by one respondent as being her biggest problem. The code 'Waste' was merged with the codes 'Rubbish', 'Trash' and 'Dirty' into the code 'Hygiene'. Third most strongly mentioned was the code 'vermin' consisting of the codes; 'Rats' and 'Mosquitos'. Apart from these, the codes 'Awareness', 'Corruption', 'Extreme weather', 'Health', 'Mobility', 'Injustice', 'Noise pollution' were mentioned. The code 'Injustice' is reason for curiosity. Injustice refers to spatial and environmental injustice. These were merged into one code given the interconnectedness of both concepts. Most of the respondents from Tambak Lorok did not mention injustice as a problem. Only when specifically asked about justice two inhabitants said that it was a problem and called it 'Unfair' that they had to suffer more from rob than other inhabitants of Semarang. The rest of the inhabitants called it 'Destiny', 'Luck' and 'Fate' that they had to suffer more than others and that it is their fate to endure this hardship. Based on the found codes, it seems as though Indonesian people look at life less critically. Inhabitants more specifically mentioned the randomness of the floods. This means that people are unable to prepare for the floods. One respondent mentioned that it was particularly stressful because the floods can strike at any time, even at night. Yet, it appears that people are getting used to it.

4.2. Living Conditions and Perception on Life

Living conditions in Tambak Lorok are harsh. Inhabitants can expect their homes to flood every day, destroying a basic sense of safety and hearth. Because of the rob and littering, the neighbourhood is mostly covered in waste, resulting in bad hygiene and vermin on the loose. This effects the health of the inhabitants on the long term. Moreover, the warm weather and dampness in the neighbourhood make it almost impossible to comfortably move around. Furthermore, space is limited. Households live in two-floor houses with their entire families. Respondents said their households go up to seven people, living in two- or three-room houses. Finally, when the rob is of a particular height, inhabitants have trouble to leave Tambak Lorok, making them immobile.

However, despite these harsh living conditions, their perception on life is of a positive nature. When talking about their living conditions, their neighbourhood and their environment all but one were positive. Calling it 'comfortable' and 'not a big problem'. In short, their living conditions are objectively deplorable, yet, they say they are comfortable, thankful and happy. One woman in her fifties mentioned her stove was gone after the floods had taken it adrift. She told it as a joke. They see it as something not to complain about. Another woman in her fifties joked about becoming a mermaid if the Rob continued like this. It seems as though this group has accepted these living conditions.

Name	Grounded	Density
Perception on life	79	9
acceptance	8	1
comfort	4	1
living conditions	30	15
lucky	2	0
perception of the neighborhood	32	7
Safety	1	3
thankful	3	0

Figure 6: codes categorised under the code 'Perception on life'.

The following codes were found; 'Acceptance', 'Comfort', 'Lucky', 'Perception on neighbourhood', 'Thankful' and 'Safety' apart from 'Living conditions'. The code 'Perception of neighbourhood' is an axial code used to code claims about their living environment. These codes summarise how the people of Tambak Lorok view their lives. Acceptance seems to be a reoccurring theme in the lives of the inhabitants of Tambak Lorok. They seem to be able to live and cope with whatever the environment throws at them. Two important factors in this are 'Family' and 'Community'. Family in the lives of Indonesians is a focal point. They live closely to each other in their daily life, often living in one household together spanning three generations.

Inhabitants and experts both mentioned the code 'Dependence' when talking about family situation. Both groups said Indonesians are dependent on their family socially and financially. Most people in Tambak Lorok work as fishermen and some have a side-job at the powerplant in the port of Semarang. This is not enough to keep a family household of 7 people afloat. The people we interviewed said that their income is dependent on children and siblings working in other cities who send them a substantial part of their wages every month. A mother said that she receives three million rupiah every month from her son who works in Jogjakarta, which is no less than 30 percent of his total wage. With this money they pay for their food and for the heightening of their houses. In other words, family is an essential part of their livelihood. It is very normal in Indonesia to take care of each other this way. The meaning of family is closely tied with the meaning of community in Tambak Lorok. Respondents explained that although they face problems, they can face anything

when they face them together. A people's resilience against adversities is strongly connected with family and community (Black & Lobo, 2008). The shared confrontation with hardship strengthens the internal connections within communities and families.

4.3. Impact of Climate Change and Land Subsidence in Tambak Lorok

To achieve an understanding of impact of environmental hazards, the sub-question; *How do climate change and land subsidence impact livelihoods in Tambak Lorok?* Was asked. This sub-question will be answered based on the empirical data.

According to experts and the literature, two large factors are creating problems in Semarang; climate change and land subsidence. The impact of which will be discussed in this chapter. The code 'Impact' stands for the amount or magnitude or severity of impact of the floods. According to the data presented by the local Semarang government, in the year 2000, sea level rose between 0 to 4 centimetres every year. In 2025 it will be between 4 and 8 centimetres per year. Land subsidence has been occurring in Semarang for at least a hundred years according to local government of Semarang. According to the government, land subsidence lies between 10 and 30 centimetres per year. Combined with sea-level rise caused by climate change, the sea rises 34 centimetres annually on average. This creates big problems as mentioned earlier, and has impacts on the inhabitants of Tambak Lorok. According to the government, people have to deal with an approaching shoreline and extreme weather events because of climate change, all the while the soil on which they live sinks into the Java-Sea. In the past two decades these trends have manifested in floods along the whole North-Java coastline.

