Perceptions of and Responses to Climate Change

in Paramaribo, Surinam

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Cover picture: the Waterside, Paramaribo (own work)

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Abstract

In this study perceptions on climate changes, causes, consequences and responses of individual inhabitants, small farmers and market sellers and the government in Paramaribo, Surinam are outlined. Three response strategies are distinguished; coping strategies, adaptation strategies and alternative response strategies. The study is structured following perceptions on changes, causes, consequences and responses. An Asset and Vulnerability Framework is used to analyze assets and response strategies. Climate changes are presented as climate change phenomena which include sea level rise, glacial retreat (as a contributor to sea level rise), thermal expansion of ocean water and atmosphere, global temperature increase, floods and storms. Reported and outlined season related changes affecting mainly residential Paramaribo and planters (small farmers) are changing weather patterns such as irregular and intensified rainfall and increased unpredictable periods of drought. Institutional responses identified are integrated coastal management (adaptation strategy), implementing early flood warning systems (coping strategy) and elevating homes, the construction of concrete dams along the major rivers including the Surinam River crossing central Paramaribo, development of drought and water resistant crops and on political legal level implementation of a national action plan climate change and a climate law. Responses on individual level have been identified as relocation (alternative response), livelihood diversification (coping strategy), elevating homes (coping strategy) and from an agricultural perspective; crop diversification, crop improvement, crop price adjustment strategy, implementation of pumps for irrigation, elevated field crop growing and growing drought and water resistant crops.

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List of Abbreviations

ADEKUS – Anton de Kom University Surinam (*Anton de Kom Universiteit Suriname*)
ASIS – Alliance of Small Island States
ATM – Ministry of Labor Technology and Environment
(*Arbeid, Technologische Ontwikkeling en Milieu*)
CCCCC - Caribbean Community Climate Change Center
CO2 – Carbon Dioxide
COP – Conference of Parties
DE – Directorate Environment
EIA - Environmental Impact Assessment
EU – European Union
FAO – Food and Agricultural Organization
IASC - International Arctic Science Committee
IPCC – Intergovernmental Panel on Climate Change
LVV – Ministry of Agriculture Livestock and Fishery (*Landbouw, Veeteelt en Visserij*)
MACC - Mainstreaming Adaptation to Climate Change project
NAPCC - National Action Plan Climate Change
NCAP-II - Netherlands Climate Assistance Program
NCF - National Conservation Foundation
NCPA - National Centre for Policy Analysis
NH – Ministry of Natural Resources (*Natuurlijke Hulpbronnen*)
NIMOS - National Institute for Environment and Development in Surinam
(*Nationaal Instituut voor Milieu en Ontwikkeling Suriname*)
OAS - Organization of American States
OW – Ministry of Public Works (*Openbare Werken*)
PAR – Pressure and Release Model
PPB – Parts per billion
PPM – Parts per million
RGB – Ministry of Spatial Planning, Resources and Forest Management
(*Ruimtelijke Ordening, Grondstoffen en Bosbeheer)*
SNC – Second National Communication Report
UNEP – United Nations Environmental Program
UNFCCC - United Nations Framework Convention on Climate Change
WNZ – Road to Sea District *(Weg naar Zee)*
WTO – World Trade Organization

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Introduction

Sunday December 11, 2011, Durban South Africa around 3am; some 194 countries have come to an agreement of a roadmap eventually leading to a global binding climate treaty going into effect no later than the year 2020. The juridical status of the treaty and the precisely yet to agree specifications of the agreement are far from clear yet. China, India, United States are hindering the negotiations and are against such global binding climate treaty (United Nations Framework Convention on Climate Change, 2011).

Climate doesn't negotiate however and the climate is already visibly changing around the globe. Science tells us very clearly the window of time is closing; climate is already changing now, continuing eight more years until 2020 with a 'business as usual' ethic will simply close the window of opportunity putting the globe in a one way direction of no return.
Climate is changing unequally impacting vulnerable countries being least responsible for the effects, being at the same time less capable of implementing adaptation strategies, lacking social, cultural, technological capital and predominantly lacking financial capital (Arenstam Gibbons & Nicholls, 2006: 40-47; Arendt et al., 2002: 382-388; Hansen, 2005: 269-279). Climate change affects the earth bio systems, consequently impacting people's livelihoods.

One of the most vulnerable countries is The Republic of Surinam, the country is defined as highly vulnerable both in ecological and socio, cultural and economic terms. Surinam is a country predicted to be increasingly suffering in the urban northern coastal area from the consequences of sea level rise in the near future, currently the country already faces difficulties with soil erosion and salt water intrusion along the coastline. In addition the country suffers from groundwater depletion due to intrusion of salt sea water, savannah forming as a result of extreme dry regions and the dry and rain seasons are seriously changing becoming highly unpredictable subsequently negatively impacting agriculture and daily life in Paramaribo (Beukering et al., 2009; Nationaal Instituut voor Milieu en Ontwikkeling Suriname 2006). In general research on climate change and it's outcomes is lacking in Surinam, leaving the country with an urgent need to social research data (Van Oosterum, 2012a).

This research aims to identify the perceived and experienced changes, causes and consequences of climate change impacting urban life in Paramaribo, Surinam and to identify the distinctive responses. The central question of this research has thus been formulated as:

'How are changes, causes and consequences of climate change in Paramaribo, Surinam perceived and experienced and how is responded to these perceptions?'

Four sub questions have been defined:
(1) How are the perceived or experienced climate changes identified? Climate changes are phenomena or anomalies in the climate brought about by climate change or perceived as such. Climate change is a global process with global and local effects. Global changes are the rise of sea level and temperature. This does not mean that temperatures are rising in the same pace everywhere on local scale; the effects of climate change are often locally bound and perceived as such.

(2) What are the perceived causes? This research question has a focus on awareness; to what extent are respondents aware about changes that can be linked to climate change and what are the perceived causes thereof. The concept awareness is an indicator for the perceived causes; therefore within this question the concept of awareness could be an important indicator for the perceived causes as well.

(3) What are the perceived and experienced climate induced consequences impacting urban life in Paramaribo? The hypothesis is that the in the first sub-question identified climate changes (phenomena) subsequently lead to consequences. Perceived climate induced consequences of phenomena such as increased temperatures and longer periods of drought could be reduction in crop production or increase in diseases. It is important to stress here that these consequences are perceived as climate induced; increase in diseases could as well be the result of other primary causes.

(4) How are perceived and experienced climate changes, causes and consequences translated into coping- or adaptation-strategies or other responses? This question defines responses in a threefold way. The responses concern both individual as institutional/governmental responses. Coping strategies can be characterized as short term and often less institutionalized while adaptation frameworks or strategies are in principle long term strategies aiming to sustain in one's livelihood or in order to become resilient to the impacts as is similarly defined by Davies (1993). Alternative responses are opposite from the former two types in the sense that alternative responses are not aimed to sustain rather to shift from one's livelihood, of which an example could be migration.

This research is designed as a qualitative explorative research with the focus on perceptions of individuals in urban Paramaribo and organizations involved on climate induced impacts on livelihoods in Paramaribo, Surinam, focusing on the causes and consequences impacting their livelihoods directly and indirectly and on the responses to these changes and consequences. The focus of this research is on perceptions because perceptions lead to responses in contrary to distant scientific climate change facts that are not a directly integrated part of daily life. Real experiences, changes in everyday environment perceived as a consequence of climate change subsequently lead to actual responses, therefore the necessity of a qualitative and ethnographic research approach. Research has been conducted through (participant) observation and open semi structured interviews and to a certain extent by archive research based on media sources and governmental documents. Common inhabitants market sellers and small farmers as well as governmental organizations form the research population. Mainly research has been conducted in urban Paramaribo focusing on central places like market places which are the central places where common inhabitants and small farmers collide. Selection of the research population has been done on the base of convenience sampling, however thereby differentiating respondents as common, planters (farmers selling their crops in Paramaribo) and market sellers (non- farmers who sell their crops). Access to the research population has been proved not to be an issue; respondents where often more than willing to cooperate taking into account the principle of informed consent by always introducing myself and the aim of this research. Research has been conducted in central Paramaribo from February until May 2012.

The thesis is structured following these research questions: the first chapter is theoretical discussing the main concepts presented from theory. Thereby presenting climate change causes, consequences and responses in a global context and in which climate induced vulnerability and responsiveness is explained to analyze by Moser's (1998) Asset Vulnerability Framework. The second until fifth chapter presents the empirical research findings. Chapter 2 presents the perceived climate changes and causes of which main changes are sea level rise and changing weather patterns. Paramaribo North as a vulnerable low lying urban coastal region is presented as a water prone area facing increasingly difficult challenges. Chapter 3 presents the perceived consequences and impacts as an outcome of the main changes presented in the former chapter. Erosion of the riverbanks of the Surinam River

pose an increasingly urgent threat to the center of Paramaribo, water nuisance such as floods and the loss of land are issues presented. Chapter 4 presents the main government responses on national and international level, followed by individual responses. Enclosing chapter 5 presents a case study on farmers' and market sellers' perceptions on climate changes, causes, consequences and their responses. In which these responses are analyzed by the Asset Vulnerability Framework.

1. Climate Change in a global context: Theories, Perceptions and Responses

In this chapter various aspects of climate change will be outlined in a theoretical and social relevant context. Climate change has become a global phenomenon as worldwide the effects of climate change are experienced responses to these effects are constructed on political international level as well as on local level. By presenting some of the major changes this chapter aims to illustrate the urgency of climate change to which proper responses are needed. Climate change effects increases livelihood vulnerability; this notion is presented from the asset vulnerability framework by which it is argued that the strategic use of assets reduces one's vulnerability, therefore exterior risks and hazards among which are the effects of climate change are seen as a challenge to strategically use one's assets.

The first section elaborates on the concept of perception which is explained by arguing that perceptions on climate change differ substantially depending on the socio-economic and cultural context. In this section perceptions on climate change are outlined from a local (Arctic Inuit) perspective, followed by a discussion on the relevance to focus on perceptions in this research.

Section 1.2 elaborates on the main human induced causes of climate change. Section 1.3 presents the consequences. Some of the main consequences impacting livelihoods are discussed; consequences for Surinam and many other regions are changing weather patterns, such as irregular (increased) rainfall and extensive periods of drought impacting agricultural based livelihoods; a case study of the Sahel as a climate sensitive rural region illustrates this, which is exemplary for Surinam as well. Temperature rise and glacial melt are contributors to the rise of global sea levels which is a looming threat to low lying coastal areas around the globe specifically also in Surinam.

A logical outcome of these consequences is the urging need to respond, in such a way that it is necessary to develop structured frameworks in which serve the proper conditions for adaptation strategies; section 1.4 deals with these forms of responses. Adaptation as one of the responses is defined as long and short term. The political framings of adaptation as well as current adaptation strategies in the regional and local context are outlined. In this section the main the responses to climate change from the international global political level are also presented. The current international debate and negotiations in order to come to a legally binding global climate agreement are outlined in a concise manner. Current projections and national interests at stake are described which is cause for the very complex and time consuming negotiating process as will become clear.

Section 1.5 presents the Asset Vulnerability framework which is illustrative for chapter 5 in which a case study on farmers and market sellers is presented. Section 1.6 introduces Surinam in the context of climate change; the main issues, impacts and responses at stake are presented.

1.1 Perceptions on Climate Change

A two degrees increase in global temperature means an average of 3.3 to 6.6 degrees increase in the polar areas. Temperature increase is by far an equally spread process; areas most capable and vulnerable to change are the northern and southern hemispheres (Hansen, 2005: 269-279; Intergovernmental Panel on Climate Change, 2007). This section aims to focus on the local perspective. It is important to understand these changes but yet a more practical question is how these changes are perceived, experienced in daily life and perhaps how is dealt with these changes in order to come to grips with daily practices in a changing environment.

Focusing on perceptions however needs some clarification. Perceptions are based on several actors; such as the media, personal experiences and knowledge and governmental

institutions. Perceptions of climate change are not based directly on the actual environmental changes they are based on information received from through internet sources, the media; written press and broadcasted media (television) as well as any other medium of information such as public advertising, stakeholders, political bodies, NGO's or individual human beings. Thus perceptions on climate change are formed in the social world and are the result of these social intermediaries. As human beings as social actors perceive change in climate as an impact in one's livelihood these same social actors will respond to these perceptions as such. Therefore understanding this notion of the continuous framing of perceptions is considered so essential in outlining the responses as well.

An illustrative case on climate change perceptions concerns the Inuit in Greenland; it shows how perceptions are formed in different social contexts with a different outcome from the western perspective (Faaij, 2010). Eighty percent of Greenland comprises out of a huge icecap, therefore civilization is concentrated on a small strip along the coastline and the country can be considered a fairly isolated place. The current climate changes impacting Greenland together with the Climate Summit in Copenhagen in 2009 has reformulated their standpoint towards climate change, however generally the perspective on climate change is one not to worry about; a politics of *laissez-faire*. According to Faaij (Ibid.) the concept climate change can be seen as a socially constructed concept, which can be defined in various ways depending on the context. Climate change is a rather sophisticated concept and will bring about different responses instead when speaking about changes in the weather or environmental changes. As Marino and Schweitzer (2009: 209) state; 'the usage of the term climate change exerts great levels of power and changes the local patterns of speech' (Faaij: 2010: 24). Therefore as a researcher, one needs to be aware and cautious to use this term. As Faaij (Ibid.) continues to explain, responses in terms of weather changes lead to local details and first hand experiences whereas responses to global warming or climate change tend to lead to repeating stories of what is heard from in the media.
According to Faaij (2010: 24); Greenlandic fishermen observe the *Ilulissat*-glacier declining every year, a captain referred to it nowadays as 'ice cubes'. Fishermen experience changes in current weather patterns and in temperatures however they are not directly linked to the process of climate change.

From an Arctic perspective climate change is not new, as it implicates the environment to be changing, but the climate is seen as in a constant state of change. Nuttal (2009) states that; 'the climate is in a continuous state of change in contrary to the Western perspective where the change of climate is seen as new and threatening'. Climate change from an indigenous Inuit perspective is according to Nuttal (2009: 305) also seen as yet another tool for the Western world to develop an imperialistic policy over the Arctic which has already explored, exploited and influenced the Arctic for centuries. However 'the indigenous are portrayed as victims of change, unable to respond properly to the environmental and social crises that the Arctic meltdown will bring about'. Argyrou (2005) makes clear how through Western science the Western view on climate change is imposed onto the developing world (Faaij, Ibid: 26). Climate change is also adopted by local indigenous organizations to use it in an instrumental way to defend indigenous rights (Nutall, 2009: 294 in Faaij, 2010). Climate change is being reformulated in such a way that it becomes a human rights issue, in the sense that climate change threatens the traditional life and local environment. One can understand how climate change can become a political concept used in an instrumental way being incorporated in the human rights debate in order to draw attention to indigenous people. It shows how the Greenlandic Inuit perspective on climate change is very different from the Western perspective and that the concept as such can be adopted and also used to frame it in a discourse to claim indigenous rights.

In the following sections the necessity to outline a framework which prepares for adequate adaptation strategies is outlined. Framing adaptation strategies is a more optimistic and pragmatic approach; obviously the approach of this research, an approach with increasing urgency for especially developing countries who are usually being hit unequally hard compared to industrialized countries. The effects of climate change are already daily reality in several developing countries around the world as will be illustrated in this chapter (Food and Agricultural Organization, 2006: 6; Africa Partnership Forum, 2007: 9; Nianogo, 2009). Focusing on the perceptions on this changing daily reality therefore is important in understanding how responding frameworks are being developed, which is the other focus of this research. Human induced climate change indicates that human interventions contribute to increased climate change; these human induced causes might most likely also be part of the perception frameworks. Taking this issue here into account is essentially for that matter as well.

1.2 Human Induced Causes: Greenhouse Gas Emissions, Fossil Fuel Burning and Deforestation

The greenhouse effect is a natural state of affairs controlling the earth's climate. The essential underlying factors causing an increased greenhouse effect are increased greenhouse gas emissions from mainly agriculture, transportation, deforestation, industry and household (energy) consumption. Global concentrations of the main greenhouse gasses carbon dioxide, methane and nitrous dioxide have been increasingly rapid increasing since human activities have intensified from 1750 onwards. Current levels are far higher than pre-industrial levels (Intergovernmental Panel on Climate Change, 2007). Carbon dioxide emissions globally are a result of fossil fuel use and land use conversion. Methane and nitrous dioxide are emitted as a result of agricultural activities. Current levels of carbon dioxide in the atmosphere have increased from a pre-industrial level of 280 parts per million (280 parts per million (ppm) parts of oxygen) to 370 ppm in 2005 to current level of 390 ppm. This concentration is far higher than any carbon dioxide concentration level of the past 650,000 years which fluctuated around 180 and 300 ppm. On an annual base the growth rate emissions have even increased from 1.4 ppm from 1960s onwards to an average of 1.9 ppm per year over 1995 to 2005 (Ibid.). These statistics are important to take into account as they are direct indicators of the process of global warming causing climate change. A concentration level of more than 350 ppm carbon dioxide equivalents (total combined greenhouse gas emissions defined in carbon dioxide equivalents) is considered as resulting in a global average temperature rise of more than 2 degrees Celsius within this century, which in itself is considered to result in dangerous hard to control climate changes (Nordhaus, 2007, Pielke et al., 2007; Stern & Taylor, 2006; Van Vliet & Leemans, 2006). With current levels of carbon dioxide emissions at 390 ppm (not including methane and nitrous dioxide) which are predicted to increase even more in the upcoming decennia the statistics are self evident.