The floods, coded as 'Rob', have an impact on a large number of aspects of daily life in Tambak Lorok. The severity of the impact of flooding is influenced by 'Vulnerability'. Floods have impact on hygiene, safety, health, mobility and the presence of vermin in Tambak Lorok. Because the severity of impact of floods is not equally spread across space, floods are an influence on the spatial equity of the area. Sanitation facilities flood, making the water dirty. It attracts vermin and insects including rats mosquitos and water snakes into the streets. This in combination with the stagnancy of the water and washed up waste make the neighbourhood an unhygienic shithole with severe impact on public health due to the spread of diseases and parasites. It is not uncommon for people to be bitten by insects or snakes. One respondent said that a friend of hers was bitten by a snake in the water at night. He had to go to the hospital, which was nearly impossible because of the flooded entry roads. Two students living in Tambak Lorok said that sometimes they cannot go to university to attend lectures due to the flooded roads. Furthermore, respondents said the floods make them feel unsafe and makes their living space dirty. The biggest problems in the lives of inhabitants, elaborated upon earlier, are all caused or impacted by the floods. Thus it can be concluded that flooding is the most prominent consequence of the anti-symbiose of climate change and land subsidence and that it impacts all aspects of life. Floods are the biggest problem for the community of Tambak Lorok

4.4. Vulnerability, Behaviour and Awareness in Tambak Lorok

According to experts, the geographical properties of Tambak Lorok determine that it is a high-risk, highly vulnerable area to floods. The main factors determining this are the positioning directly on the Java-Sea, and the land subsidence. Adapting reduces vulnerability. Inhabitants said that the community tries to adapt to the flooding through raising their houses. According to experts, this is just a short-term solution and a sustainable solution is out of their reach. People do not have any other choice than repeating this dead-end adaptation strategy.

Socio-economic variables influencing vulnerability of Tambak Lorok are the behaviour and financial capabilities of the community. According to the inhabitants and the experts, the community of Tambak Lorok focuses on short-term goals. They mentioned the code 'Behaviour', 'Income' and 'Poverty' as factors influencing vulnerability. This is mainly due to unawareness and indifference to the problems, such as the use of ground water, which causes land subsidence. Unawareness and indifference are caused by mediocre education and acceptance. According to inhabitants they rather buy a new motorcycle than address their problems on the long-term. Young inhabitants mentioned the code 'Willingness to change'. Large differences in this 'Willingness to change' between groups based on age and education appeared. The elderly people were the most rigid in keeping the living conditions in the neighbourhood the way they are now and showed signs they are somewhat oblivious to the causes of their problems. The opposite was true for the younger respondents attending university. They knew about the causes of their daily problems and were eager to change the status quo. They complained about the lacking willingness to change among the inhabitants and the behaviour of other members of the community. A heterogeneity exists within the community of Tambak Lorok regarding their problems.

Show codes in group **Behaviour**

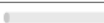
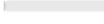
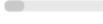
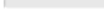
Name	Grounded	Density
 behavior	 11	 13
 ground water usage	 8	 4
 Habituation	 3	 3
 path dependancy	 7	 4
 Short-term focus	 3	 3
 sunken-cost	 3	 6
 willingness to change	 7	 4

Figure 7: codes in the code group 'Behaviour' mentioned by experts and inhabitants. Codes marked red were pre coded based on the theoretical framework.

Another factor influencing vulnerability is income. Poverty and the lack of income increase vulnerability through the lower financial capability to strengthen Tambak Lorok's defences against floods. In figure 8, causes of problems are coded. The codes 'Poverty' and 'Vulnerability' are related. 'Poverty' is a cause of 'Vulnerability'. Most people are fishermen and are dependent on relatives working outside the community to keep them afloat. The spending of the money they have is sub-optimal. Experts mentioned the codes 'Short-term focus' According to both experts and inhabitants, people buy consumption goods and tend not to think about sustainable options to improve their lives on the long-term. Short-term focussed behaviour of the people not only directly influences land subsidence due to ground water depletion, it indirectly influences vulnerability through their sub-optimal economical choices. By noting that the behaviour and choices of the people of Tambak Lorok is influencing their vulnerability to floods, they are themselves a factor.

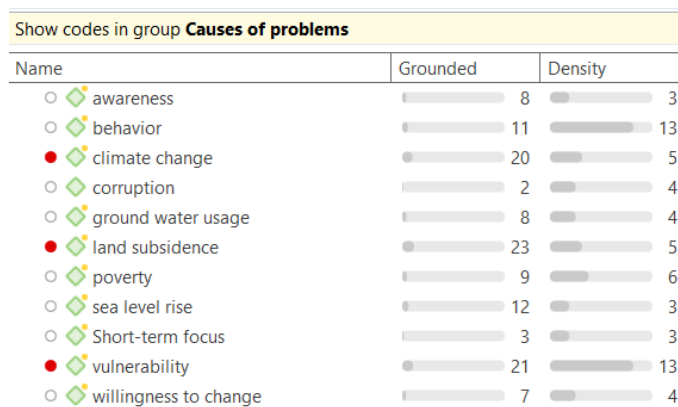


Figure 8: codes in code group 'Causes of problems' mentioned by inhabitants and experts. Codes in red were pre coded based on the theoretical framework.

This creates the narrative it is their own fault their houses are flooding every day. Though this is not entirely untrue, this is an oversimplification. Therefore it must be noted that from the perspective of the community, they do not have any other choice than to behave the way they have always behaved. Experts mentioned the code 'Habituation', 'Education' and 'Awareness' as factors influencing the behaviour of people in Tambak Lorok. With the lack of a good education, awareness is poor. Not knowing about the causes of problems and solutions creates a very limited palette of options to choose from when taking a course of action. One cannot hold someone responsible for something he does not know he (unintentionally) influences. Behaviour must be criticised, but really they should be informed better. The community lacks any proper agency because they lack any proper knowledge. Through habituation the people continue the adaptation strategy and behaviour they have grown accustomed to.