Methane levels have increased enormously from pre industrial levels at 715 parts per billion (ppb) to over 1700 ppb in 2005, this number is way higher than any concentration level of methane in the past 650,000 years fluctuated between 320 to 790 ppb as is analyzed from ice core data. The human activities presented here are combined almost certain human induced causes of global warming causing climate change, almost certain meaning a certainty of over ninety percent according to the Intergovernmental Panel on Climate Change (IPCC) (2007).

Deforestation is a form of land use conversion, meaning that deforestation is purposely done to convert forested land into a new form of land to be used (Beukering et al., 2009). Mining, agriculture, palm oil plantations and infrastructure are main causes for deforesting

land. Due to the process of deforestation carbon dioxide is released while at the same time the process of trees absorbing carbon dioxide no longer functions when forested soil is cleared. Deforestation in that sense is an important contributor and cause of global warming as well (Beukering et al., 2009).

It should be noted that the underlying cause of increased global warming is the worldwide need for economic growth. The inheritance of the industrial and green revolution is exponential economic growth which has also led to the world's population to grow exponentially from a stable one billion to a current seven billion. The main stimulus of the world economy is oil production (and wood- and food (meat) production among others). Therefore at the core of the world economy lies an inherent outcome of increased greenhouse gas emissions eventually resulting in human induced (unnatural) global warming. Finite conventional energy resources as oil are cheap and still abundant or at least cheap enough to be economically most profitable to produce. It is a matter of geopolitics and competition between individual countries and global multinational corporations for finite resources and infinite needs which can be explained as 'the tragedy of the commons' (Hardin, 1968). The current and future outcomes of climate change make up the 'bill' (consequences) of economic growth which is not taken into account in the conventional economic growth model and therefore have to be paid by future generations, with unforeseen irrational high 'climate change interest rates'.

As this section presented human induced causes and the complexity (of conflicting interests) at the core of these causes, consequently one can raise the question about the consequences of these changes.

1.3 Consequences of Climate Change outcomes

The outcomes of climate change lead to consequences for both rural and urban livelihoods. These consequences lead to increased vulnerability, risks and pressure in sustaining in one's livelihood. Among these outcomes (phenomena) are changing weather patterns (increased or irregular rainfall), glacier melt, increasing temperatures and other weather extremes such as storms and sea level rise.

1.3.1 Changing weather patterns: The Sahel a climate sensitive rural region

Changing weather patterns have far reaching implications and involve a broad array of changes such as increased weather extremes, increased temperatures, extensive periods of drought, intensified periods of (irregular) rainfall, storms among many other climate anomalies. These changing weather patterns are all characterized by both their irregularity and increased intensity and seem to occur more often as a result of the changing climate. Livelihoods in most cases rural, depending on natural precipitation and regular weather patterns such as rain fed agriculture are increasingly impacted by these changes, while agriculture can be considered as the main source of livelihood for most of the world's poorest regions (Food and Agricultural Organization, 2006: 6).

Africa is a good example because it is especially vulnerable to climate changes due to its high dependency on natural precipitation for farming practices. In Africa precipitations are projected to decline with more than twenty percent compared to 1990, additionally climate changes will occur faster on the African continent and temperatures will increase by 3 to 6 degrees by the end of the 21st century (Africa Partnership Forum, 2007). On the long term globally these changes include changing rainfall patterns affecting agriculture leading to reduced food security, worsening water security and increased water stress. In Africa this means likely a decrease in the length of the growing seasons and yield potential in the semi and arid regions. The Africa Partnership Forum predicts a possible rainfall decline of *fifty* percent by 2020 (2007: 9).

The Sahel in this case is an extremely climate sensitive region. Extensive and intensified periods of drought in the Sahel are already putting pressure on sustaining a traditional livelihood of farming in this area (Nianogo, 2009). Sixty percent of the soils are considered vulnerable and thirty percent extremely vulnerable to droughts (Ibid). East Africa will by 2030 become drier, Southern Africa will face a ten to fifteen percent rainfall decline in the growing season. The Zambezi River could drop its run-off by about thirty percent in 2050 and yields will decline for maize with a 1- to 2- degrees temperature increase and less water (Intergovernmental Panel on Climate Change, 2007). Enclosing the Sahel has had the most severe droughts in the past three decades with declining rainfall patterns. River discharge has fallen by more than forty percent since the 1970s and the river Niger could drop a third of its river flow (NCAR, 2009).

When by far the majority of people for their livelihoods are depending on rain fed agriculture, agricultural growth can be considered key to alleviating poverty and stimulating economic growth. Generally speaking changing weather patterns lead to increased water insecurity, due to both the time and volume of precipitation leading to more variable and uncertain water flows combined with severe droughts and increased flooding. Implications are ample to livelihoods with limited infrastructure to adapt to these changing circumstances (Barrios et al., 2003). Changing rainfall patterns will thus result in dry areas to become even drier and wet areas to become even wetter. Also due to temperature rise evaporation from land will increase with the consequence that less rainfall will reach rivers (Intergovernmental Panel on Climate Change, 2007). All these factors will increase risks and vulnerability in many countries around the globe. Yet there are more climate change phenomena which can be distinguished.

1.3.2 Livelihood impacts of sea level rise

Glaciers are shrinking almost everywhere worldwide, as they are shrinking the rate at which they are doing so is increasing as well; a study of Lemke (2007) shows that glaciers are melting at an average length of ten meters on a yearly base while this melting process is increasing and they are also declining in their thickness as well. Contributors to glacial melt are increased temperatures and changing weather patterns. Another important contributor is a positive feedback mechanism called the *albedo*-effect (Lim 2007; Tedesco et al., 2011). Ice reflects sunlight by about ninety percent, however one's a glacier or part of it is melted the bare soil absorbs sunlight by ninety percent. Thus one's the ice has melted it becomes warmer on the surface reinforcing the melting process of glaciers remaining on that very surface. The glaciers of the Andes in Latin America are among the fastest melting glaciers in the world (Orlove, 2009).

Glacial melt is, next to slowly increasing ocean temperatures and thermal expansion also a distinctive contributor to another important climate change phenomenon; the looming process of sea level rise. Consequences are increased salt water intrusion of ground water contaminating drinking water, ground water and water for the production of crops and increased threats of flooding in coastal, most often urban areas (Alliance of Small Island States, 2010 in: Brown, 2011; Greenpeace, 2006).

Rising sea levels will pose a threat to coastal areas and coastal cities. Urban and economically important areas tend to be located mainly in coastal areas. On a global scale those cities include financial and political centers such as London, New York and Washington, but also big cities as Miami, Shanghai, Calcutta, Tokyo or Cairo. One can imagine that eventually these cities will have to take measures in order to prevent the cities from the rising sea levels. Yet other vulnerable areas are the low lying islands including all the 39 members of the Alliance of Small Island States (ASIS) are directly threatened by sea level rise. Most seriously threatened island states in the Pacific are Tuvalu, Kiribati, the

Marshall Islands and in the Indian Ocean the Maldives (Hansen, 2005: 269-279; Brown, 2011: 74-77). Surinam is due to its low lying coast also especially vulnerable for the consequences of sea level rise impacting agricultural land and the coastal urban areas.

Sea levels can rise due to thermal expansion but even more due to land ice glacial melt; a potential major contributor to global sea level rise is the Greenlandic ice sheet, which could lead, *if* to be melted completely, to a six to seven meter sea level rise. However as the Greenlandic ice sheet is melting, water streams are formed causing the ice sheet to break leading to potentially huge un-melted ice caps to slide into the sea all at once, which obviously speeds up the process of melting and disappearing of the ice sheet enormously. However being aware that this may sounds alarming; it is not an unrealistic process, which is indeed already happening on the Greenlandic ice sheet (Harris, 2007).

Climate change impacts lead to responses; the responses are outlined in the next section followed by illustrative cases that present these responses from a global political and regional context.

1.4 Responses

1.4.1 Responses: Adaptation, Coping and Alternative Responses

Within this research another focus will be on the responses: how are the experiences, consequences and perceptions translated into various responses? It is important to stress here the distinct types to which responses will be analyzed. One can speak about coping responses which incorporates the short term responding strategies, most often they are less structural, not characterized by long term planning and more often referring to individual response strategies (Davies, 1993).

The second type of responses is adaptation strategy, which is characterized by long term, structural and often planned and collectively implemented measures. Strategies aiming to adapt mean that the sustaining of livelihood is pursued in order to reach this by implementing adaptation strategies (International Arctic Science Committee, 2010; Berkes & Jolly, 2001; Davies, 1993: 60). This is essentially different from a third type of response which in this research is defined as alternative responses. Alternative responses are not aimed to sustain in a certain livelihood but they can include migration or a total change of one's livelihood, this being analyzed as a response to climate changes. Table 1.1 captures the main characteristics of the three distinguished response strategies.

Table 1.1 Threefold Typology of Responses

Coping response strategy	Adaptation response strategy	Alternative response strategy
Short term Individual Increase resilience Sustainable (in e.g. livelihood) Human, Technological, Social Capital	Long term Individual and Governmental Increase resilience Sustainable (in e.g. livelihood) Social, Political, Financial, Technological Capital	Short/Long term Individual Increase resilience Shift (in e.g. Livelihood) Voluntary/Non voluntary Social, Financial, Human Capital

(Source: Davies, 1993; Berkes & Jolly, 2001; Blaikie, 1994)

Locality is an important notion when it comes to adaptation. The geographical location plays an important role due to the fact that the regions hit hardest and thus most urgently need to develop adaptation frameworks include countries which have often contributed the least to the occurring consequences however are suffering directly from the consequences. Adaptation

strategies referring to long term implemented strategies and frameworks obviously require the right knowledge, capital and technology. Therefore to increase one's or a country's adaptive capability various forms of capital are needed, the geographical location merely determines the structural vulnerability of a region (being flood prone, low lying, or a drought sensitive region).

Adaptive capability refers to which extend one is able to adapt to the internal and external risks or impacts. Livelihood strategies are defined by which assets both tangible and intangible are strategically used. Tangible assets being physical capital and intangible assets as social capital, and capabilities which include human and cultural capital (Valdivia, et al.,2003 in: Verkooijen, 2011: 16). One's livelihood strategies or adaptive capability define one's level of vulnerability. Those livelihoods that are least resilient or least able to adapt often have the least assets and are most vulnerable to risks and disasters. Often they are living in climate sensitive regions and dependent for their livelihood on the natural climate. Blaikie (1994) argues that one's vulnerability is determined by the exposure to risks and the ability to cope with these risks. Phenomena like floods, storms, increased droughts and sea level rise, defined by Blaikie as risks affect one's or a country's capability to cope with these risks. Vulnerability is defined by Blaikie to the 'characteristics of a person or group and their situation that influence their capacity to anticipate, cope with, resist and recover from the impact of a natural hazard' (p.11). Vulnerability is at the core of many other factors other than just climate change impacts, these could include political instability, power relations, inequality, war, famine and earth quakes. Within this research vulnerability is referred to as a result of climate change impacts in relation to what extent one is able to reduce its vulnerability by strategically using one's assets.

In the Pressure and Release Model (PAR) it is argued that vulnerability is the result of outputs such as the mentioned climate change phenomena (defined as risks) and root causes such as limited access to power and resources, inadequacies in training, local institutional systems and ethical government standards and that different levels of access to these resources; the presented forms of capital lead to differential impacts of hazards.
It is important to understand this definition of vulnerability and therefore that adaptive capability determines one's vulnerability.
In the following cases responses and adaptation strategies to climate change risks and impacts are presented.

1.4.2 Responses to Climate Change in a Social and Political Framework

From Conference of Parties 5 (COP 5) in 1995 until the long debated and extended end of COP 17 last December 11, 2011 climate change has been high on the political international agenda. What was agreed on in the year 1995 during COP 5 can be compared with the last outcome of COP 17 in Durban, South Africa. In COP 5 a roadmap was made for a climate treaty which would be agreed upon in 1997 in Kyoto, Japan (Nationaal Instituut voor Milieu en Ontwikkeling Suriname, 2006). Currently 194 countries have agreed during the United Nations Framework Convention on Climate Change (UNFCCC) conference that a follow up treaty; a new global binding climate agreement will be agreed upon in 2015 to be ratified no later than 2020 (United Nations Framework Convention on Climate Change, 2011). The current Kyoto protocol (the only current global climate treaty) was ratified in 2005, eight years after the protocol being agreed upon in 1997 and is for the sake of time extended from the end of 2012 until 2020 on a voluntary base; Russia, Canada and Japan have already announced to resign after the end of the first Kyoto commitment period in 2012. The remaining Kyoto participating countries combined are only responsible for about fifteen percent of total greenhouse gas emissions (National Centre for Policy Analysis, 2011; Sydney Morning Herald, 2011; de Volkskrant, 2011). China, India and The United States are

explicitly against a legal binding climate treaty in an international context. The European Union (EU) and seventy developing countries, among which low lying island states are pledging for a legal binding treaty to be ratified in 2017. These are contradicting positions taking into account that the opponents combined are responsible for almost half of the total global greenhouse gas emissions (The Telegraph, 2011; The Guardian, 2011).

The roadmap which have been agreed upon to have a climate treaty ratified in the end of 2020 bridges a timeline of which it is increasingly backed up by scientific evidence that the timeline involved is too long in order to be able to reasonably convert the inevitable consequences involved with the looming climate changes. 2020 bluntly put gives us eight more years to continue with 'business as usual'; it is *too* far in the future; time to effectively act will run out (Canadell et al., 2007; Nordhaus, 2007, Pielke et al., 2007; Stern et al., 2006; Trouw, 2011).

It is not the perspective of this research to emphasize on the scientific based evidence to outline the current and future tipping points of a 'runaway effect' of climate change. But there is ample evidence however that the current timeframe outlined from 2012 until 2020 is very crucial in order to prevent the process of climate change to transform in an uncontrollable climate change characterized by increasingly rapid positive and negative feedback mechanisms (Nordhaus, 2007, Pielke et al., 2007; Stern et al., 2006). It should be perfectly clear that the urgency to reduce, mitigate and control climate change is stringent. It calls for an urgent adequate way to act, to respond.

Responsiveness on UNFCCC level is time consuming, perhaps responsiveness is more effectiveness on smaller scale. but the roadmap gives options for Surinam as a member of Kyoto, to apply for an adaptation fund. The now following section will present current developments on adaptation strategies in the Amazon among which is *Ocucaje* in which it becomes clear how adaptation strategies can effectively being implemented on region level, increasing the region's resilience to the adverse impacts of climate change.

1.4.3 Different Response Frameworks: Ocucaje and the Low Lying Atolls, Responsive Capability to extreme conditions

Ocucaje is a green agricultural region located in the dry dessert of the Ica Valley in Peru. Farmers are dependent on natural precipitation and as the region has a low climate resilience, farmers have developed adaptation strategies in order to regulate the water and become less dependent on the rainfall period, as a result becoming increasingly adaptive subsequently increasing their resilience to the regions' climate sensitivity.

A distinctive adaptation strategy used in *Ocucaje* is flood irrigation and another essential strategy is drip irrigation. By the use of flood irrigation the fields can be irrigated at least ones a year. Canals are constructed surrounding the fields and can be used as irrigation channels. By drip irrigation water is collected in ponds and can be transported to the fields with pumps. Drip irrigation is considered more efficiently than flood irrigation as the water can be regulated more precisely. However flood irrigation doesn't need electrical pumps and the water from the river Ica is considered fertile, which is also an advantage (Blokker, 2009: 39). Circumstances in the Ica Valley are however worsening. Water is getting scarce due to increased agricultural usage and increase of agricultural activities. Planting trees therefore is a strategy to prevent the ground from erosion. Increased efficient use of water and using less water is also a way to the decrease water scarcity. Using less water could be realized by growing less water demanding crops. Crop diversification is yet another example of a coping strategy in order to sustain in one's livelihood under the changing conditions namely increased climate induced water scarcity.

Another climate sensitive region in which adaptation strategies are needed is the Amazon River Basin, the world's largest fresh water resource. The river is largely fed by

recycled water from the rain forest and by the Northern Andes (Case, 2010; Organization of American States, 2005 in: Pinola, 2010: 26). Adaptation strategies in this region could be to shift from rain fed agriculture to irrigated agriculture, which will be effective and could prevent land from being further deforested, decreasing the risks of floods at the same time (Junk, 2007).