4.5. Mitigation and Adaptation

Firstly it must be noted that both the codes 'Adaptation' and 'Mitigation' were used in the framework analyses of the interviews based on the theoretical framework. Mitigation was mentioned a total of zero times. This was not totally unexpected given the situation Tambak Lorok is in. It is simply too late for climate mitigation in Tambak Lorok, therefore no one mentioned mitigation. Instead, adaptation was discussed numerously. The code 'Adaptation' was mentioned 57 times. The method of adaptation to sea level rise by the people of Tambak Lorok according to both the inhabitants and experts is to compensate for the 30 centimetres of annual sinking by heightening dwellings every three to five years. Based on observations and according to respondents, this involves buying a truckload of soil to strengthen the foundation of the dwelling, putting it on jacks and pouring cement under it to solidify the new base. Or simply by building a new floor on top of the dwelling. According to the inhabitants this costs 15 million rupiah for the materials alone to raise the dwelling by one metre. Expenses further rise to pay an engineer. With approximately one metre of land subsidence every three years, people are forced to pay 5 million rupiah per year to keep their feet dry. Given how the land subsidence will likely increase in the coming years, the costs to sustain this adaptation method will do so as well.

Judging from the remarks of experts and inhabitants, the people seem unable to change their approach to vulnerability treatment and are seemingly stuck in a feedback loop shackling them to preserving the status-quo. Here, the concepts lock-in, path dependency and sunken-cost emerge.

4.6. Lock-in, Path Dependency and Sunken-Cost in Tambak Lorok

According to the experts, the population of Tambak Lorok has adopted an unsustainable adaptation strategy which has them raising their houses every three to five years again and again, without addressing the actual source of the problems. It is merely the treatment of symptoms while overlooking the cause of the disease itself. When asked about the sustainability of their adaptation method, inhabitants gave mixed reactions. Some said that it indeed was no sustainable coping mechanism, while others found it sufficient against the floods, even though their ground floor flooded daily. They all said the same about having no choice but to keep doing it, illustrating their inability to escape this unsustainable symptom treatment. Thus it is suggested that lock-in occurs in Tambak Lorok, using this adaptation strategy.

the raising of dwellings in Tambak Lorok is an adaptation practice which has been going on for decades according to the experts and literature. It is a practice to which people have become familiar. As the inhabitants say, they do not know how to change their ways. Only how to continue practicing this method. As time is the enemy, and water is flooding their doorstep daily, there is no room to think around the discourses and biases. As it becomes a habit, path-dependency is looking around the corner. This further tightens the noose around their neck.

4.7. Wickedness

Climate change is a wicked problem with many stakeholders, causes, feedback loops, innumerable amounts of implications, terrible potential consequences and no apparent all-encompassing solution. In Tambak Lorok, climate change is only one problem of a myriad of problems. Even though this research is primarily focusing on the impact of floods, a holistic view on the problems in the area shows that there is more to worry about than wet feet. Early on in the research it became apparent that the problems people were dealing with have deep roots which are intertwined. Connecting the problems and concepts after coding, it became more and more clear how intricate the situation in Tambak Lorok really is. The problems form a web of mutually-amplifying factors. Therefore is the totality of the problems in Tambak Lorok not the entire picture. The wickedness of this web of problems seems so strong that the wickedness can be perceived as an amplifying factor itself and not just as a dependent variable.

Source	Relation	Target
◆ sea level rise	● is part of	◆ Wickedness
◆ behavior	● is part of	◆ Wickedness
◆ poverty	● is part of	◆ Wickedness
● ◆ climate change	● is part of	◆ Wickedness
◆ corruption	● is part of	◆ Wickedness
◆ health	● is part of	◆ Wickedness
◆ complexity	● is a property of	◆ Wickedness
◆ Mobility	● is part of	◆ Wickedness
◆ Vermin	● is part of	◆ Wickedness
● ◆ land subsidence	● is part of	◆ Wickedness
◆ extreme weather	● is part of	◆ Wickedness
◆ Hygiene	● is part of	◆ Wickedness
● ◆ vulnerability	● is part of	◆ Wickedness
◆ Rob	● is part of	◆ Wickedness

Figure 9: list of codes related to 'Wickedness' comprised of problems mentioned by inhabitants and experts. Codes marked in red were pre coded in the framework analyses.

The code 'wickedness' is made up of the totality of the problems according to experts, and perceived problems according to the inhabitants. The code 'Wickedness' has a density (amount of relations to other codes) of 15. This means that in the code network it influences or is influenced by 15 other codes. All the problems of Tambak Lorok based on the mentioned problems by inhabitants and experts, as shown in figure 9, are: sea level rise, behaviour, poverty, climate change, corruption, health issues, complexity of problems, immobility, vermin, land subsidence, extreme weather, lack of hygiene, vulnerability to floods and finally floods themselves. Wickedness shows to be a cause of the continuation of existing problems. Wickedness is determined by the amount of intertwined problems. Wickedness shows how complex and intertwined the problems are in Tambak Lorok. Moreover, it underlines the severity of the situation.

4.8. Migration and Livelihoods

Respondents and experts talked extensively about the subject of migration. My peer and I were particularly interested in why people don't migrate out of the area. 'Abandon ship' would be the adage in most places. Mixed responses were given by the inhabitants. Although all of the inhabitants were at least moderately positive about living in Tambak Lorok mentioning a sense of belonging within the social context of the community, there were large differences in perceptions on migration. Age plays a role here. The older inhabitants (aged 50 and 52) were reluctant to leave Tambak Lorok. They showed to be less well informed on the issues at play and the future prospects of the community, while the younger respondents (aged 21) said leaving the community would be the first thing they do when they are able. In summary, the younger generation, having more awareness of the problems, want to leave but can't, while the older generation does not want to leave. Why is it then that people do not want to leave or cannot leave?