In general it can be stated that examples of current (adaptation) response strategies in the Amazon region are mainly the conservation of essential ecosystems, implementation of early warning systems (adaptation), risk management in agriculture (coping and adaptation), and strategies for flood, drought and coastal management. However main factors hindering the successful further development of these strategies mainly are; the lack of basic information, the lack of observation and monitoring systems, the lack of the right political, institutional and technological frameworks and lack of financial capital (Intergovernmental Panel on Climate Change, 2007). A solution to come to a global understanding to these shortcomings is (among others) being negotiated on from the UNFCCC conference of parties, as is outlined in the former section. These shortcomings in order to implement structural effective response frameworks in order to increase a region's responsive capability can generally be considered shortcomings in any typical climate vulnerable developing region.

Climate change impacts such as sea level rise could also lead to other types of responses such as (mass) migration or even forced displacement, which are defined as alternative responses, obviously. Displaced people due to environmental events are climate victims or climate refugees. It is expected that climate change refugees due to rising sea levels will likely outnumber environmental refugees. Already today more than half a million people living in the Atoll islands of Tuvalu, The Maldives and The Marshall Islands are most likely to become the first climate refugees as a result of sea level rise (Arenstam et al. 2006: 40-47; Arendt et al. 2002: 382-388; Hansen, 2005: 269-279). Today 3 thousand of the total 10 thousand inhabitants of Tuvalu have migrated to New Zealand. The Maldives with 300 thousand citizens are relocating within the island group; citizens from 200 of the lowest lying islands are moving to the few bigger and somewhat higher lying islands of the Maldives (Koko Warner et al., 2009; United Nations Population Division, 2009). (695) On the level of relocating complete coastal areas or even island displacement to alternative less vulnerable regions (e.g. to a neighboring country; New Zealand) it should be noted that depending on the urgency financial, political and social capital are essential in order to realize a relocation of such magnitude.

1.4.4 Current Adaptation developments

Some impacts call for only one appropriate response which is adaptation. Adaptation measures are occurring and being implemented in risk assessments, however generally adaptation measures taken are far behind from what is currently needed in order to reduce vulnerability to future changes to come. Many impacts of climate change can be effectively dealt with through adaptation response strategies, however as time continues to pass the outcomes of climate change are increasing, options to successfully adapt to the changes will diminish and the costs involved will only increase more rapidly. Adaptation strategies can vary from technological to individual, behavioral, to managerial (for instance farm practices) and to policy measures taken. Apart from the adaptation measures taken it is often unclear how effective the measures are in order to reduce the risks. Other hindering factors are the environmental, informational, economic and social barriers to implement adaptation response strategies (Intergovernmental Panel on Climate Change, 2007: 18). It is important to take these notions involved with implementing effective adaptation strategies into account as they are essential barriers to overcome, this specifically also applies in the context of the Amazon region and Surinam.

1.5 The Asset Vulnerability Framework

In this research Moser's Asset Vulnerability Framework is used to analyze responsive capability of respondents in the changes and challenges they face as a consequence of climate change (1998). It is argued that one's vulnerability is determined by one's capability to strategically use its assets. From this perspective the aim is to focus at tangible and intangible assets that individuals, small farmers and governmental institutions have rather than not have. One can then analyze vulnerability and resilience from an urban assets vulnerability framework. These assets as defined by Moser (Ibid.) are fivefold categorized in:
(1) human capital (knowledge, education, and competencies), (2) financial capital (e.g. savings), (3) material capital (e.g. a house, car or work equipment), and also not tangible capital like (4) social capital (the existence of networks, access to services, family based networks and relations) and (5) political capital (political influence, politically mobilized). From this assets perspective one can analyze how these assets are exerted to reduce climate change induced impacts.

Impacts on individual (household) and governmental level are various however the focus will be on natural hazards (flooding, storms), (perceived) threats of sea level rise, changing weather patterns, and other various perceived climate changes. These risks directly and indirectly affect one's vulnerability in the coastal urban context of Paramaribo.

Vulnerability is the outcome not of absence of food for instance but as a process to which extent individuals (farmers, general inhabitants, market sellers) and governmental institutions are being able to respond effectively to the adverse impacts of climate change and how their assets are strategically being exerted to reduce these impacts (Ellis, 2003). Vulnerability is not the same as poverty, poverty is referred to as a static state while vulnerability is dynamic; 'people move in and out of poverty' (Lipton and Maxwell, 1992: 10 in Moser, 1998). Not all vulnerable people are poor, while most people who are poor are often also vulnerable. Vulnerability thus can be understood as the interplay between risks (defined as climate change outcomes) and responsive capability, by which the framework of assets is being instrumentally and strategically used, there by looking at these responses (coping, adaptation and alternative strategies) as Moser (1998) states to 'people's own incentive solution to diversify their livelihood sources. The assumption is that individuals are creative when challenged by the changes of climate; in order to become less vulnerable from perceived climate induced impacts individuals can prove to be effectively responsive with few assets in order to sustain in one's livelihood. By already having resource limits and few assets facing a different set of challenges is already a daily livelihood task. Responsiveness of farmers in chapter 5 will be analyzed by Moser's Asset Vulnerability Framework. The following tables present the analytical framework by which responsiveness can be analyzed. Table 1.2 presents how these five assets could be vulnerable to climate change outcomes and how could be responded to this climate induced vulnerability in order to reduce the impact. Human capital could become under pressure due to increased climate change pressures on one's livelihood leading to prioritizing one's basic needs therefore education and personal development becomes secondary. Responses could be relocation to climate stable regions or training or awareness programs which could increase one's responsive capability. In a similar structure the table presents the asset vulnerability in this context.

Table 1.2 Assets and Vulnerability Framework: Asset Vulnerability

Assets	Vulnerability	Response
Human (e.g. Knowledge, Education, Capabilities)	Climate pressure on Basic needs priority over Secondary needs	Relocation, Training, Awareness Programs
Financial (e.g. Savings)	Climate induced-personal/market Insecurity	Withdraw/(Re-) invest Savings
Material (e.g. Housing)	Storms, Erosion, Flooding	Shock/Water Resistant Housing
Social (e.g. Family-, Work Networks)	Climate induced Social Pressure and Differentiation	Farmer's Cooperation, Re -formulate/-scale social Bonds
Political (e.g. Government Relations)	Conflicting Climate Government Interests	Political- Mobilization/-Influence

(Source based on: Moser, 1998; Ellis 2003; Blaikie 1994)

Table 1.3 presents a more extensive overview of which assets can be strategically used to respond to climate induced risks (vulnerabilities). Hereby the specific response strategy and type of response is identified and the main beneficiaries and disadvantages thereof as well as the concerned climate induced vulnerability and the main impacts thereof are outlined. Three distinctive responsive strategies presented in the former sections are illustrated. In chapter 5 the identified responses of famers and market sellers will be analyzed according to this analytical framework.

Table 1.3 Assets and Vulnerability Framework: Asset Responsiveness

Response strategy	Type of response	Assets	Vulnerability	Impacts	Benefit/ Disadvantage
> Early Warning System	>Governmental /Communal Coping strategy	>Technological > Financial > Material	> Glacial melt > Sea Level rise	> Glacial lake Induced flood > Glacial Induced River flood	+Decrease adverse impact - Expensive >(Un)Reliability
> Global Climate Treaty	>Governmental Adaptation Response	> Political >Technological > Human	> Global an region specific	> Current and future global, local threats	+ Resilience + Reduce impacts + Sustainable + Stable climate > Reformulate intrinsic values and economic system
> Migration	>Individual Alternative response	> Human > Social > Political > Material	> Sea level rise > Changing weather patterns	>Floods > Food security > Housing	> Shift in Livelihood > Relocation - Social Pressure + Opportunity

(Source based on: Moser, 1998; Davies, 1993; Blakie 1994)

1.6 Climate Change Causes, Consequences and Responses in Surinam

> 'Despite all efforts taken to conserve the Surinam forest, Surinam is considered to be one of the most vulnerable countries exposed to the effects of climate change. A reinforcing factor to Surinam's vulnerability is the low lying coastal area where about eighty percent of the population lives and works.'[1]

Surinam suffered from a great flood in 2006 of a magnitude which was not experienced since some seventy years ago. Especially people in the inland where hit hard since they are mainly concentrated to be living along the river banks. The floods of 2006 which caused major damage to land and people had a severe impact on Surinam's collective memory and one can state that this catastrophe was a turning point in which both the people and the government acts and perceives climate events or changes. After the floods the media also paid more attention to assumed climate changes. From a media perspective it is illustrative that in the nineties there was hardly any written news on issues linked to climate change, currently this has changed and climate change as a phenomenon is much more integrated in daily life in Paramaribo (Evers, 2010b)[2]. 2006 was a warning for both the government and the people that changes can have severe unexpected impacts.

Many of the presented consequences of climate change are applicable for Surinam. Surinam is among the five most vulnerable countries in terms of climate induced sea level rise impacts as defined by several sources such as the IPCC.
In Surinam main issues at stake are deforestation, gold and bauxite mining, erosion, weather changes in the dry and rain season, sea level rise, groundwater salt intrusion and river flooding. The next statement illustrates how climate change has become an integrated part of Surinam's collective awareness:

> 'By now the whole society in Surinam is aware of the fragile and even more becoming fragile coastline of Surinam. This is due to climate change and as a result thereof sea level rise, but also by wrong decision making.'[3]

Cutting down mangrove trees negatively impacts the coastline. The sea is dangerously winning ground and approaches on some places the main corridor 'East-West Road' within hundreds of meters, mainly on places where the mangroves have made place for subdivision of the land into parcels. Consequence of this irresponsible land use along the coast is erosion leading to loss of fertile land. Other consequences of the eroding coastline are: salinisation of agricultural land, infrastructure loss or destruction, loss of biodiversity and floods (Anton de Kom University Surinam, 2010).

Suriname has a vulnerable coastline and one of the effects of climate change is sea level rise. Scientific studies by the World Bank and Caribsave and also national studies indicate that Surinam is very vulnerable for the rising sea level as a result of climate change. A consequence of sea level rise is salt water intrusion affecting water quality of the aquifers and affecting Surinam's food production. Other climate changes projected are intensified heats, more extreme rainfall periods, during the dry period the country will face extreme droughts consequently isolating some parts of the inland and increasing the risk of scarcity in drinking water (Nationaal Instituut voor Milieu en Ontwikkeling Suriname, 2011).

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[1] ATM-minister Ginmardo Kromosoeto (Gov.sr, 2011)
[2] Ganesh, Journalist, February 29, 2012
[3] Ivo Evers, Anton de Kom University, 2010

Rising sea levels have increased more than expected in the last ten years according to Susmita Dasgupta, researcher to the effects of rising sea levels due to climate change. One of the advices by Dasgupta is to develop a national adaptation plan focusing on dams and developing higher situated housing; if the sea level will rise with one meter the coastal area of Surinam will flow over (Klimaatnieuws.nl, 2007). In Surinam currently plans are being developed to build dikes along the coastline. The water levels are being monitored in order to develop effective coping projects such as Comprehensive Water Management and Early Flood Warning Systems. Stakeholders involved are different government departments and the community of farmers in Nickerie in the northwest.

Although Surinam hardly contributes to climate change it is very vulnerable to the adverse effects. In fact as a huge part of the country consists out of forestland, it does contribute to cleaning of the atmosphere through the forest surface. Jennifer Simons (2010) emphasizes on the importance of conserving the forest in Surinam:

> 'Our interest and that of the world depends on the amount to which we are able to leave the dominant economic model which dictates government policies through short term interests and profits. This model sees the natural environment as inexhaustible not taking into account the financial losses of their ecological destruction. Surinam has to be very clear about their standpoint on international conferences on these issues. We have to be financially compensated for conserving the forest, than we can sustain the forest indeed.'

She underlines the forest as an asset; which should be conserved and compensated for. Surinam has ratified the Kyoto climate treaty of the UNFCCC in 1997. One of the requirements of the Kyoto Protocol is to produce a National Communication Report (NCR). Currently the Ministry of Labor Technology and Environment (ATM) is since 2009 working on the Second National Communication (SNC). Likely this document will be finished in 2012 and handed in at the UNFCCC. Surinam can benefit from the Kyoto Protocol as a 'carbon sink' country it can as a developing country sell its 'carbon credits' to developed countries. This type of income can serve to stimulate 'clean energy' projects. Surinam has ratified the Kyoto Protocol internationally in the end of 2006.

Currently Surinam is also finishing the second phase of the Netherlands Climate Assistance Program (NCAP-II). The assistance program aims to develop a national strategic climate policy in order to reverse the negative effects of climate change in Surinam. The second phase involved the implementation of mitigation and adaptation measures concerning Surinam's vulnerability, specifically in Paramaribo and Wanica (the district bordering Paramaribo). And the National Institute for Environment and Development in Surinam (NIMOS) has developed in 2007 a 'National Action Plan on Climate Change' in which strategies are outlined to reduce the negative impacts as well as strategies to adapt to the inevitable effects of climate change.

2. Perceptions of Climate Changes and its Causes

In this chapter climate changes and their causes are central. The main aim of this chapter is to outline the identified different climate change phenomena and its perceived causes. Thereby this first empirical chapter serves as a base for the following empirical chapters. Climate change phenomena in Surinam are multiple, the main outcomes of changes are: changing weather patterns including irregular rainfall and droughts, floods, sea level rise increased temperatures and storms.

The first section presents the governmental and institutional scientific perceptions on climate changes and its causes and the second and third presents the perceptions of inhabitants of Paramaribo such as taxi drivers, market vendors an ice-cream vendor and a journalist on climate changes and their perceived causes which are among others explained through human and religious causes. Perceptions and the causes of the urban water prone area Paramaribo North are presented in the fourth section. It becomes clear how both human and natural factors are cause of the changes.

2.1 Government and Institutional Perceptions on Climate Changes

This section presents perceptions of climate change and its causes from a government and institutional perspective, such as government officials, scientists and climatologists of the meteorological service of Surinam.
Cor Becker, Head of the Meteorological Service in Surinam formulates the changes in the weather as follows:

> 'Surinam suffers since the past years not only from increased droughts but also with extreme precipitation which are ascribed to climate change. One can't make a clue out of the weather pattern: Than it heavily rains for three days straight combined with gusts of wind and then it turns suddenly to six days of drought and heat. And all of this happens in months like May which is the period of the rainfall season.'[4]

Professor Naipal is a renowned climate change expert in Surinam, specialized in water resource management at the Anton de Kom University in Paramaribo (ADEKUS) and describes some of the by him experienced changes in nature:

> 'When you ask people about changes in the weather people will most likely refer to the changing rain, but is this true or have they heard it for it to be climate change?
> In 2009 in May during the small rain period it did barely rain at all, it was a real dry month. As a consequence nature responded to it; plants started growing and insects responded as well, they showed a reaction as if the big dry period had started. This I experienced with my own eyes and you will not hear this in the conference rooms but it is happening. The rainfall fluctuates and changes during the seasons but on a yearly base the amount of rainfall itself is not increasing. The intensity changes and I have these statistics.
> For instance during the dry season it could rain for one week straight and then stop again. These fluctuations disturb nature even the marine life, fishes respond by laying eggs.'[5]

Thus the intensity of rainfall according to Prof. Naipal does increase, however the volume of it on an annual base does not. The changing rainfall periods are also reported in a renowned newspaper *De Ware Tijd* by Roel Oehlers of the Meteorological Service in Surinam, as he explains that the dry season should have started in February but in 2012 the small dry period

[4] Evers, 2010a
[5] Prof. Naipal, Climate Change Researcher, Anton de Kom University, Paramaribo, May 9, 2012

is predicted to onset in late March eventually. According to Oehlers it is reported in the article that this is due to the warming of the earth and the effects of La Nina which puts pressure on the seasons. A lot of rain did fall from February until the end of March 2012 while meteorologically it should have been already the short dry period (Lang, 2012).

Head of the Meteorological Service Cor Becker states that the division between the seasons is not shifting or at least there is not yet enough data available to underline this assumption, however 'due to global heating of the earth the periods of rainfall are changing during all the seasons', thus making the *character* of the seasons different (Dagblad Suriname, 2008). Becker explains that the meteorological statistics reveal that precipitation along the coast has reduced indeed in the past century:

> 'A century ago annual precipitation in the coastal areas was 2400 millimeters; while anno 2010 this has been reduced with 200 millimeters and this declining trend is continuing. The alarm bells are ringing in fact already for a long time. The changes we are experiencing in the rainfall periods are becoming unpredictable; this is due to the atmosphere which is warming due to global warming of the earth, which leads to a longer time in which moist can transform into rain leading to a reduction in total days of rainfall. Changes are longer periods of drought and shorter periods of intense rain. Not the seasons have changed or are shifting, but the character of the seasons has changed.'[6]

One can thus state that according to these individuals (scientists and meteorologists) changes are perceived as happening and ongoing leading to different outcomes with unpredictable precipitation patterns as a consequence of warming of the atmosphere, leading to more intense rainfall, longer periods of drought and unpredictable outcome of the seasons with a total decline of days of rain.