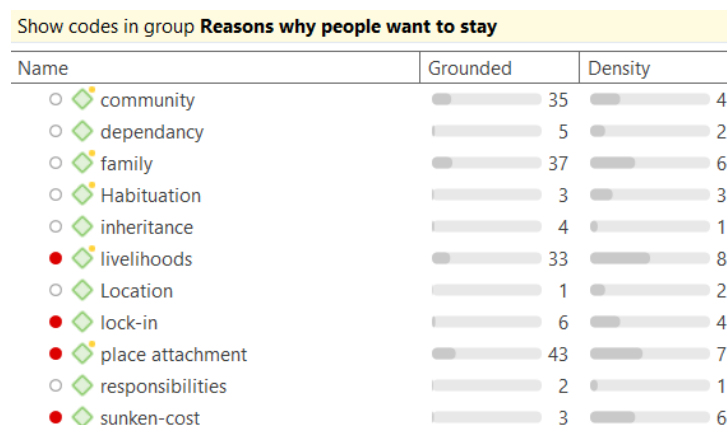


Figure 10: codes in code group 'Reasons why people want to stay'. Red codes were pre coded.

Figure 10 shows all the codes found for reasons to stay in Tambak Lorok. The older generation typically mentioned the code 'Community' and 'Family', showing signs of sense of place and place attachment. The connection the people have to Tambak Lorok goes farther than merely a 'sense of belonging' and 'place attachment'. The code 'Sunken-cost' makes a return here. People are economically and psychologically shackled to the district, because they spent such a copious amount of money in adapting to the floods. Moreover, this enormous spending to preserve the status quo and trying to keep their feet dry, hinders people in saving their money for moving to a place with better living conditions. Investing in adaptation keeps them from moving to safety. We asked whether they would consider moving if they had the option. The older people said they would stay, whereas most young people would have moved. What is keeping them from leaving is 'Livelihoods'.

Codes connected to 'Livelihoods' are again 'Family' and 'Dependency'. People are dependent on their family financially, but moreover are expected to support them. According to inhabitants and experts, family is a focal point in the lives of Indonesians. People do not just move out of their childhood home to find a new life, unless it is supporting the family. Usually the eldest finds a job somewhere and sends a substantial amount of funds to the family household to support them. Supporting their family is expected of the younger generation. When asked about what people hope for their children in the future, they said they hoped they would stay in Tambak Lorok.

Furthermore, the inhabitants were asked what they did for a living in order to achieve a better understanding of their livelihoods. Inhabitants and experts said that the men are the main provider of household funds. Women usually do not work for money, but serve the household as a housewife. Men mostly work as fishermen and some have side-jobs at the power plant or the port. The younger women were students and did not earn money themselves. This may again be another obstacle to leave Tambak Lorok. Young women are not expected to work according to the inhabitants. The men need to be in the vicinity of water for their boats, and the women are dependent on the income of their men. To sell the fish, they need to be close to the fish market in Tambak Lorok. In other words, their livelihood is tied to Tambak Lorok.

The code 'Solastalgia' was found zero times. The inhabitants mentioned that they see the floods and damages in their neighbourhood as a big problem, yet they show resilience and acceptance in coping with this daily menace. They don't seem to suffer trauma, pain or any psychological discomfort in the deterioration of their environment due to the floods. People even joke about becoming mermaids and drifting stoves.

A discovery during the interviews was the way the asset market works in Tambak Lorok. It seems like it is not really a thing. Inhabitants were asked what happens with the houses when people move to other areas. They said that if people want to migrate to another area or city, they simply abandon their homes. Some dwellings fall into disrepair, others are claimed by neighbours. Concepts like 'starters' do not exist in Indonesia. It is more common to live in the same household as parents until they perish and pass on the dwelling to the children, who most likely will stay there. On the rare occasions people do sell their house, it is for a very low price. Given the situation of Tambak Lorok, selling a house for a good price does not occur. Yet, people still move into Tambak Lorok, despite the problems. According to the inhabitants, people hope to find a better life there and are attracted by the low prices. According to the young inhabitants, people do not think about the future prospects or the floods.

Experts said the government is trying to move people out of Tambak Lorok in order to build a new floating town for the fishermen and turn Tambak Lorok into a marine tourism attraction called Kampung Bahari. They said this does not go at the desired pace however. Still, some people temporarily move to apartments in Semarang. According to our respondents, these apartments are a step down compared to Tambak Lorok, thus most people refuse to leave.

4.9. External Support and Interventions

Less related to the conceptual model, the issue of support from the government and NGO's emerged during the interviews. It became clear when comparing the perspectives of the inhabitants, NGO's and the government that large discrepancies exist between them. This will be elaborated upon further in the analytical chapter.

In Figure 11, the mentioned codes categorised as 'Interventions' are shown. These refer to actions or transformations, either by the government or NGO's, to improve the water problems of Tambak Lorok.