Other changes of climate are experienced in Surinam with outcomes such as floods and erosion of the riverbanks and coast. The government perceives the floods and ongoing erosion of the Surinam River as consequence of sea level rise, therefore the government is taking this threat seriously. It has formulated a two year upgrade plan at the Waterside which is a long term adaptation strategy and is explained in more detail in chapter 4 concerning the responses (Times of Suriname, 2012b). Mr. Chirmotie, district member of the Ministry of Public Works explains the floods in the Surinam River as follows:

> 'The dikes are too low or flooded away a long time ago, in combination with springtide this causes flooding, however a more disastrous cause of flooding is climate change. Erosion is taking place quickly in combination with rainfall flooding is a logic outcome.'[7]

Another flood prone area is the Road to Sea in the Wanica district south west along the coast bordering the Paramaribo district. Concerning the 'Road to Sea' Joyce Jordan of the National Democratic Party (NDP) refers to the floods in the area as a consequence of the 'advancing sea' which puts pressure all along the coastal areas. Surinam is among the countries in this region that sooner or later will face the adverse consequences of the rising sea, as is stated by Jordan (Bhikharie, 2011). Both changing weather patterns as the rising sea level are perceived as outcomes of climate change and are posing challenges to the government in urban Paramaribo. The following section presents perceptions on climate changes from the perspective of common general inhabitants in Paramaribo and it portrays how the changes are experienced from daily life.

[6] Evers, 2011

[7] Rostamkhan & Toefanie, 2012

2.2 Urban Climate Change Perceptions

The main climate changes are outlined as change in rainfall, however other outcomes are also mentioned which are other issues at stake such as sea level rise, flooding, storms, increased temperatures and extensive periods of drought. Surinam's meteorological climate can be divided by a short and long dry and rainy season. However this division seems to become faint. The typical set division between the four climate periods is perceived to be changing or shifting. Practically every respondent; farmers, market sellers and urban citizens claim that rainfall has been changing over time, some report that rainfall has become totally unpredictable, some report that rainfall is only shifting a bit. At the same time many of the respondents claim that it is a continuing process, which therefore has not ended. Waldo a taxi driver who operates the Paramaribo-Albina[8] route for over 15 years reports he has seen the climate changing, as he describes increased rainfall and heavy storms:

> 'All I know is that the weather has been changing radically, that is my experience. There is a lot of rain, a lot today! From my childhood we had the clear distinction between the dry and rainy season, but as I said everything has changed in Surinam. Since years the rain is mixed up, you cannot tell anymore when the rain will fall, when the rain will stop. There is no clear distinction anymore today, and I don't know why this is really, but it does rain a lot today.'
> Q: 'Taking these changes into account how would you expect the weather in Surinam to develop in another ten years from now?'
> 'Soo!...it would become chaos as it is already like this today, I really don't know but if this continues things will get very difficult in the future. Probably it will worsen but I don't know how it will develop. Already outside Paramaribo in Wanica sometimes there are gust winds blowing roofs of houses, this is something not happening before.'[9]

Thus the change seems to be continuing and worsening, the dry and rainy period are becoming unpredictable. The changes seem to be concerning as some people are not aware what the future will bring, as Clarence a city taxi driver explains:

> 'O, everything and everywhere it has changed. You know that from your country as well don't you. This is not only in Surinam. It has started to rain more often. I don't know why, I think because of the ozone layer.'[10]

The conclusion derived from these perceptions is that rainfall has increased or that the irregularity and intensity of rainfall periods has increased. One could question if these changes in rainfall are indeed an outcome of climate change but it cannot be misunderstood that exceptional weather is being experienced and reported.
Another respondent Eddie a national army officer explains his view on the changes; the rain, the sun, the sea level all are changing making the outcome of the changes all harder to predict:

> 'I am aware about global warming, due to global warming; the sea level is rising, rainfall is increasing. Also the sun gets too tense; the weather cannot be predicted anymore. The rain we are experiencing now I haven't experienced this before honestly. The rain! Yes it comes in boisterous abundant amounts I can tell you. At the same time lately in the past years in December we experience more drought. The rain is also more locally and it is

[8] Albina is a border town located in the North East and is connected by the East-West corridor
[9] Waldo, Taxi Driver, March 5, 2012
[10] Clarence, Taxi Driver, March 27, 2012

more tense and short. I would say more rain is released in a shorter period. Truly; one has no inkling of how to predict anymore and the future if I may believe doesn't look so pretty for the changes that still have to come, therefore we have to change our attitude totally from tomorrow otherwise the earth itself I believe will stabilize itself in its own way'[11]

Wilfred, an ice-cream vendor formulates the changes as follows:

'Already I can clearly experience the effects of climate change, during the dry season it is extremely hot and more often storms do occur; trees are damaged and roofs from houses are blown away during these storms. I read this also in the newspapers.'[12]

Thus changes indicated are various; storms, temperature rise, sea level rise and changed rainfall patterns. Towards the future it is assumed that this process is to continue into a worsening state. The urgency to change one's attitude therefore is also mentioned. Surinam suffers also frequently from floods at the coastal and river areas. It is perceived as more urgent due to the rising level of the sea and increased rainfall, Hanjoman a Hindustan bus driver is describing the situation at the Hindu burial site in the 'Road to Sea' in the Wanica district:

'At the burial site for Hindus I know the sea has flooded away all the land. There is not a concrete dam and land has been lost.'[13]

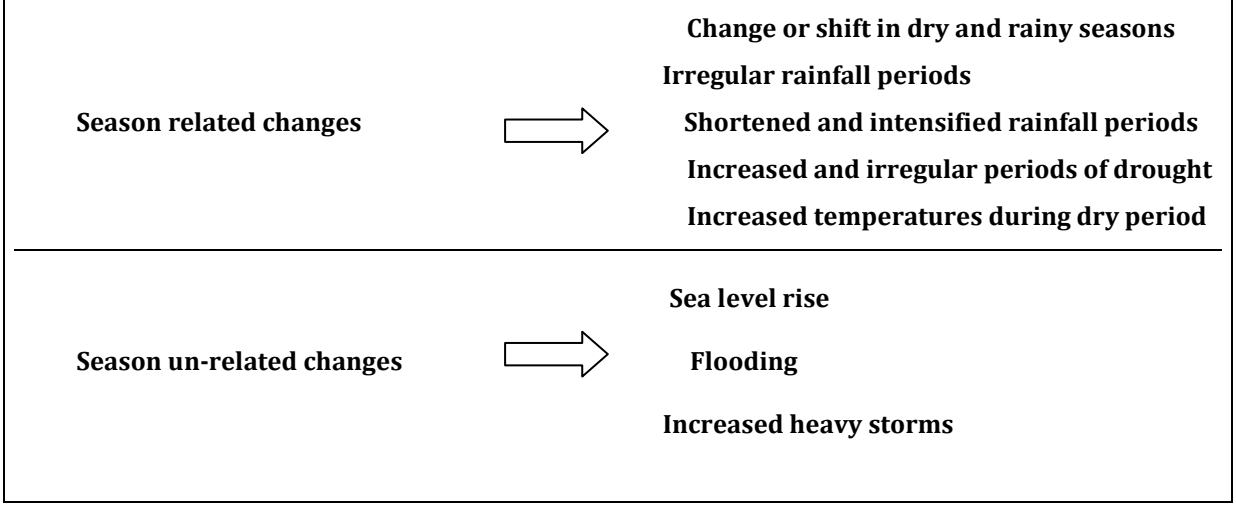
Mohan, planter from the agricultural cooperation market states that changes are increased rainfall and a rising sea that cause floods at the river and coast:

'In combination with high tide and abundant rainfall water level rises high and floods will occur near the river banks. At the 'Road to Sea' I don't think it is possible to manage with the floods as the sea comes closer every time. The weather is changing everywhere and the rain will always come back, in contrary to before when we had a distinct dry and rainy season. The temperature is getting a bit hotter as well.'[14]

The here presented Figure 2.1 summarizes the main climate changes that have been reported.

[11] Eddie, National Army, February 22, 2012
[12] Wilfred, Ice-Cream Vendor, February 25, 2012
[13] Hanjoman, Bus driver, March 27, 2012
[14] Mohan, Market Seller and Planter, Agriculture Cooperation Market, April 22, 2012

Figure 2.1. Perceptions of Climate Change Phenomena in Surinam



Through the media such as newspaper items climate phenomena are often referred to as outcomes of climate change, from a governmental and meteorological perspective these linkages are also outlined, therefore making the climate situation different from the usual state of affairs and a notion of urgency to respond is thus reported.

As these changes are perceived as climate changes does this make the statements true? Especially the first part of the question is of interest, however nature is responding by bringing forward the changes causing confusion among humans and nature. Meteorological data in Surinam shows that the climate is changing. As these changes in the climate are perceived as climate change another interesting question is what the perceived underlying causes thereof are.

2.3 Urban Perceptions on the Climate Change Causes

The perceived causes of climate change and the causes of the outcomes thereof are outlined in this section. It seems that climate change can be understood from three lines of reasoning: (1) It is happening everywhere but the main outcomes are experienced in other countries and (2) climate change and the outcomes thereof are caused by human activities and (3) it is religiously explained.

Climate change is perceived by many of respondents as a global process which not only influences Surinam, moreover the consequences experienced are according to respondents often more serious abroad, while Surinam is perceived as being protected from the worst consequences:

> 'We live in a blessed country, we have a fairly stable climate, we don't suffer from great earthquakes, tropical storms or tsunami's, it is because of our geographical location; the Guyana plateau is blessed despite of a lot of other countries nearby in the region.'[15]

To a certain extent this is true; it might also be a preferred optimistic view leaving out Surinam's vulnerable sites presented in section 1.6. However Surinam is often perceived as

[15] Ramon, Construction, February 17, 2012

a blessed country with abundant undisturbed areas of rainforest not facing the most direct outcomes of climate change, as another respondent state:

> 'We do face the consequences of a changing climate, however I think not as much as in other countries such as small islands.'[16]

The assumption is that the climate is changing but that this process is happening everywhere. An often heard reply on changes in rainfall is; 'Everything is changing, not only here but everywhere, also in your country'. One could conclude that climate change is perceived to be happening but for the most part not affecting Surinam. Some respondents tend to give a bright view on Surinam.
Perceptions on climate change are seen as human caused, however the real human cause as perceived by both farmers and general respondents stays mainly vague. People are not aware of the complexity of the process but are aware of the consequences and that somehow men have induced the climate to change. As was described by a respondent:

> 'I think people sent machines in the sky trying to measure the climate while disturbing the climate. They say that not only because of rain but due to melting of ice sheets the sea level is slowly rising.'[17]

Another respondent, Mr. Bhoelai, a small farmer vaguely state:

> 'It is changing because of the rockets flying into the sky by people and we damage the ozon layer.'[18]

These descriptions; 'rockets' and 'machines' sent into the skies and the ozone layer which is damaged show that one is not familiar with the causes behind these issues in daily life.
Other causes as mentioned are; the big industrial countries like China polluting the air, the melting of the glaciers and the often mentioned damage being done to the ozone layer.
The statements differ from vague to more specific accurate statements. Respondents don't specifically mention the burning of fossil fuels like oil through which CO2 is released or emissions of methane through agricultural activities. The mechanisms are complex and respondents indicate that being aware of these issues by being informed through the government, television and other institutions matters. At the same time most of the farmers and in general respondents also already indicate that they are informed through documentaries, internet, the newspapers and other channels.

There is yet another often heard cause, which is religiously embedded. A minority of both farmers and general respondents is not aware of the causes of the changes, an often heard reply is: 'I don't know about that, only God knows' or 'I cannot predict the future, only God knows what the future will bring us'. But in some cases people have two versions of the story which include both the acts of God and the acts of men. The next story as vividly told by taxi driver Waldo, illustrates this reasoning:

> 'People think they can predict the weather with certain measurements but it is God who decides that the rain will fall on a different moment; it is God who decides what the weather will be tomorrow. So far there is not clearly a given grounded reason for these

[16] Alberga, Director Open Air Museum Fort New Amsterdam, February 6, 2012
[17] Waldo, Taxi Driver, March 5, 2012
[18] Mr. Bhoelai, Market Seller (Wednesday market), April 11, 2012

changes to occur, that is my opinion. God decides over this, only God knows. My conclusion from what I have experienced is that this is something from nature. People don't act in line with God, it is a struggle between men and God. I think people sent machines in the sky trying to measure the climate and disturbing the climate. It is just not to predict, people think they can but you can't. It is God's department. But why has something like this occurred now, why is this changed so much, why?? You know it rains so often now, and we don't know, that is really a question for me! Before there was clearness about the weather but today so much has changed.
The river also does contain more water due to increased rainfall, more often with a little rainfall combined with high tide the water of the river will flood.
Some four years ago people in the inland suffered from a huge flood, people were hit hard: their homes, their land, because they live near the riverside and water levels went up until their knees. This was an extremely unusual event, this never happened before in my lifetime but then it did. And as I remember this only happened once in all history and this was a long time ago around the fifties. But as I'm saying a lot of things are happening and changing now.
They said we have to built a dam now, ehm my wife was busy with this research about climate change. They say that not only because of rain but due to melting of ice sheets the sea level is slowly rising.
Q; And is this something truly happening right now?
Well I think it is reality, yes. Because also without rain during high tides the river will flood and we suffer from that. Earlier on we had not those kinds of things.'[19]

This story shows that religion comes in the first place. Probably because nature has everything to do with God's creation, therefore when God's creation is changing it surely has to be somehow meant by God to change. It shows faith in God to state that the climate is changing but that the underlying reason cannot be explained as easy by men. It is in the hands of God. As one's belief is stronger it would be more logic to explain it in religious terms rather than in terms of human causes. This makes sense, but the story shows that one can have a religious persuasion while at the same time as the story goes on, one can as well hold a human caused persuasion. In fact they are contradictive, therefore one could argue that as religious people come to be aware of the human cause of the changing climate they start to experience a struggle between their religious assumption and the human caused explanation. It must probably seem farfetched that a creation as big as the planet earth can be changed by human interventions. Therefore the most logic assumption is to firstly explain the changes as something that is in the hands of God.
Another respondent Rud, who sells vegetables and plants from his car, who is also strongly religious makes the following striking statement:

'The weather is changing and will continue to do so, but if it will go back to the former stable state? Well, that is up to God, but I don't think so, no. Men have disrupted nature, not only here in Surinam but all over the world which leads to the changes we are facing now.'[20]

The former respondent clearly states: 'People don't act in line with God, it has become a struggle between men and God.' However: 'It's God's department'.
Thus as these respondents come to realize that men are 'interfering with God's department, disturbing God's creation' they come to encounter God's creation in a different way. God

[19] Waldo, Taxi Driver, March 5, 2012
[20] Rud, Market seller and planter, March 17, 2012

should be above all this, but men seem to interfere, men seem to act not in line with God, disturbing the balance between men and nature and hence the relationship of men with God. It seems that the changing climate in this context disturbs not only their actual life but also their personal relationship with God. This is an interesting notion, I would argue that the stronger one's belief is in God the harder it is to understand or even to support the notion that men in fact is interfering with nature causing human induced climate change. It could explain therefore how perceptions on climate change are embedded in this religious based argument. In this context might lay also an explanation to the fact that most indigenous people don't understand the complexity of the climate change process (Van Oosterum, 2012b) and perhaps that Hindustani's do acknowledge the notion of climate change but embed it in their prayer to a religious story line without particularly mentioning the human induced causes as is illustrated in the following newspaper fragment:

> 'Once a year Hindus celebrate Shivaratri, a night devoted to the God Shiva. Hindus believe in Brahma the creator, Vishnu the maintainer and Shiva the destroyer.
> The climate changes leading to floods, global warming and erosion of land are explained as the works of Shiva. Hindus in 'The Road to Sea' have to pray to mitigate these consequences. It is a communal prayer against climate change.'[21]

The religious storyline is one: the influence of climate change in daily life is the other. Concluding basically one can state that there are three main types of perceived causes of climate change that can be distinguished which are presented in Figure 2.2.

Figure 2.2. Typology of Climate Change Causes

Human induced: outside Surinam	⇛	Ozone layer, Polluting Industries, Deforestation
within Surinam		Wrong decision making, Out-dated maintenance
Religiously explained	⇛	Men is not in a good relationship with God
Ignorance		Change has become normal as it is a global phenomenon

More obvious the causes can be explained as human induced when it comes to the issue of water nuisance in Paramaribo North, the higher class residential area of Paramaribo, which is outlined in the next section.