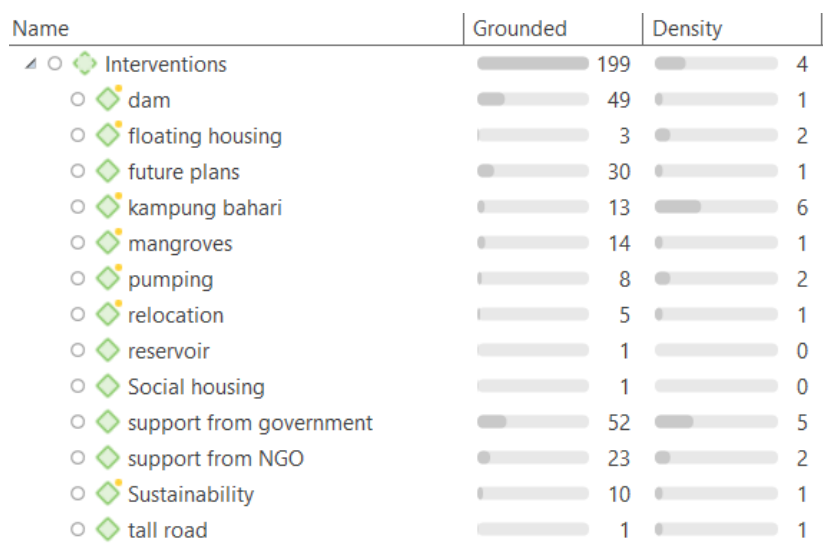


Figure 11: list of codes categorised under the code 'Interventions'.

Raising houses will not make the floods go away. The inhabitants know this too. When asked about what would be the best solution in their perspective, all respondents mentioned the dam, which is promised by the government to rid the community of structural floods, as the best option of adaptation. The code 'Dam' was mentioned 49 times. However, faith and confidence in the government is low. The inhabitants mentioned the code 'Faith in government' 30 times, all inhabitants mentioned they had little confidence in the government to help them. Some inhabitants said they trust the government somewhat, but mainly because the local chief of the district, RW 15, tells them to be patient, not because the government shows promising progress. Respondents from the community called the government useless, corrupt and said that they only care about themselves. The codes 'Corruption' and 'Discrimination' were mentioned. Inhabitants say they feel that a corrupt government discriminates against their neighbourhood and prioritises the tourist rich 'Old Town' area. Inhabitants said that the responsibility to help Tambak Lorok mainly lies with the government, though they do not expect them to deliver on their promises. inhabitants said that they feel unrepresented and wrongly treated. They said they have gotten used to it. They feel like the LPUBTN does much more to improve the living conditions in Tambak Lorok than the government.

A spatial planner from the government was interviewed, who laid bare a hiatus in the political and governmental system in Semarang. While the inhabitants said they do not feel represented or heard by the government to be helped, the government said the people of Tambak Lorok do not want to be helped.

The CEO of LPUBTN said that humanitarian projects to sustainably improve living conditions have been implemented for years but came to little permanent change in the beginning. The people's willingness to change was the biggest problem in sustainably improving their lives according to her. The past years have seen better results. According to the LPUBTN, they have adopted a bottom-up approach to change in Tambak Lorok. They show the people what can be achieved by adopting more sustainable behaviour and they attempt to educate the people using the younger generation from within their own community. This is called 'Pondok Belager'. It is a community based educational program in which members of the community educate their own community on important issues.



Figure 12: Relocation of Tambak Lorok for Kampung Bahari

Between the port of Semarang and the dam a reservoir for fresh water will be established (blue area in figure 13). This would partly resolve the problem of ground water usage.



Figure 13: Envisioned toll road from the port of Semarang to Demak is marked in red. Tambak Lorok is marked in yellow (Beek, Letitre, Hadiyanto & Sudarno, 2019).

In this chapter Based on the findings in the empirical findings, framework of codes is constructed. Based on this code network, sub-conclusions are drawn to answer the sub-questions.



As land subsidence worsens living conditions in Tambak Lorok at an ever increasing rate, the population is forced to increase their spending in adapting to the floods, which is only increasing their rigidity to change tactics. It resembles a tunnel vision. Because the increasing amount of invested funds into their raised dwellings, their willingness to change their approach decreases. This is due to the cognitive dissonance of sunken-cost bias (Magalhães & Geoffrey White, 2016). What this means is that the community is not going to find a method to decisively overcome the flooding problem on its own.

The effects of sunken-cost, lock-in and path dependency, combined with the mediocre education and awareness really shows the community of Tambak Lorok lacks the capacity of proper agency in their economic behavioural practices. This underlines the importance of external support. The community of Tambak Lorok is unable to escape this vicious circle on its own. Financial support will not work, since funding will only deepen the hole of cognitive dissonance in which the community is stuck. But by providing education to ensure people know what consequences their choices have, providing better alternatives to enable them to choose a more sustainable course of action and making those alternatives affordable, perhaps progress could be made.

5.2. Migration

Seeing how dwellings flood daily, climate change is going to continue and land subsidence will increase, a question has to be raised; *does spatial injustice influence migration in Tambak Lorok?* In this paragraph this sub-question will be discussed and answered.

The problems of Tambak Lorok are many and future prospects are not very promising to say the least. Normally, people are not attracted to spaces with such deplorable living conditions and bad prospects. Normally people leave such environments to settle somewhere else. This is a very Western perception on the issue of migration. In residential spaces embedded in capitalistic market systems, space declines in value and people migrate as fast as they can. In Tambak Lorok the situation is different.

To answer the sub-question, migration is occurring. Yet, given the different manners in which people are bound to the area, socially, financially and psychologically through people's livelihoods, family and place attachment, it only happens sporadically and on a relatively small scale. Those who want to leave but cannot, for reasons stated above, all said that the reason why they want to leave is because of the hard living conditions in their area. However, mostly people do not mind the spatial injustice. They say justice has nothing to do with it. According to them, it is a matter of fate and destiny.

5.3. The People-Government Gap

There exists a gap between the people and the government. The government knows about the problems of Tambak Lorok and says it is working on ameliorating the situation. As opposed to the bottom-up approach of the LPUBTN, the government is adopting a top-down approach. They have made plans for a large comprehensive project to combat the floods, to curtail groundwater usage and to build a maritime tourist area called Kampung Bahari. This involves building a dam with a toll road and the relocation of the community of Tambak Lorok between RW sixteen and the East Banjir canal (from the orange part to the white transparent part of figure 8). The fishing community will live in floating dwellings and the area of current Tambak Lorok will become a public maritime tourist area.