2.4 Causes of Water Nuisance in coastal Paramaribo North

2.4.1 Physical conditions: Cause of water nuisance

The residential area Paramaribo North suffers since decennia structurally from water nuisance. This is due to several human and natural causes. Generally one can state that the current urgency of the problem is intensified by increased heavy rainfall and coastal erosion, which are both perceived as outcomes of climate change. In combination with out-dated capacity or tubes and canals that are adjusted to process normal amounts of water and cutting down of mangroves the result is increased pressure on the total drainage system. If the natural circumstances would not be so pressing the problem would most likely not have been recognized or formulated as urgent yet. The area is located at the low lying coastal area of which at the one side of the dam the water level is high and at the other side, the residential

[21] Gangapersad, 2010

area is low. The slowly rising sea level therefore poses a looming threat in combination with current abundant rainfall and human causes the outcome are various forms of water nuisance.

Prof Naipal explains the difficulty with different perceptions on sea level rise in relation to the different stakeholders and power relations and interests in the area that are at stake:

> 'It is hard to make your argument because people don't want to hear or are lobbying against it. I am busy measuring the sea level rise, which is also done by measuring the exact height of several locations in Paramaribo North. Once this is finished in about two months I can use any climate model or climate prediction used by the IPCC or from any other research for that matter and show how the outcome for Paramaribo North will be. But there are experts in this country who stick to the IPCC predictions with sea level rise from 34 to 56 cm in this century and they argue that the sea level rise will develop very continuously and slowly so they tell me there is nothing to worry about and that within this scenario mangroves will be able to stabilize independently.'
> 'The argument often is with IPCC; as it is agreed upon by so many thousands of scientists that the projections therefore must be accurate, and then I have to come up with data that supports that the outcome will be a bit different a bit less conservative probably but by then policymakers have already cut down the mangroves and come up with insufficient measures. However sea level rise is contributed by several factors they include thermal expansion and the melting of land ice from Greenland and Antarctica of which the West Antarctic ice sheet is one really difficult to project how it will develop but it has a potential of contributing enormously to the rise of global sea level. Not one single scientific model projects that sea levels are *declining* or not rising at all. Any scientific model will tell you that, there is however a broad variety in the exact outcome.'
> Right now in Paramaribo North, the only structure to protect the land from the water is half a meter high only; it is by far from sufficient. When the structure will fall a part the whole area will suffer greatly and we will have a huge problem affecting a lot of people.'[22]

Maretraite and *Tourtonne*[23] are suffering from water nuisance, but also *'Zustersproject'*. During heavy rainfall the project is left under water resulting in the residents being stuck in their houses. The residents feel misled by the parcel sellers (Times of Suriname 2012a). Some underlying causes of water nuisance are that the channels are not well maintained, and that the tubes are too small to drain the huge amounts of water. Other causes can be the high water level in the rivers such as the Sarammacariver which blocks the flow of the water according to Rawinderakoemar Mathoera, head Drainage of the Ministry of Public Works (OW) (Brave, 2010). Roopram Jankie, drainage expert from OW states that the drainage in the area is insufficient, while the parcel seller is responsible for adequate drainage. According to Jankie the whole area of Paramaribo North needs to be renovated. A proposed plan is to construct four channels supported by pumping engines to the Atlantic Ocean that needs to solve the water nuisance (Times of Suriname, 2012a).

The government also wants to develop an integrated approach to the national water problems. It is important to stress here that these problems are intensified by the recent heavy rainfall periods. Schools that suffer from great water nuisance might be replaced in the specific areas if the problems cannot be solved. The water is also source for viruses causing potential diseases amongst students in the schools (Cairo, 2011a)

[22] Prof. Naipal, Climate Change Researcher, Anton de Kom University, Paramaribo, May 9, 2012
[23] Districts in the city of Paramaribo (North)

According to Prof. Naipal from the Anton de Kom University huge investments are needed to keep Paramaribo North free from water nuisance, as a reaction to the OW plans to construct four channels and pumping engines in the area, Naipal:

> 'The residential area Paramaribo North is low lying; at the one side of the dam is the high water level at the other side the low lying swamp area. Once these pumps fail to work or once the channels aren't cleared problems will very quickly occur. It is well known that swamp areas are difficult to drain during the rainy season.'

Sub director Foen a Foe point out that parcel sellers have illegally connected dams along the roads for drainage in the newly build parcels and that a pumping engine no longer is working, this is yet another cause of water nuisance. According to Naipal great investments are needed taken into account that the sea level is rising, this calls also for a backup system once the newly build channels or pumps fail to serve (Times of Suriname, 2012a).

According to the Organization of American States (OAS) Surinam is one of the most vulnerable countries concerning sea level rise; eighty percent of inhabitants is living in the coastal area which is threatened by the rising level of the sea, causes of erosion, flooding and salt water intrusion, which is also part of water nuisance in Paramaribo North are already happening and can be ascribed to the sea level rise (Times of Suriname, 2011)

2.4.2 Cutting down mangroves: Cause of water nuisance

Other causes of water nuisance are the clearing of mangroves. Cutting down mangroves therefore should be stopped. Prof Naipal explains the multiple functions of mangrove trees, and is visibly agitated when asked about the irresponsible use of mangroves:

> Q; Why are mangroves cut down so often, because officially it is a protected species?
> 'This is for several reasons and people are unaware of the adverse effects and the multiple functions mangroves have for an ecosystem.
> Often they are cut down in order to build houses, the house owners want to have a clear ocean view for instance and the mangroves attract insects such as mosquitoes, sometimes mangroves are also used for their wood. In Guyana they have already cut down basically all their mangroves and they are building dikes all along the coast, but this is a huge investment.
>
> People forget or are not aware of the multiple benefits that mangroves have; they hold fresh water which is profitable for agricultural purposes, they reduce the risk of erosion hugely, they attract fish in the water and they can absorb CO2 ten times more than normal trees, which is a huge benefit as well. We should be warned by the 2004 Tsunami in which it became clear that mangrove areas along the coast protected the inland much more than other areas. It shows how important mangroves are for coastal protection.
>
> We should think not in a backward modern model, by building dikes not backed up by mangroves and thinking that is modern, we should embrace the multiple benefits of mangroves and restore them in their natural habitat it is a more efficient and less expensive and more sustainable solution in many ways to our coastal area.
>
> We are living in a world in which people all want to live on a large footprint, without taking into account the starting position of our grandchildren. We might think technology will come along with solutions to climate change but resources such as water will get scarce and their starting position will be worse in fact. It is really a pity he, so we will see what we can do.'

Mangrove trees are officially a protected species, taking into account these multiple benefits mangroves have one could understand that conservation and protection is a serious issue. Being unaware in this case causes a lot of misuse or loss in terms of the mangrove coastline. Table 2.1 shows the main reported causes for cutting down and beneficiaries for conserving mangroves.

Table 2.1 Causes for cutting and conserving of Mangroves in Paramaribo North

Causes for cutting down Mangroves	Benefits of Mangroves
Clear parcels for housing plots Ocean view preferred over mangrove view Wood use Absence of awareness Illegal clearing of mangroves	Reduced risk of erosion Absorption of fresh water Stimulation of marine biodiversity Absorption of avg. ten times more CO2 Medicinal use Function as wave-breakers

(Source: Open interviews)

Creating awareness is in this context also vital for the right use of mangroves. 'Modern thinking' is building only concrete dikes which is in fact not modern and not sustainable; the solution lies in the combination of natural and concrete. Another concern is that resources are scarce and running out; according to Naipal, modern thinking is not only belief in endless technological solutions but combining and embracing the natural solutions that are already available.

2.4.3 Increased rainfall and the drainage system: Causes for water nuisance

Another consequence of both human and natural factors is the combination of increased rainfall and, due to several reasons, the lack of a properly functioning drainage system. A respondent explains how more and more areas are suffering from this type of water nuisance:

> 'In the past times you knew certain places, certain roads that would flood but today this occurs more and more often with a bit of rain, you don't know anymore which places will flood. Because it rains a lot more the drainage system is not in a condition to deal with these amounts of water anymore.'[24]

The drainage system has an outdated capacity which often can't handle the current amounts of rainfall, there is another cause as well:

> 'When the water level of the river is high, water streams into the sewer system therefore the water from the streets cannot be drained. It used to work with pumps but when water is high this problem does occur and it is proven really difficult to prevent.'

Thus not only the drainage system has an insufficient capacity or a capacity based on normal precipitation patterns, the pumps are also not strong enough for such amounts of water, while increased amounts of water can also be ascribed to increased rainfall. Section 3.2 illustrates how a crucial pump is out-dated and that proper measures are planned to be taken by the government. These human causes increase livelihood risks as well, Blaikie (1994) includes

[24] Waldo, Taxi Driver, March 5, 2012

these physical conditions as well, next to natural causes. Disasters and risk reduction is also a matter of power relations and good or bad governance just as is explained by Blaikie.

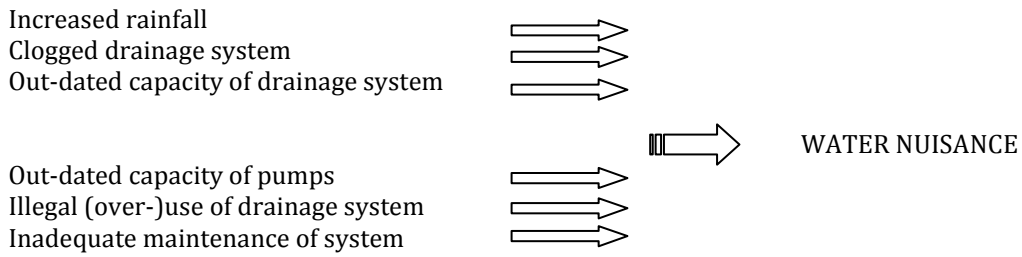
2.4.4 Governmental inaction: Cause for water nuisance

There is yet a more obvious cause for increased water nuisance, which is mentioned by a majority of all the respondents namely the clogging of the drainage system by plastics, with the start of the use of plastic bottles this problem has increased.
Besides these factors there is one more factor leading to water nuisance especially in the neighborhood of Maretraite, this has to do with parcels of land not righteously given out by the government:

> 'If you speak about building of houses, these projects are only based on short term thinking. Cutting down trees like Parwa and mangrove trees is unwise because they form a natural wall of protection. But these projects don't take that into account they try to gain money on short term. But I think they are trying to come up with binding rules in order to reduce these practices.
>
> In *Maretraite* much areas are suffering from water. My cousin lives there but the whole street is under water, she can't then even take the car out. She has now elevated her house. But people will buy houses in the North because of status. But they are unaware about the condition of the public area. We have a bit of a corrupt government; a lot of land is domain land but sold as land for construction.'[25]

A lot of public domains are unofficially given out by the government to be sold as parcels for construction, the owners of the housing projects don't take responsibility for the construction of a proper drainage system and often mangrove trees are cut down as a result leading to increased vulnerability to water hinder. Figure 2.3 illustrates the human and natural factors that causes water nuisance.

Figure 2.3 Human and Natural Causes of increased Water Nuisance



(Source: Open interviews)

It has become clear that different actors and different causes create water nuisance in the area. The parcel sellers are unaware or at least don't deal responsibly with the consequences and the residents are unpleasantly surprised. Mangroves are cut down to clear parcels for housing plots. The low lying location in a swamp area next to the high and rising water level of the Atlantic, a not sufficient supporting dam, lack of sufficient pumping engines, increased heavy rainfall and a lack of sufficient and clean channels in newly build parcels create the

[25] Eddie, National Army, April 17, 2012

continuous situation of water nuisance. It is the interplay of both human and nature's activity that causes this situation.

The vulnerable situation can be explained by Blaikie's (1994) Disaster Pressure and Release Model (PAR). Vulnerability of the area can be explained by the root causes which are: limited access to power and resources, government decisions (mangroves are not protected enough en parcels are still given out) or ethical standards in government and economic interests (short term profit of housing plots construction). While the physical conditions on the other side form the natural cause of vulnerability which is the actual location of the area: low lying, at the coast with a poorly constructed dam. In addition dynamic pressures as explained in the PAR model can in this context be explained as the rapid urbanization of the area. The 'unsafe condition' phase of the model is explained by Blaikie as the physical factors and human action or inaction, of which the latter is outlined in this chapter as causes for water nuisance thus leading to increased vulnerability. According to the model vulnerability can be released by decreasing or eliminating the root causes respond effectively to the natural causes which will be an issue outlined in chapter 4 on responses. Table 2.2 illustrates the main causes structured and analyzed though Blaikie's PAR model. The next chapter will outline the perceived consequences of climate change.

Table 2.2 Water Nuisance in Paramaribo North

Root causes	**Natural causes**	**Dynamic pressures**
> Limited access to power and resources > Governmental in action (concerning mangroves, parcels) > Economic conflicting interests (Short term profit of parcels)	> Low lying swamp area > Coastal area > Increased rainfall > Erosion > Sea level rise	> Rapid urbanization

(Source based on: Blaikie, 1994)

3. Perceptions on Climate Change Consequences

In this chapter the perceived consequences of climate change are outlined. The first section presents the general perceptions of which a main consequence is water nuisance. It becomes clear how different stakeholders involved are not taking responsibility for maintaining a proper drainage system for instance, in combination with increased rainfall and out-dated structures the logic outcome are various forms of water nuisance. The second section presents similar difficulties with water nuisance in relation to the Surinam River. It becomes clear that vulnerability increases not so much due to the climate changes but perhaps even more due to not properly applying of human, technological and organizational forms of capital.

3.1 Governmental and Institutional Perceptions on the Climate Change Consequences

Consequences of climate change phenomena such as increased rainfall are various and expected to increase as well. Most outside work is affected by the unpredictable weather. For instance the asphalting of roads which is described in a newspaper; asphalting in May was postponed because normally it is expected that it will be raining in that month as it is the rainy season, however it did not. Due to absence of rain in December and January rice farmers were forced to postpone their sowing period with the consequence that harvesting of rice was delayed which then had to be harvested during the rainy season, while rice has to be harvested during the dry period.

A consequence of sea lea level rise is salt water intrusion which is already happening; fewer rice fields can be sowed due to too salt water. According to Mr. Becker from the Meteorological Service in Surinam the sea level is already rising and this has consequences already for Surinam, eventually, he fears; 'it will destroy the coastline' (Evers, 2011).
Thus these consequences adversely affect Surinam's economy. These examples show that being vulnerable to the changes in one's daily life depends on the type of livelihood and location where one lives. Most often farmers and other people working outside exposed to climate changes are affected hardest.

Being vulnerable to risks is a matter of power relations as well. Most often people are unaware about the risks they face when buying new parcels of land.
Prof. Naipal brings in an interesting perspective that is that parcels of land are bought as a future investment, while the consequences are taken for granted, as he explains:

> 'The people who are living at the Anton Dragtenweg in Paramaribo North can see the salt water intruding their land. Often they only live there during the dry season. However my conclusion is that people see it as an investment. Currently they can buy parcels of land with a low price and they expect that in the future a dam will be built by the government once the problems literally will rise too high. They will have the political influence and as owners they can support the politicians by voting on them if they are willing to build a dike. And then the price will increase by tenfold for example.
> But who will pay the price for such an investment? It will be a huge project and if not planned properly it will be too late to realize.'

In this case owners don't take own responsibility for the consequence, in fact they calculate that it is a profitable investment to wait for the government to respond to the rising sea level. As these owners often have the money and political influence they can make the government prioritize certain topics, such as to build a dike in Paramaribo North. They can reduce their vulnerability by strategically using their political capital. One's vulnerability is not so much determined by physical output risk such as floods but a matter of how one's capital, in this case financial and political capital is strategically used (Moser, 1998).

The dependency of predictable weather and regular seasonal changes, Prof. Naipal explains that many companies are adjusted to these seasonal divisions, which makes sense. The economy is fully adjusted to the rain season. One thus could state that the economy drives on these seasonal fluctuations. For instance seasonally dependent rice producers are affected; if the rainfall is delayed the whole growing process is delayed. This is just one example, the damage could be considered quite extensive (Evers, 2011). The next section presents the consequences of climate change as perceived by mainly urban residents.