Though the plan looks great by design, it could be overly ambitious. It shows the gap between people and governance. The plans are of a large scale and macro oriented drafted by the national government. The feasibility of such an undertaking is barely held into account when considering the perception on migration and abandoning the community within Tambak Lorok.

This gap between government and people is an important factor in the tedious process of improving living conditions in Tambak Lorok. The people are unable to do it by themselves, the government cannot sustainably and ethically execute their plans without consent or compliance of the people. For living conditions to sustainably improve for the people of Tambak Lorok, this gap must be closed.

5.4. Spatial Equity and Injustice

To answer the main question of this research, the most important sub-question is; *How are the impacts of environmental hazards connected with spatial justice?* This will be answered in this section.

The consequences of climate change and land subsidence impact Tambak Lorok and its population tremendously on a daily basis. It can be expected only to become worse in the near future. This research tells the narrative of a resilient people, happy in their living space despite all environmental hazards. According to experts, Tambak Lorok is only one of a larger set of coastal districts being impacted by climate change and land subsidence in north Java. Semarang is a large coastal city of one and a half million people. It typically is a city laying in LECZs and highlands and hills inland. This inherently means large differences exist in vulnerability to environmental hazards between urban areas. The impact of climate change and land subsidence is thus unevenly divided over urban space. The ramifications of these impacts affect all aspects of life. People are unable to leave the district and to attend college, water flushes waste around the neighbourhood, dwellings sink into the ground, people experience deterioration of their health, and rats, snakes and mosquitos are running rampant. Traveling through and residing in different parts of Semarang during the research, it became clear very quickly that none of the places we visited were impacted as severely as Tambak Lorok.

This means Semarang and Tambak Lorok are an example of urban space in which spatial equality is currently non-existent. Apart from the large inequalities in geographical properties of the city, Semarang boasts a relatively high income disparity. In damp kampongs near the coast rats as big as cats run through cracked streets and people live in small houses alongside open sewers. In the hills, far away from environmental impacts, grotesque fortresses are erected complete with walls and spiked fences to keep poverty at bay. Living conditions, vulnerability and impact of floods are unequally divided across the urban space of Semarang, Indonesia, based on income. Spatial equity thus influences the impact of environmental hazards on livelihoods in Semarang, which are partly caused by land subsidence. Although the people of Tambak Lorok are partly responsible for using the ground water to drink from, according to the experts, the power plant and extensive construction in the harbour area of Semarang have a far larger effect on land subsidence. This does not seem just. Poor people deserve just as much to live in environments devoid of flood risks as the rich. Tambak Lorok is an example of spatial injustice, but is not unique in this property.

It happens in the global north as well. New Orleans was hit by hurricane Katrina in 2005 and caused major damages and 1.800 casualties. The case of New Orleans shows involuntary societal segregation forces pushing certain social groups into areas vulnerable to environmental hazards (Marcuse, 2019). Subsequently, these groups were hit unproportionally severe. Tambak Lorok shows similar effects. Moreover, it shows that the losers of capitalism in the periphery of the world are often impacted the hardest and environmental dangers add to this disproportional spatial injustice in a grave way. Governments have a responsibility and an obligation to protect them against these dangers.

The unequal distribution of the world's wealth and power in the modern capitalist world system is a multiplier of spatial and environmental injustice. In the future, impact of environmental hazards will likely only increase. Looking at the case of Tambak Lorok, it will be the people on the lower end of the global financial ladder who have the highest chance of sinking into the rising sea.

To answer the sub-question, the connections between environmental hazards and spatial justice is that the absence of spatial equity, most notably spatial inequality of vulnerability, amplifies the impact of environmental hazards. Thus, spatial injustice amplifies impacts of environmental hazards over spaces unequally.

6. Conclusion

In summary, a long term solution to the problem of land subsidence and flooding is ambitious and seems far away. Tambak Lorok does not have any margin left for climate change to be manageable. They are out of time and the effects of climate change are affecting the daily lives of people heavily. Walking amidst the flooded houses, smelling the sludge, seeing people making their way through the flooded streets while children play in the water, it is clear climate change is no hoax and that it's too late for this community to prevent its consequences. For these people, mitigation is too little too late. Therefore the only possible long-term solution is climate adaptation. Raising their houses and the streets is in no way a suitable, sustainable, long-term solution to floods however. This is the current coping strategy in Tambak Lorok. This means change is needed. Moreover, people are forced to spend large amounts of funds in raising their dwellings. People are economically, psychologically and socially shackled to the neighbourhood through the effects of lock-in, path-dependency and sunken-cost bias. They are stuck in their flooded houses, deprived of real agency, repeating the same cycle without end. All the while, floods are getting worse.

The only suitable options from the perspective of the community are migrating or building a protective barrier against the water. Migrating is not ideal for most inhabitants, as their livelihood depends on fishing, which requires them to live close to coastal areas. Furthermore, place attachment plays a role in their negative views on migration because they are expected to take care of their families and community.

While the people are hoping the government will address land subsidence and flooding with little faith, the government is aspiring to implement their large scale project of Kampung Bahari with little to no communication with the people of Tambak Lorok, placating the chiefs of the districts to keep the inhabitants calm. This project seems overly ambitious and implementation without consent and cooperation from the community seems an erroneous move. This gap between public and government is an obstacle to the amelioration of the area and increases its vulnerability.

To explicitly answer the main research question; *How does spatial justice affect the impact of environmental hazards on the coastal urban community of Tambak Lorok, Semarang, Indonesia?*, it can be concluded that spatial justice, or rather the lack of it, affects the direction and severity of impacts of environmental hazards over spaces and peoples. The direction and severity of impact is based on vulnerability of spaces. Spaces which are the most vulnerable are impacted the most. Vulnerability is dependent on an area's geography, income, planning capabilities and behaviour practices. This means that the poor will structurally be impacted more severely by environmental hazards, due to spatial injustice.

Since the unequal distribution of wealth and education is inherent to capitalist societies, unless inequality of vulnerability is addressed by a central government or other higher entity, poor people will unequally be exposed to the impacts of environmental hazards. As these environmental hazards will only grow, the poor will increasingly suffer compared to the rich. Tambak Lorok sets an example for the continuation of this effect of spatial injustice on the impact of environmental dangers, and the disparities between the people at the receiving end.

7. Discussion

To improve possible future research the findings and methods of this research will be discussed. Moreover, the next step for future research, to further increase knowledge and understanding, is expanded upon.

7.1. Reflection

The results of the research were partly expected and partly unexpected. It was to be expected that the impact of climate change and land subsidence would mainly be flooding based on the literary research done prior to the data collection. Therefore it was to be expected that inhabitants and experts treated the floods as the central problem in Tambak Lorok. It was interesting to see how most observed behavioural tendencies of the population connected well with the theoretical framework. The absence of solastalgia and a house-market was not expected. The resilience and rigidity of the people in Tambak Lorok was a remarkable find. It really showed the capability of people to cope with anything and be happy with friends, family and community. Furthermore, the disparity and distance in viewpoints between the government, experts and mostly the people surprised me. The need for cooperation became quite clear.

7.2. Methodological Discussion

Some improvements in this research will be reflected upon. The external validity of Tambak Lorok as an example of global spatial injustice connected to the world systems theory is still insufficient. The research took a few months and the data collection focussed on the perception and narrative of the people and local experts, not on global power structures and injustice. Furthermore, in the research the views and perceptions of the community of Tambak Lorok is discussed, while only having interviewed and conversed with several inhabitants. It could be that conclusions are over generalising for the community. Moreover, spending just a month in Semarang to collect data is too brief for an extensive ethnographic research on the people and their trials and tribulations. Moreover, the transcripts of the interviews of both the experts and the inhabitants were coded together. This creates a problem. The codes become scrambled and it is somewhat unclear to see which type of responded mentioned what. The data should have been segregated better.

7.3. Recommendations

The influence of spatial injustice on the impact of environmental hazards is still relatively unproven and contested after this research. Tambak Lorok is only one case and may be an exception. Thus it will have to be researched further to build a more steady foundation.

The connection between spatial justice and environmental hazards to vulnerability and global financial power structures was merely theoretical. Although Tambak Lorok may have confirmed the theoretical connection as an example, it is not proven clinically in any way. Though it is an interesting connection to current and future environmental hazards, WST and power structures meddling with spatial injustice and subsequently with environmental hazards could be far-fetched. It will have to be researched further in the future with a different focus and a larger scale of data collection across the globe. This may be only possible after combining more cases across the world combining research in this connection.

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9. Appendices

Interview guide experts:

Introduction	
Introducing	Hello, welcome! Thank you for being here. I'm very pleased that you would like to participate in this interview for my research. I'm Abe Nijkamp, and this is Jonas Buying. We study social geographics, spatial planning & environment at the Radboud University Nijmegen, based in the Netherlands. We are doing research in Semarang, regarding climate-related problems residents in Tambak Lorok have to face. Through our own observations, interviews with residents, and interviewing multiple experts we hope to gain more insight into this matter. Again, I'm very happy that you would like to talk with us.
Research goal	Compare multiple perspectives of experts on climate change-related problems and solutions, and find similarities and differences in these perspectives.
Subjects	• Climate-related problems • Climate adaptation strategies • Spatial equality and environmental justice due to climate change • (place) Attachment, livelihood, and perception of the residents in Tambak Lorok
Anonymity and confidentiality	This interview is entirely anonymous, which means that your personal information won't be used or published.
Stop	You can stop this interview at any given time if you no longer feel comfortable proceeding. This is no problem and I will stop this interview immediately if this is the case.
Recording	To be able to transcribe this interview and analyze it, I like to ask you if it is okay if I record this meeting? If that is okay, I will start the recording from now on.
Variables, topics, central questions, and subquestions	
<u>General introduction</u>	Could you please introduce yourself (name, age, living situation), what is your expertise, and what is your role within your institute?
Climate-related problems at the	What is your perspective on the current problems existing in the coastal urban region, more accurately, Tambak Lorok, in Semarang,

coast	in light of recent developments? -Broken dam -Sea level rise and land subsidence (with all its consequences) What are the different causes of these climate change-related problems? What are the biggest causes in your opinion? How big is this problem compared to other problems in Semarang? How important is it to fight these climate change-related problems for the city?
Climate adaptation strategies	For how long are these problems occurring? What is the coastal community of Tambak Lorok doing to fight these problems? -What is your take on that? What are NGOs doing? -What is your take on that? What is the government doing? -What is your take on that? How were these problems fought in the past? Do you think that the battle against climate change-related problems is going well? What do you think is the best remedy against the rising tides and subsiding soil? What do you think the future will hold for Tambak Lorok in the coming years regarding climate change-related adaptation strategies?
Spatial equality and environmental justice	do you think vulnerability to climate change-related hazards is connected to differences in income? does this create spatial inequality? do you feel like one of the reasons why people in tambak lorok live under threat from floods because of their income? If yes- does this mean that the poorer people are impacted more by climate change than the rich? - although they contribute less to climate change
(place) Attachment, livelihood, and perception of residents in Tambak Lorok	What are the livelihoods of inhabitants in Tambak Lorok? -To what extent are they impacted by climate change? To what extent are inhabitants of Tambak Lorok attached to their livelihood and their sense of community and why? -Does this have an influence on migrating to other (safer) areas? -What does the government have to do to make migration plausible? Do you think inhabitants of Tambak Lorok know they live in a