3.2 Urban Perceptions on the Climate Change Consequences

Impacts of the changing rainfall are various on daily live in Paramaribo.
People have to deal with higher vegetable prices as a consequence and increasingly difficult circumstances for crop growers as a result of the experienced change in rainfall. But there are more issues such as water nuisance along the coastline which is caused by a combination of both natural and human factors, this issue is also presented in section 2.4.
Farmers and general respondents are aware of these troublesome mechanisms. One respondent explains clearly:

> 'Nature has been disrupted really. What they are doing at our natural supposed to be coastline is that all these mangrove trees are cut down. People are building houses over there just where the coastline should be, this causes trouble. It disrupts the harmony with nature. People should learn to live in the south, there is so much space anywhere else, but people want to live upstate having an ocean-view. These mangroves grow there with a reason they protect the ground from falling a part and they absorb rainfall. But now they are gone, the rain will end up more easily in the river leading to the river to rise and to flood more often.
> Water levels of the river have risen indeed. All the water is already under the street in the ground. This makes the street less stable, as you can see the water side is crumbling down, the water eats the land both at the river side and at the coast.'[26]

Astrid another respondent who works in a restaurant just at the Waterside can see the river flooding from time to time she unquestionably states that:

> 'Everything in the weather has changed; the river floods often just hear in front of the restaurant, than the whole parking lot is drowned under water for a few hours.'[27]

The coastline is suffering from erosion and sea level rise. This is also due to wrong decision making and irresponsible actions; cutting down mangrove trees negatively impacts the coastline. The sea is reaching the land especially where mangroves have been cut down for housing plots. Often parcels of land are irresponsibly changed into housing plots with the consequence of land erosion. Other consequences are loss of fertile land by the sea and salt water intrusion of agricultural land, damaged infrastructure, loss of biodiversity and flooding (Anton de Kom University Surinam, 2010). The mechanism is clear and the continuing urbanization process in the North puts pressure on the area as is also explained from the PAR model.
Other consequences of increased rainfall are hinder in traffic and increased crop prices:

> 'A lot of places and people are affected. Normally when it rains this road between Albina and Paramaribo is very slippery and you cannot see the holes in the road and then it will

[26] Serebad, Market Seller and Planter, March 29, 2012
[27] Astrid, Restaurant employee, February 27, 2012

take you easily one and a half hour more to reach Paramaribo. And it is not only this road, in the city roads are under water in a lot of places. But also veggie prices have risen extensively today. Vegetables on the market are expensive; the fields are drowned under water, this makes harvesting not possible. I heard on the news that rice farmers in Nickerie are in big trouble, if the rain will not stop soon their rice fields will be lost.'[28]

Another perceived outcome of climate change is the onset of heavy storms impacting neighborhoods in Paramaribo:

'On the road to Wanica just outside Paramaribo in neighborhoods called A, B and C sometimes there are heavy winds taking roofs of houses, this is something not happening before.'[29]

But increased and irregular rainfall does also pose other difficulties in daily life as is explained by Wilfred, who is an ice-cream vendor in Paramaribo:

'The rainfall has become totally mixed up and it affects basically al outside work and life. In the past weeks friends were not able to work in construction because of the rain it is not possible to start building the foundation of the houses. Dumping of cement is not possible because of the rain you have to wait. But it also affects me as a scrape ice-cream seller. You know I do this work already for fifteen years now and the sun is my friend. If the sun shines people will go out and buy more scrape ice-cream; I will have more customers. But last days with all the rain I stayed home.'[30]

One can understand how these consequences are impacting one's livelihood in the end the consequences negatively impact the whole economy as well. Another contributor to several water related consequences is the Surinam River which flows right through the center of Paramaribo. The section explains in more detail the consequences in relation to the Surinam River.

3.3 Consequences of Water Nuisance: The Surinam River

The Surinam River contributes to several water related consequences in Paramaribo. Since the flood from 2006, both the government and the people have been warned by the real threat the river can pose. It is experienced by people living in the inland and since then the government has put this issue seriously on the agenda.

Both the Surinam and Commewijne River are steadily winning ground inland. Roads are being flooded away and both agricultural and residential land is affected. Erosion of the riverbanks is happening quickly. In front of Commewijne at the other riverbank of the Surinam River is the center of Paramaribo. The riverbank bordering the center of Paramaribo and its Waterside faces severe erosion. During every high tide more and more of the river bank erodes and get lost in the river water. For years the government didn't take action on this ongoing situation. One of the benches is not there anymore as the river had eroded the land severely (see photo). The riverbank has never been renovated since it was built in colonial times.

Figure 3.1 illustrates the causes and consequences of water nuisance from the Surinam River.

[28] Waldo, taxi driver, March 1, 2012
[29] Waldo, Taxi Driver, March 5, 2012
[30] Wilfred, Ice-Cream Vendor, February 25, 2012

Figure 3.1 Causes and consequences of water nuisance from the Surinam River

Not all respondents are aware of the looming threat the river poses although also without rain during high tide the river can easily flood hindering traffic and daily life. People are aware of this issue but not all respondents claim that the water level is slowly increasing. Many respondents refer to the fact that increased rainfall in the inland causes the river level to increase leading to more difficulties towards Paramaribo at the end of the river.

The *Tapajay* project is an example of which the outcomes could have huge consequences for the riverbanks at the Surinam River downstream, as the amounts of water transported through the river will increase enormously. It is an example in which hydro energy profits are prioritized over the consequences which it will bring for land and people downstream the river.

According to ATM 'The effects on the environment and the *Van Blommerstijn* reservoir are still being investigated, however it is expected that the effects will not be as strong on the lake as in the past.' ATM speaks about the nearby located communities and the perhaps threatened hunting area. However is apparently unaware of the potential consequences downstream near the urban area of Paramaribo. Independent consultants are involved within the research, the ministry of Natural Resources (NH) has assigned the consultants. All ministries are working together, and agreements have to be made among the participants in the government.[31]

However according to Prof. Naipal the *Tapajay* project is an example of the 'backward modern model thinking'; a human intervention increasing the effects of climate change without acknowledging the consequences by focusing on the positive outcomes which are; easy, quick and an increased hydro energy potential, as he explains about the project:

> 'They are planning to connect the *Tapanahony* River with channels to the *Brokopondo* lake, therefore it becomes possible to increase the capacity of hydro energy. This project is relatively easy to realize and in terms of hydro energy it would be highly profitable, the whole infrastructure is also already there. A consequence however is that the flow of the Surinam river downstream towards Paramaribo, will increase from 450 cubic meters of water per second to 650 to 700 cubic meters, this means that the stream will be much greater which will have huge effect on the river banks and on the river level as well. Another factor is the flow of the river itself. The river meanders causing the outer curve to deepen and increasing the river's flow while the inner curve can slowly win ground. This process can be stopped only if along the whole river dams are build in the curves to straighten the stream of the river, if it is not done all along the stream would only increase leading to bigger land erosion in the left over curves.'

His response on the question if the project takes into account the consequences downstream the Surinam River is as he laughs cynically:

[31] Drs. de Meza, Policy Officer ATM, May 18, 2012

'I don't think so; they probably will hire some good and expensive consultants that will show in a report that the negative consequences will be minimal.'[32]

Illustrative for the *Tapajay* project is the human intervention. The consequences of climate change are often a combination of natural and human causes which intensify the negative impacts on the land and people. The power relations are also tangible; it is a highly attractive and profitable opportunity and most likely the project will be realized, however the negative consequences will be intensified downstream the Surinam River just where the economic, agricultural and politically important residential districts of Commewijne and Paramaribo with its Waterside are located. ATM could not react on this adverse effect, in their response: 'the outcomes (positive and negative) of the project are still being investigated by a group of independently chosen consultants.'[33]

One can thus conclude that human induced consequences are mainly not yet taken into consideration and are a result of conflicting interests, worsening the already vulnerable regions due to the natural consequences. Consequences are various but mainly impact urban life due to land erosion, flooding and changing weather patterns leading to water nuisance posing difficulties on residential areas. Chapter 4 will outline the various response strategies that are identified as a response to the consequences.

[32] Prof. Naipal, Climate Change Researcher, Anton de Kom University, Paramaribo, May 9, 2012
[33] Drs. de Meza, Policy Officer ATM, May 18, 2012

4. Responses

This chapter on the responses to climate change firstly goes into detail about the various government responses. Projects focused on adaptation, conservation and mitigation, the Surinam government and its Kyoto Protocol obligations. Another important responsibility of the government is creating awareness on national climate change issues through awareness programs and the NIMOS awareness campaign. Secondly; general individual responses of urban citizens in Paramaribo are outlined as well as their perception on the responses taken by the government. The responses are analyzed and structured according to the three distinguished responses: coping, adaptation and alternative responses. One of the major lacking assets on macro level is financial and technological capital, however on micro level people prove to increase their responsive capability with few assets subsequently reducing their vulnerability.

4.1 Government Responses to Climate Change

This section presents the government responses to climate change; adaptation measures, the awareness campaigns and the importance of fundraising.

4.1.1 Climate Change Measures

Surinam's climate change policy is mainly focused on developing adequate adaptation measures. In the coastal area are the majority of the population, economic activities and infrastructure concentrated this makes that adaptation measures are prioritized.
Adaptation measures to climate change defined by the Ministry of Labor Technological Development and Environment (ATM) are:

- Rehabilitation of mangrove trees or planting of mangroves on mud banks so that they can break the waves and serve as a natural coastal protection zone in front of existing dikes
- Applying integrated coast management, including adjustment of existing legislation, protection of areas, installments of buffer zones and spatial planning among others
- The application of alternative agricultural methods and growing of less vulnerable crops

ATM stimulates clean technologies focusing on both adaptation and mitigation. According to ATM adaptation involves changes in lifestyle while prioritizing the environment. Measures can also be individually taken in order to reduce one's vulnerability.
Adaptation measures include: coastal protection to sea level rise, constructing houses higher above ground, focusing on the construction of new houses located in the south away from the coastal zone and on ground located higher above sea level.

Currently ATM is trying to get finance from the UNFCCC adaptation fund for a mangrove rehabilitation project. ATM has also developed a climate documentary to inform the Surinam society about the issue of climate change and to inform about the national and international climate change policy measures taken.
In terms of mitigation; changes are made in production processes such as the use of bio fuel made from sugarcane instead of fossil fuels which is used in agriculture, industry and transport. Mitigation serves to reduce the consequence of climate change, rather than to adapt to the consequences; it is a prevention strategy.

The first defined adaptation strategy by ATM is to protect and rehabilitate mangroves in the coastal zone. The Ministry of Spatial Planning, Resources and Forest Management (RGB) is developing a law which should legally protect mangroves from being cut down, according to RGB Minister Mr. Martosatiman:

> ‘A ban on deforesting mangroves is necessary in order to prevent the coastal zone from necessary and expensive measures that have otherwise to be taken in the future. Mangroves are a natural coastal protection zone. Constructing dikes like the one in Coronie cost about 60 million euro, with annual maintenance; it is an expensive and not long term solution. Mangroves can grow fast enough to protect the coast from the consequences of sea level rise as an outcome of climate change.’[34]

Minister Ginmardo Kromosoeto of ATM states clearly why adaptation measures are defined focusing on rehabilitation of mangroves:

> ‘The Ministry of ATM is focused especially on mangrove rehabilitation as one of the most important adaptation strategies; Adaptation is and will be a priority for the ministry of ATM within the climate change negotiations, taking into account the disastrous effects that climate change and in particular sea level rise can have on our economy and our people.’[35]

According to the ministry of ATM’s website already ‘there are locations in Surinam that can be possibly identified as locations that have been lost as a consequence of climate change’; therefore in these cases Surinam could be compensated in the ‘loss and damage’ mechanism (De Ware Tijd, 2011).

Protecting mangroves are in many ways a durable solution to the effects of sea level rise. Currently as a response to the construction of concrete dikes such as in Coronie, research is being done on the possibilities to replant mangroves at the coastal zone. Main purpose of this research is to come up with an alternative solution for building expensive dikes and as is formulated to:

> ‘Minimize the adverse consequences of sea level rise. As a consequence of climate change precipitation patterns are disturbed and floods occur as a result of sea level rise, affecting the mud banks upon which mangroves have to grow’[36]

These kind of adaptation measures are characterized as long term, planned and institutionalized measures. Chapter 1 outlines that responses can be defined as individual or on organized institutional level and that these responses can generally be divided in short term (coping) and long term adaptation strategies.

The first defined strategy by ATM to implement a natural protection zone is a long term adaptation solution. In terms of capital (assets); knowledge, finances, human, organizational and technological capital is needed to realize this type of adaptation. Obviously it is a durable solution which aims to sustain the inland and livelihoods (being farmers, urban residents and the economic and political centre) that are being dependent on the protected land.

According to Blaikie’s (1994) PAR model the root causes of vulnerability in the region can be explained as; the physical location while the underlying dynamic causes are the action or in action which is being taken and the different stakeholders that have access to resources. Obviously different interests are at stake, clearing mangroves is necessary for clearing new housing plots, while it increases the vulnerability of the region as a consequence.

The second type is characterized as an organizational adaptation strategy, that is integrate coastal management and to adjust the existing legislation. In this type of adaptation

[34] Van Oosterum, 2012c
[35] Cairo, 2011b
[36] Filemon, 2008: 12

it is important that agreement among the different stakeholders is realized as explained by Blaikie (1994) a solution is to eliminate the dynamic causes contributing to vulnerability.

Third to stimulate alternative growing methods and less vulnerable crops in agriculture is an obvious long term adaptation strategy which can be realized on macro level (the government) and on micro level (individual farmers). Table 4.1 gives an overview of the distinguished government response strategies. The main assets that are essential for that particular response strategy and vulnerabilities and impacts of the vulnerabilities (risks) to which is responded to are outlined. Furthermore the main benefits or disadvantages of the response strategy are outlined. Moser's Assets and Vulnerability Framework is used to analyze the different responses (1998).

Table 4.1 Assets and Vulnerability Framework: Governmental Asset Responsiveness

Response strategy	Type of response	Assets	Vulnerability	Impacts	Benefit/ Disadvantage
> Mangrove rehabilitation	>Governmental /Institutional Adaptation	> Human >Technological > Political > Financial	> Sea level rise	> Salt water intrusion of Ground- Drinking- Agricultural water > Erosion > Loss of urban and rural land	+ Natural coastal protection + Sustainable + Conservation of marine biodiversity + Conservation of mangroves + Absorption of fresh water & CO2 + Dynamic + Inexpensive
> Integrated Coast management	>Governmental Adaptation	> Political >Technological > Human > Financial	> Sea level rise	> Salt water intrusion of > Ground- > Drinking- > Agricultural water > Erosion > Loss of urban and rural land	>Combination of existing dikes with mangroves as buffer zone > Protected areas > Adjustment of existing legislation
> Alternative agricultural methods (e.g. growing of less vulnerable crops)	>Governmental/ Communal/ Individual Coping or Adaptation (depending on method)	>Political >Human >Material >Financial >Social	>Changing weather patterns	>Drought >Irregular rainfall >Intense rainfall >Increased heat	+Increase resilience >Expensive >Market flexible

4.1.2 The Directorate Environment

As a response to the increasingly urgent climate change consequences the country faces the ministry of Labor Technology and Environment (ATM) has as a result in 2011 assigned the Directorate Environment (DE). The DE is involved with policy making around national environment and climate change issues. Currently the DE is developing a draft law on

environment which should be legally binding. [37] Box 4.1 presents the main policies and perspectives of the director Ms. Uiterloo of the DE on climate change issues.

Box 4.1
Ministry of ATM:
***Directorate Environment* Installed**

"The negative effects of climate change become more and more visible and tangible; loss of biodiversity, land degradation, sea level rise, loss of traditional medicine and indigenous languages and more. In 2011 reducing the consequences of climate change was among the highest priorities of the Ministry of ATM as a result the Directorate Environment was installed.
The Department, coordinated by Henna Uiterloo makes plans, prepares laws and undertakes action in order to sustain the environment. Emission of carbon dioxides is cause of concern due to its contribution to global climate change and due to the fact that they are non renewable. Uiterloo;

"As ministry of ATM and director of the Directorate Environment I support the use of renewable energy for the whole country."

The World Trade Organization has identified Surinam as the most vulnerable country to sea level rise. Uiterloo states:

"Sea level rise is just one of the consequences to which we have to adapt to."

Adaptation measures taken can be met financially at first. Surinam is member of the Board of Directors of the Caribbean Community Climate Change Centre (C5), responsible for developing plans to reduce the adverse effects of climate change in the region.

"Currently Surinam is chairman of the CARICOM and therefore Surinam has to take the lead in developing proper measures; the natural environment crosses any national boundary, causes in one part of the world can lead to consequences all over the world."

Currently a draft version of an environmental law is being debated about in the National Parliament. One of the important institutions involved with this law is the National Environment Board; it is proposed that measures can be taken against offenders of this (concept) law.

- Source: *De Ware Tijd*, 13-01-2012

About these and other issues DE environmental policy officer Drs. de Meza and two other assisting colleagues outlined in an interview conducted for this research, the main policies and measures taken.

Drs. de Meza explains and emphasizes that before the DE was installed there was a Board responsible for environmental issues which does exist since 2002 as part of the overarching ministry of ATM, however it has thus been recently promoted to a Directorate. Current political developments have led to increased attention to environmental issues and increased awareness of the importance of protection and conservation of the national environment. According to Drs. de Meza installing a directorate in this perspective is a logic next step. Policy making and responsibilities with international organizations requires the department to operate on a higher level: from section to directorate level.

[37] Staff member, Directorate Environment ATM, May 18, 2012

The draft law on environment is currently developed among the different ministries. Likely the law will be ratified this current year (2012). Drs. de Meza emphasizes why it is so important to ratify this draft law:

> 'It is an important tool for the directorate because without a binding law, (climate change) agreements cannot be enforced, agreements so far are only based on goodwill, having a binding law we can operate as an authority.'[38]

For ATM endorsement of the law on environment is crucial also in the light of policy making on the national forest. With a law sanctions can be enforced and real agreements can be implemented. Without a law ATM has less legal power and stakeholders like the goldmine industry in the forest act only on the base of goodwill. Another task is informing gold miners about the polluting effect of using mercury in the process of gold mining and instead using alternative natural sources. Surinam is a net sink country; it absorbs more CO2 instead of emitting CO2, due to the large forested area in Surinam. Surinam is also involved in the REDD+ partnership.[39]

In an international context 'binding and legal judicial' agreements are essential and are the issue over which countries in the international arena cannot come to an agreement on the specific terms about, when it comes to a legal binding agreement or protocol on global climate change. Just as well on national level being an authority by being able to endorse a legal binding climate or environment law is therefore similarly important for a body like the DE; it enables them to operate as an authority, it is an important political tool and asset.

One of the climate change issues in Surinam is the steadily rising sea level due to the low lying coast. Currently the government is working on coastal protection by constructing dams in Coronie and Commewijne, ATM is also involved. In the next fragment Prof. Naipal explains in more detail why it is important to combine the construction of concrete dams with a natural coastal protection zone and how it functions:

> Q: I know you are doing research on natural coastal protection by planting mangrove trees. Could you explain me what you are currently doing and what the objective is?
> 'The area of Coronie is a fragile area. Currently they are building a concrete dike there, but if nothing else is done, the dike will need often maintenance which is expensive; the dike in this stage will be resilient for ten years. Due to the mud bank along the coast it is possible to plant mangroves on this mud bank. However they have to grow at first without being pushed back too much by the ocean. Therefore they have to grow quick in order to become resilient for the waves. What we are looking for is if it is possible to let mangroves grow quicker in order that it is possible to plant them in front of this twelve kilometer long dike. Then they will break most of the waves and the dike will be sustained for much longer. This could be done rather quickly, within two years.'[40]

A solution thus would be to combine a concrete dike with a natural coastal protection zone consisting out of mangroves, in the end it would be less expensive and longer lasting, therefore making it an effective adaptation strategy.

In regard to the water nuisance of the Surinam River and the Commewijne River, district board member Mr. Chirmotie has developed a concept plan to elevate the existing dike, however the district commission faces a lack of sufficient finances to properly deal with the water difficulties (Rostamkhan & Toefanie, 2012). The ministry of Public Works (OW) is

[38] Drs. de Meza, Policy Officer ATM, May 18, 2012
[39] Drs. De Meza, Policy Officer ATM, May 18, 2012
[40] Prof. Naipal, Climate Change Researcher, Anton de Kom University, Paramaribo, May 9, 2012

also taking steps to renovate the dike, the roads and sluice doors in Commewijne (Jagan, 2012). Commewijne is located on the other side of the Surinam River opposite of Paramaribo which faces increasing problems at the Waterside.

Currently the government is responding to these problems, but it has taken long before proper action is undertaken. Since February 2012 the government started with renovation plans of the Waterside. The Waterside is located in the center of Paramaribo in between Fort Zeelandia and the Central Market, it is a two year plan and a dike has to be built from Fort Zeelandia to the Central Market in order to preserve the monumental area from the rising sea level and make the area attractive for tourists. It is specifically formulated that one of the main reasons for these renovation plans for Paramaribo is to become resilient to the rising sea level. The current process on the dike being built at Commewijne as a result has been postponed in order to start working at the Waterside which has priority. The renovation plans will costs several tens of millions of Euros (Times of Suriname, 2012b).

Thus as the area suffers on different locations from water nuisance the government has to set priorities; obviously it is financially not possible to deal with the challenges all at once. Another adaptation strategy to deal with floods is the installation of early flood warning systems; Professor Siewnath Naipal from the Anton de Kom University is doing research on measuring water levels in Surinam. As a prevention method the Meteorological Service of the Anton de Kom University has installed some measurement instruments along some of the rivers that automatically monitor the water level in the river. The measurements are concentrated on flooding areas in the inland of Surinam. These data can be used for the Comprehensive Water Management Project and Early Flood Warning Systems. Stakeholders that could be interested according to Naipal are; the ministry of Agriculture, Cattle and Fisheries and the National Coordination Center for Disaster Management (Anton de Kom University, 2010)

A conclusion that can be drawn is that in order to increase the responsive capability of the government finances are needed. Surinam as assigned member of the Kyoto Protocol qualifies for the UNFCCC Adaptation Fund which grants funds to adaptation projects up to 10 million US dollars in total and a minimum of 4 million dollars. The current NAPCC is being funded by the Caribbean Community Climate Change Center (CCCCC) which is working with the European Union Global Climate Change Alliance.[41] In 2003 the government has done research on the vulnerability of the Surinam coastline with the focus on resilience and adaptation options. In line with this research ATM has developed a National Action Plan Climate Change (NAPCC). Together with the National Conservation Foundation (NCF) they have started a project in Coronie. Aim was to get funding from the UNFCCC Adaptation Fund, however this failed because the deadline was not met in time and the project was not supported and endorsed by the advisor of the president[42].

Getting finance from the UNFCCC Adaptation Fund can be explained by Moser's (1998) Assets and Vulnerability Framework as a strategic use of this political asset in order to realize a certain adaptation project resulting in increased adaptive capability (hence: reduced vulnerability). One can conclude that the focus on adaptation is prioritized on governmental level as the presented issues are mainly related to adaptation.

Another point of focus of ATM is raising awareness on climate change issues in order to stimulate understanding and cooperation on community level.
The awareness policy of ATM is focused on stimulating recycling, using waste products as source to generate energy and increasing awareness among society about the responsible use of the environment. The sub-directorate is responsible to inform about the next tasks:

[41] Drs. De Meza, Policy Officer ATM, May 18, 2012
[42] Staff, Directorate Environment ATM, May 18, 2012

To identify, plan and implement awareness programs stimulating environmental institutions and organizations, to supply information and promote information about the use of clean technologies and to inform and collectively produce societal activities to reduce environmental pollution. Daily information is supplied to students and teachers and staff by the directorate. Other activities are training sessions, information sessions, presentations and workshops, daily broadcasting of the environment advice through radio and newspapers, the use of the website of ATM and spreading of flyers as well as taking part in several fairs and shows. The underlying thought of creating awareness thus is to stimulate responsible behavior and ATM is using all kinds of media through which they aim to reach the public.

Another aim is to integrate education on climate change in schools. As explained by Drs. de Meza the aim to integrate climate change as a separate part within national education. Currently the issue of climate change is integrated in existing classes, but interest is rising among students. More and more theses are written about topics related to climate change. Box 4.2 presents fragments on a by ATM distributed flyer to raise awareness on climate change.

Box 4.2
ATM flyer about climate change (fragments)

The here portrayed information illustrates how awareness on climate change is raised; by informing the public about the complex problem of global climate change:

'Causes of climate change are both natural and human; human activities being the burning of fossil fuels and deforestation. In the last 150 years human activities have led to increased greenhouse gas emissions in the atmosphere resulting in fast dramatic global temperature rise'.
Amongst the consequences of climate change for low lying areas such as Surinam will be:
-Global average temperature rise, causing glaciers to melt
-Sea level rise causing floods resulting in loss of land and economic investments
-Changes in rainfall, wind patterns, clouds formation and ocean flows
-Extinction of animal and plant species
-Extensive dry periods causing harm to agriculture, energy and water supply

Government responses to climate change:
One of the major responses is the ratification of the climate treaty in 1992 in Rio de Janeiro. Aim is to stabilize the level of green house gasses in the atmosphere through which dangerous human intervention in the climate system can be prevented. This resulted in the Kyoto Protocol in 1997; the protocol was ratified in 2005. Surinam joined in 2006.'

According to ATM the Kyoto Protocol makes an important connection between environment and development, as is stated in the flyer:

> 'If all countries follow the protocol global greenhouse gas emissions can reduce by at least 5 percent, which would reduce the increase in greenhouse gasses in the atmosphere or stabilize the greenhouse gasses in the atmosphere. The transformation to a climate friendly world economy will become more easy as a result.'

This conclusion is incorrect. Only a number of countries worldwide are participating in the Kyoto Protocol, therefore greenhouse gas emissions cannot reduce by at least 5 percent globally, they hypothetically can reduce by a maximum of 5 percent among the participating countries who are committed to the 5 percent reduction agreement. Due to the fact that big greenhouse gas emitting countries are not committed to the Kyoto Protocol greenhouse gasses will and have only increased in the 2008-2012 period which covers the Kyoto commitment period. Stabilization of greenhouse gas levels in the atmosphere therefore is not an outcome within Kyoto Protocol.

- Source: Ministry of ATM, Information Flyer, '*Klimaatverandering en Kyoto Protocol*'

4.1.3 The NIMOS Awareness Campaign

The National Institute for Environment and Development in Surinam (NIMOS) is part of ATM and is an institute focused on creating awareness on climate change issues in the Surinam society[43]. Research by Rachel Pinas has been done on the effectiveness of this campaign started in 2006. One of the main results is that the campaign was not effective. One of the main findings is that the definition of 'climate change' has proven to be confusing for journalists. Journalists tend to confuse the concept with the effects and consequences thereof, the public as a result is also not correctly informed. NIMOS also didn't use opinion leaders within journalism and the different media should assign editors specialized on climate changes topics (Evers, 2010b). However the topic of climate change received increased attention as an increased number of students visited NIMOS and over 25 percent of students supervised by NIMOS had chosen their main topic for their thesis on climate change.

After the 2006 flood the media started paying attention on the effects of climate change. In 1999 there was barely any written news about climate change in the media. Today journalists have changed their attitude. A majority of journalists find that the media in Surinam doesn't pay enough attention to climate change. Becoming aware about climate change is a slowly process, another reason is that the media has a commercial and political focus. Background information about climate change is often left out, this count especially for radio and television (Ibid). Main conclusion is that the issue of climate change is not indebt reported in the media. Mr. Ganesh a journalist of the *Dagblad Suriname* explains that 'journalists are not climate experts their function is to only write news items'.[44] There are currently however 'climate journalists' in Surinam one of them is Radjoe Toefanie of the *Times of Suriname*. Many respondents note that they get information about climate change related topics through internet and television documentaries.

Main conclusion is that the mainstream media (this does not include ATM, which is a governmental body) does pay attention to climate change related issues but with another focus and starting point; the media functions to present news items on daily issues, real background information is merely left out as it is not the journalists function to report on technological or scientific background information on climate change. Journalists or television makers are not scientists; their main aim is to make popular news items which generate a lot of media consumers.

4.2 Individual Responses

4.2.1 Responding by planning adaptive measures and preservation

The majority of farmers, market sellers and general respondents are perceiving climate change as a serious challenge, the changes are perceived as structural and ongoing, therefore making the impacts also becoming increasingly serious on the long term. Respondents often state that it is hard to really stop a natural process, therefore it becomes increasingly important to start planning to face the challenges.

On the one hand it is acknowledged as a human induced climate change, however on the other hand it takes too much effort to really try to reverse the natural ongoing process. This statement from a respondent is illustrative as similar statements are made by many respondents:

> 'It is said that every year the sea level rises by 1 mm, in the end at some day if we will not take measures it is really possible that we would flood from the water. Therefore it is important to plan ahead and to already start to take measures. Because we cannot change

[43] Ms. Jankipersad, Department Awareness, NIMOS, April 4, 2012

[44] Ganesh, Journalist, February 29, 2012

the weather, we cannot influence the weather really, therefore planning to deal with the changes is the one thing we have to do.'[45]

It is assumed that 'we cannot influence the weather' but we can prepare to adapt which therefore is a logical outcome to do.
However on what level do 'we' need to adapt. Responding could be the government's responsibility; are there enough finances and are the actions taken effective. Hendrik who is a water taxi owner for many years on the Surinam River argues:

'People have to make a better irrigation system and they can use nets or greenhouses as you do also in the Netherlands. The consequences of these climate changes are also occurring beyond the border of Surinam, it is occurring around the whole world, therefore we cannot do something about it on our own.'[46]

Due to the fact that Surinam has a high percentage of its land covered with forest most respondents argue that Surinam contributes to a minor extent to climate change.
As a respondent explains:

'Surinam has a fairly great forest covered ground, we compensate our own climate with the forest. The forest I don't know how but produces fresh air. We therefore should be compensated by foreign countries for conserving our forest.'

These two issues: to prioritize adaptation measures over reduction measures and to preserve the forest in order to be compensated by the international community are also in fact prioritized by the government as has become clear in the former section on government responses.

4.2.2 People's perceptions on the responses taken by the government
Both farmers and general respondents are often also aware of the renovation plans of the Waterside, a renovation and adaptation project to solve the urgent erosion problems of the river banks:

'What they are currently planning to do is, from what I read, that they completely want to elevate the street here and that they want to push back the river and make it into land again. The whole riverside they want to renovate and make it more stable. As long as the measures are taken, which are there to be taken we would not get into trouble.'[47]

This is what a respondent has to say about water prone areas such as the 'Road to Sea' and Paramaribo North in relation to responses taken by the government:

'The government has to set priorities, if in more places the sea water disturbs the land one should think about which is most important.
For Surinam this is really a challenge, I don't know how to really properly meet this challenge though. The government takes steps too slowly, everything you see here are activities by private initiatives. The ministry of Public Affairs has to jump in and do something about this situation in 'Road to Sea'. But people think it can be dealt with later instead of today, while every hour, every minute of waiting is already too long.'

[45] Winston, Political party, April 18, 2012
[46] Hendrik, Water Taxi, February 28, 2012
[47] Serebad, Market Seller and Planter, March 29, 2012

'In the case of Paramaribo North, currently the construction activities are slowly pulling backwards; they are trying to build on higher ground. Cutting down mangroves for construction is an unwise thing to do, this tree protects the coast from eroding and keeps the ground fertile and protects the ground from dehydration. But these trees are also being replanted in order to recover the damage done. So people are aware of the use of this tree.'[48]

Replanting mangroves elsewhere is an option, but takes a lot of time.
Prof Naipal also has a strong opinion on the district 'Road to Sea' and the effectiveness of building dikes as an ultimate solution, according to Naipal building of concrete dams is much more costly and unsustainable at the same time:

'We should think if we really want to build dikes everywhere and if that is a feasible solution. The costs will be huge, while government spending will only have to shift to building dikes. In Guyana 25 percent of the national budget is spent on building dikes; that is a huge cost. In the area of the 'Road to Sea' they also want to build a dike. But approaching it in a different way could also be an outcome- replacing the people for instance.
If I warn for the projections of sea level rise people don't want to listen. The people from the housing projects are telling me that it is not happening and people can safely live along the coast, while in fact they are literally selling a piece of swamp land.'[49]

Both farmers and general respondents are aware of the fact that the Waterside is vulnerable and that there is a possibility in the distant future for the whole of Paramaribo to drown as a consequence of sea level rise if no proper steps are taken. Therefore the respondents value the renovation plans of the Waterside.

'At the Waterside they are trying to attract more tourists and also to improve the riverbanks at the waterside. Because currently it is in a bad condition, have you seen it? There is a bench almost dropping over into the river; that far the river has eroded the riverbank. This is not a healthy situation, within ten years the whole center of Paramaribo will be drowned under water if nothing is done. They are also building a dike along the river, but currently the government has put it on hold, because they have given it more priority to work on the Waterside. They were building a dam in North but money has to be spent here first. I know that they are also planning to build a bridge over the Corantijn. But I think it is more important to build a dike first.'[50]

But some respondents indicate to be skeptical about the responsiveness of the government plans as well:

'No, they are doing nothing about it, they only just start writing about these plans in the newspapers, but as far as I know they aren't doing anything about it. But from what I've heard from the experts is that in some 30 years time if no proper action is taken everything here, the whole city would be drowned under water by some 1 or 2 meters.'[51]

[48] Wilfred, Ice-Cream Vendor, February 25, 2012
[49] Prof. Naipal, Climate Change Researcher, Anton de Kom University, Paramaribo, May 9, 2012
[50] Wilfred, Ice-Cream Vendor, February 25, 2012
[51] Serebad, Market Seller and Planter, March 29, 2012

Moreover respondents are aware of the government's plans at the Waterside and the Surinam River, ultimately the government will act, but some respondents are hesitant in the sense that the government generally waits until the situation becomes urgent, while planning ahead and act ahead would be a better approach.
Responses to water nuisance are outlined in the next section.