	vulnerable area to climate change-related dangers?
<u>Reflection</u>	How do you think the inhabitants of Tambak Lorok will continue to deal with climate change-related problems in the future? How do you think local government will handle the climate change-related problems in the future? What would be in your opinion the ideal future of the situation in Tambak Lorok?
Cooling down	What did you think of the interview? Did everything make sense? Do you want to add something regarding this interview?
Closing	
Closing the interview	
Giving props	I want to thank you for your time and effort to participate in my research. I hope you found it interesting as well and that it all went well.
Goodbye	If there is anything that comes to mind that can be helpful for me, please don't hesitate to send me an email Thank you again, and have a nice day!

Interview guide inhabitants: Introducing	Selamat siang! Thank you for being here. It's an honor to be here. Thank you for helping me with this interview for my research. I'm Jonas, I am a geography student from the Netherlands. I'm staying 4 weeks in Semarang to do interviews and observe this city. I'm very happy that you would like to talk with me. And I am grateful.
Research goal	my goal is to gain in depth understanding in regards with the effects of climate change on the coastal community of Tambak Lorok.
Subjects	• Living ways and conditions • Impact of the <i>rob</i> on your life • What you do to keep your feet dry • Help from the government • Livelihood • Justice (what kind of justice?)
Anonymity and confidentiality	This interview is entirely anonymous, which means that your personal information won't be used or published.
Stop	You can stop this interview at any given time if you no longer feel comfortable proceeding. This is no problem and I will stop this interview immediately if this is the case.
Recording	To be able to transcribe this interview and analyse it, I like to ask you if it is okay if I record this meeting? If that is okay, I will start the recording from now on.
Variables, topics, central questions, and subquestions	
<u>General questions</u> topics: • age • wealth • living situation	May I ask your name, age, and where you are living? (RT/RW) What kind of work do you do?/ what do you do for a living? How much money in average do you make per day? With how many people do you live together? - How many children do you have? - Any other relative live together with you? How many times per week do you eat meat or fish? How often do you exit tambak Lorok? Have you ever been outside Semarang? - (if so) How often?

<u>Livelihood</u> <u>Living conditions</u> -Daily life	• Could you give your living conditions a number from 1-10?, Could you describe your house for me, how many floors, what kind of spaces, big or small, garden? -Could you describe your neighborhood for me? -Do you know a lot of people in the neighborhood? -Do you have a feeling that you are part of a community in this neighborhood? -Do you have friends and family living in this neighborhood? • -Do you feel attached to this place because of people, places or memories? Could you describe your daily life? (daily struggles, what makes you happy?) • What are further actions need to be done to make living conditions in this neighborhood better? • Could you describe the most necessary living conditions (things you expect to have and/ or should be available) in your house and neighborhood? • What are the things you 'd consider to have / to be available as your ideal living conditions?
-Climate related problems	- Do you experience struggles from climate related problems, as floods (rob), land subsidance (sinking land), sea level rise and landslides? - If yes, how do you adapt to these problems or how do you deal with these problems? - How often do these problems occur in a (month/ year/...)? - Do you feel that you are in danger because of these problems? - Do you feel that the government or other parties provide any support/ are helping you solve / adapt to these problems? - If yes, are their support suitable and helpful? - - What is the biggest problem you have in your life in general
<u>Adaptation strategies</u> <i>Management</i> <i>Mindset</i> <i>Practices</i> <i>Government</i>	What works the best against the problems/what's the best solution? Who comes up with solutions? Who manages these solutions? Does the government help? Who helps you the most you feel? (the government? Companies? Or the community itself?) Do you think current strategies work?
<u>Migration</u>	• What is your opinion on migrating to another area with less risk for climate related problems such as rog (floods) and land subsidence? • Did you ever think of migrating / moving to another area and if yes;

	To where? And what is holding you back?
<u>Justice</u>	I would strongly suggest you to provide prologue/ clearer/ further explanation about this “justice” topic before you start the questions to make them clear what do you really mean with this “fair” matter. - Do you think it is fair that you earn your income? - Do you think it is fair that your life is hard because of the water, while richer people live in safety?
<u>Reflection</u>	- Do you have any willing to improve your neighbourhood? - If these climate related problems continue to this extend or even get worse, would that be a problem for you? - how do you think climate change will impact your life in the future? -What are your thoughts /idea for the better future of your own livelihood (place where you live) and on the future of the RW (neighborhood)? -Do you feel that you have a choice of living here? and for example do you think the government wants to keep you safe here? (what do you wat to know/ explore with this question? -If they have kids: What are your thoughts on the life your children will have in the future, will they still live here for example? -For female : Do you think your husbands profession is putting you in danger because their job is near the sea? -What could the government or organisations like (LPUBTN/) do make your living conditions better? - (in your opinion) What could your community / neighbors do to make the living conditions better in this RW?
Control variables	
Cooling down	What did you think of the interview? Did everything make sense?
Closing	
Closing the interview	Do you have any questions? Do you want to add anything to this interview? Are there other things that we might not have mentioned that you feel is important for this research? What did you think of this interview?
Giving props	I want to thank you for your time and effort to participate in my research. I hope you found it interesting as well and that it all went well.
Goodbye	If there is anything that comes to mind that can be helpful for me, please don't hesitate to send me an email

	Thank you again, and have a nice day!
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