4.2.3 Responding by building houses free from water nuisance
One of the individual responses is to build houses on higher ground away from the water threat:

> 'Already people in the inland will start to live a little bit higher up the mountain. I live further away and don't foresee trouble from where I live.'[52]

Another respondent claims to be leaving when the sea level would rise too high:

> 'In my case I would definitely leave because I have family in the inland I would go back and leave this place. I have that place to go and to fall back to. But if things change you have to adapt.'[53]

Here is another example of a respondent claiming that it is already wiser to live in the south of Paramaribo instead of along the coast:

> 'The government should not want to stimulate that people would want to live in the North, I don't understand, it makes much more sense to start living in the south, there is ample space, however all the facilities are here in the crowded center of the city. The government should spread this out so that less people would be attracted to the city and people could reasonably live down south. The more you go south away from the coast, the higher the ground is anyway so it is a safer place to stay as well'[54]

Elevating houses and streets is an adaptation strategy in order to reduce water nuisance. Elevating streets is effective and happening but a time consuming task and costly:

> 'We used to have water nuisance as well here, but recently we don't have that anymore. They have completely renovated this street; the whole street at the same time is elevated and they have placed bigger tubes resulting in an increased capacity to process all the rainfall.'[55]

Parcel sellers also advertise of housing projects with elevated houses which shows that it is a growing issue among house owners and it is used in advertising to attract potential buyers. Table 4.2 is a sequel to table 4.1 and gives an overview of the identified government and individual responses as presented in this chapter (not including table 4.1). Main assets that are essential for the response strategy concerned and vulnerabilities and impacts of the vulnerabilities (risks) to which is responded to are outlined. Furthermore the main benefits or disadvantages of the response strategy are outlined. Moser's Assets and Vulnerability Framework is used to analyze the different responses (1998).

[52] Waldo, Taxi Driver, March 5, 2012
[53] Wilfred, Ice-Cream Vendor, February 25, 2012
[54] Eddie, National Army, March 14, 2012
[55] Clarence, Taxi Driver, March 27, 2012

Table 4.2 Assets and Vulnerability Framework: Governmental and Individual Asset Responsiveness

Response strategy	Type of response	Assets	Vulnerability	Impacts	Benefit/ Disadvantage
> National Climate law	>Governmental Coping/ Prevention strategy	> Political > Human	> Various	> Human induced	> Mitigation of adverse impacts
> Dike	>Governmental Adaptation	> Financial > Material >Technological > Political > Human	> Sea level rise	> Salt water intrusion of > Ground- > Drinking- > Agricultural water > Erosion > Loss of urban and rural land	+ Coastal protection - Unsustainable on long term - Loss of Marine biodiversity - Loss of mangroves - Loss of land - High maintenance - Expensive - Un dynamic
> Early Flood Warning System	>Governmental /Communal Coping strategy	>Technological > Financial > Material > Human	> Sea Level rise	> River flooding	+ Decrease adverse impact - Expensive >(Un)Reliability
> Awareness/ Educational Programs	>Governmental Coping strategy	> Human > Political	> Various	> Human induced	>Increase communal responsiveness and awareness
> Elevate homes and streets, Storm resilient homes	>Governmental Adaptation (in some cases: Individual Adaptation)	>Technological > Human > Political > Material > Financial	> Changing weather patterns > Sea level rise	> Floods > Squalls > Intensified rainfall	+Spatial planning +Climate resilient > Relocation > Cost effective
> Relocate/ Move to Housing on ground higher above sea level (outside the coastal area)	> Individual/ Communal alternative response	> Social > Material > Political	> Sea level rise > Changing weather patterns	> Floods > Loss of land > Increase in disease > Shift in livelihood & economic infrastructure	+ Reduced risk +Opportunities - Increased social pressure

5. Farmers and Market Seller's perceptions on Climate Change

This chapter presents climate change causes, impacts and consequences as perceived by farmers and market sellers, as well as their responses. As these farmers are dependent on the natural climate for crop growing they are increasingly vulnerable to the changes and challenged to sustain in their livelihood. Following Moser's Assets and Vulnerability Framework, the level of one's vulnerability can be defined by the means through which available assets are strategically used; vulnerability therefore can merely be defined through one's responses rather than through the presented perceived climate changes and consequences. In this chapter the different types of assets are identified and analyzed in how they are applied as a response strategy to climate induced risks imposed onto farmer's and market seller's their livelihood. Main assets which will be identified to analyze responsive capacity are the five categories of assets which have been presented in section 1.5: namely human, financial, social, political and material capital.

The first section analyses the main assets and how they are used in their livelihood. The second section presents the climate changes affecting farmer's and market sellers. Which are vulnerabilities to climate change and the third section presents the consequences and responses. In this section the responsiveness of farmers and market sellers is presented in an overall table in which the presented responses are outlined together with the main assets that are needed to effectively respond the climate change vulnerabilities.

5.1 Farmers and Market seller's Assets in a Changing Climate

Pomtaier is an important export product in Surinam and many farmers are growing pomtaier for their livelihood. Now that climate changes are experienced these farmers are becoming under pressure as a result they have to be inventive in order to sustain in their traditional way of livelihood. Growing pomtaier is time consuming and in several stages during its in normal conditions nine month grow period it is dependent on stable and regular rainfall. As this situation is changing Sabajo, chairman of a pomtaier cooperation explains the hardships he and the other farmers of the cooperation has to face.

Explained from Moser's (1998) Asset Vulnerability Framework the farmers who grow *pomtaier* use different sets of assets; in terms of social capital they are organized in a cooperation which makes them (1) more resilient to change, (2) they can share knowledge, (3) land and (4) technology and as cooperating in a group (5) they can more easily sell their product. In order to become less influenced by the changing growing process as a consequence of changing rainfall they are shifting in their strategy by growing less but improving the end product before it is exported. Thus as is explained by Sabajo, it is their way of life to grow pomtaier but under changing circumstances they are shifting towards a different production model in which a lower production is incorporated. At the same time this livelihood shift can be analyzed as a strategy to cope with the changing climate while at the same time not turning away from their traditional livelihood. It is defined as livelihood diversification which increases one's resilience. Moser explains that one's vulnerability is determined by one's assets and how they are used, this story outlines how is responded to the changing climate and which assets are applied to be able to sustain in their livelihood of growing *pomtaier.* Box 5.1 tells the story of Sabajo the chairman of the *pomtaier* cooperation.

Box 5.1

The increasing challenge of the growing process of Pomtaier

Sabajo is chairman of the pomtaier Farmer Cooperation. He explains the growing process of pomtaier and how he deals with the changing demand and changing climate and hardships he increasingly has to face in his traditional way of living: growing of pomtaier, a well known export product, but a product which seems to be disturbed in its existence by the changing climate.

'We grow traditionally pomtaier for export. Today we ship 80 bags. We are in a cooperation of about twelve people. We strive to use as less as possible of chemicals because many chemicals used in Surinam are not qualified for export use. Therefore we use different parts of land in order to not exhaust the soil and keep the soil fertile. We burn down a little area in the dry season to prepare the land for growing pomtaier after a growing season we move on to another plot and leave the land so it could restore. So we work in a cycle, after a few years we come back to the old land. We are very much dependent on the export for pomtaier. The demand currently is less and our client wants to have a certain amount of pomtaier over time.'

'For instance this month they want eighty bags and next month another amount, but we have a bigger capacity to grow. Therefore we make sure we grow pomtaier over the four month dry period so we could harvest every month to comply with the demand. Actually we are currently busy in finding new sponsors and new clients. Our aim is to process the product further, right now pomtaier is harvested and exported for further processing. But if we could include the processing as well we have more work, and we could make more profit as the end product becomes more valuable. Instead of increasing production, which becomes now more difficult we enhance the product. It is our only product of export, it is our way of living to grow pomtaier. I grow pomtaier for over fifteen years now.'

Q: How does it grow really?

'We have to prepare the land, this is done in the dry season by clearing some forest land. We don't use chemicals therefore we shift from the land, so we don't exhaust the soil. Pomtaier is planted during the four month dry season from September until December. It is important that we have a dry period afterwards it has to grow for at least nine months before it is ready to be harvested. In early days however we had a lot more harvest. Eighty bags is not much, we would ship five times more. Production is becoming difficult and demand is low.'

'You must understand that we grow pomtaier according to the season, it is important that we have a dry period in which pomtaier in its initial state can grow. But unexpected rainfall periods makes growing of pomtaier a daunting challenge. Sometimes after a short dry period it starts to rain intensively damaging the growing process of the newly planted pomtaier. As a result depending on the unexpected time of rainfall the pomtaier will be disturbed in its growing process resulting in a slower growing process. Often today it takes fourteen months to grow pomtaier in these conditions. Pomtaier will also become bigger and more yellow of color, the weight will be less as well, all in all the quality of the product is less.'

'Unexpected rain makes it also difficult to clear the land as we normally burn it, but the forest has to be dry. Now we have to work fast and take any opportunity there is. The majority of harvest of pomtaier takes now more than nine months and therefore is delayed. This delayed amount is increasing, it is becoming more and more difficult to traditionally grow pomtaier. As a result we lose in our investment, it takes longer before we can export, but the price stays the same so per amount of time we make less profit. There is another disturbing factor that is a beetle which is active during January causing a lot of damage every year to the pomtaier crop. This beetle plague is very persistent and really hard to control. The beetle is resistant to a lot of pesticides and we are currently trying to develop a cure for this plague.'

'It is sometimes really discouraging for the farmers to see their hard work lost by the beetle or damaged by heavy rainfall. Farmers are more and more disappointed they feel saddened and pain in their hart. It is our way of life, traditionally we grow pomtaier but in the future it might become really difficult. The aim of our cooperation is to sustain in growing pomtaier and also to become responsible for the further processing of the product. Thus instead of increasing production we could enhance our way of living by improving the product.'

- Source: Sabajo, Chairman *pomtaier* cooperation and planter, April 24, 2012

5.2 Changes in the Climate affecting Assets

One of the direct affecting influences is the perceived changing rainfall pattern. As farmers are dependent on predictable and regular rainfall pattern a change thereof causes a major insecurity and challenge in the livelihoods of farmers. Many farmers indicate that the rainfall pattern is changing and that this poses in fact a huge challenge to effectively adapt to the changes. Ro is a market seller of the evening market for over twenty years and is very aware of the changing circumstances in the climate:

> 'We are experiencing a change in rainfall and it will only destabilize more towards the future, it is a problem and we need to deal with that now by becoming less dependent on natural rainfall for the growing of our crops.'[56]

As current weather patterns are perceived to continue to destabilize even more, adaptation strategies are prioritized. Another respondent similarly state:

> 'Everything is changing and it will continue to do so, I don't know how, but once something has changed it will be changed forever.'[57]

But there are exceptions:

> 'I don't think that the weather really is different, not so much has changed really. We are now in the rainy season. But prices can go up when there is a lot of rain. Like now.'

A major impact of changing rainfall is that the market directly responds by increased crop prices. An explanation could be not wanting to show being vulnerable to the changes. Another farmer, Mohan explains how he has experienced the weather to change as he shares his opinion on how to adapt:

> 'The weather has changed, everything has changed. It is like, before we had the dry and rainy season while today we don't know anymore; the rain will always come back. However before we start adapting to the new situation we first have to analyze it for a few years. It has changed since not too long, like 5 to 6 years ago. It should be from April 15 onwards the big rain period but in fact it stays more often dry recently, so perhaps there is a shift going on, we should analyze this process for a few years so that we really can say it has changed to a new situation.'[58]

This is indeed true; is the weather changing into a new stable condition, so that adaptation is possible or is the weather continuously changing? In terms of adapting which concerns a long term strategy it is necessary to understand the long term changes.
Sabajo, explicitly states:

> 'Everywhere the weather is changing, growing of pomtaier will get more difficult. I think within ten years conditions will be totally different again.'

[56] Ro, Market Seller, Evening Market, April 2, 2012
[57] Rud, Market Seller and Planter, March 17, 2012
[58] Mohan, Market Seller and Planter, Agriculture Cooperation Market, April 29, 2012

All these reported changes impose pressure on farmer's livelihoods. The next section presents how farmers and market sellers are responding to these impacts and which assets are applied in order to reduce their vulnerability to the imposed climate change pressures.

5.3 Consequences & Responses

5.3.1 Responding to the consequences by being concerned about climate changes

Most of the farmers and market sellers are calm in the sense that they always have to deal with challenges, it is yet another issue among many which has to be dealt with, therefore not making it a huge issue at once. In other words, vulnerability is not determined by external outputs such as climate change but in the way how is dealt with the challenges. As is indicated farmers are already creative and resilient in the sense that they have dealt with many changes already.

But farmers and market sellers also seem worried when asked how they feel about the changes, to show or admit that you are worried, shows in some way one's vulnerability; therefore it is not a comforting statement to make, as a respondent state:

> 'I am not worried; it is not an immediate threat, the weather is slowly changing but I might be worried for my children or grandchildren, I am not sure in what climate they will live years from now.'[59]

To what extend respondents are worried also depends on how they are affected. Market sellers who do not grow their own crops seem less concerned. As the same respondent continues:

> 'You see, we as market sellers are flexible we only buy and sell crops depending on supply and demand: if the price goes up due to increase in oil price or rainfall, we similarly increase our price as well so we still have a twenty percent profit in contrary to crop producers who have to invest on the long term and during the whole process are dependent on the weather conditions until they can harvest. They have to invest in labor, in machinery, in seeds, pesticides, but in the end if the weather conditions are bad the harvest could be reduced by 75 percent of the total field capacity. This could mean that prices go up by four times and this does occur from year to year that harvests fail and farmers simply see their investment lost to a large extend. We as market sellers don't have to invest like that, we simply adjust to the variable prices as they can change daily.'

In what way one is vulnerable in his livelihood is certainly determined by the means upon one is dependent for sustaining in his livelihood. Being a market seller for that matter and not being a planter one simply is exposed to less risks and a more stable income as investments in land, seeds, fertilizer are not made over a one year period, which for planters is an annual obligation.

This is how a planter formulates his concern; planters seem to be affected most directly by the changes in their daily life, therefore making it a current cause for concern:

> 'Yes, of course; I am a planter; the changes in climate are cause for concern. I mean I grow crops and things get difficult for me and I also worry for the other planters in the inland, they don't know yet anymore what to do. For them it has become difficult as well. It would be necessary to work with machinery, but this costs money and therefore is not yet happening.'[60]

[59] Ro, Market Seller, Evening Market, April 2, 2012

[60] Rud, Market Seller and Planter, March 17, 2012

These examples show how the lack of physical and financial capital increases one's vulnerability and it is important to have financial capital as well to be able to invest responsibly. As explained by Ellis (2003) this shows the relation between the available assets and the level of vulnerability. It can be stated that planters are more vulnerable in their livelihood in comparison to market sellers. However more important it is to focus on what planter have rather than what assets are lacking and how they are able to respond with these assets.
However sometimes it is not possible to use livelihood diversification as a responsive strategy. Livelihood diversification is a strategy by which one secures his livelihood by diversifying in his livelihood therefore reducing the risks and being increasingly flexible to the changes, it is an alternative response strategy, but assets such as human (the knowledge) and social capital are essential when shifting to another form of livelihood, which is not always perceived as a feasible option;

> 'At my age, to do something else is not a possibility anymore. I just couldn't, I have to manage with the options I have and have to deal as much as possible in the changing circumstances. I drive from my hometown to the city on Monday, Tuesday and Wednesday I drive back and have a stop in between to sell my products in the field and on Thursday again I am here in the city the whole day. Once a week I as well work in the field.'[61]

Due to irregular rainfall harvesting and growing of crops becomes more difficult. Therefore farmers have to be inventive in order to minimize the adverse effects of the change.
A respondent from the East Market explains how he deals with the increased crop prices, this can be seen as a coping strategy:

> 'You see, now that the prices are up I simply make four bundles instead of two out of the same amount of veggies and I sell them for a slightly higher price.'[62]

Instead of increasing his price he deals with it by simply decrease the size of the bundle a bit. It shows the inventive solution to cope with this challenge. It can be referred to as a coping strategy as it serves a short term solution.

Crop producers are more vulnerable in their livelihood than market sellers, as they are more exposed to the natural weather conditions for their daily income. It is more difficult to cope with the changes and they state that they have seen it changing over time. Planter and market seller of WNZ market Shailesh shows not fully grown sweet peppers and explains the situation:

> 'They are still green and too little, but you see, I have to sell them now otherwise they would not make it at all, there is too much water for them to grow fully now.'[63]

Sometimes it is a choice between reduced and little harvest or no harvest of a certain crop at all, which is better than nothing obviously. As another respondent stated who doesn't grow his own crops:

> 'Farmers have really difficulties growing their crops, we should build greenhouses just as they do in your country, but our government is too hesitant and it takes too much money to realize that on large scale, so farmers will continue to face the challenges.'[64]

[61] Serebad, Market Seller and Planter, March 29, 2012
[62] Rashan, Market Seller, East Market, February 22, 2012
[63] Shailesh, Market Seller and Planter, Agriculture Cooperation Market, May 6, 2012

Another crop producer states that it is difficult to grow crops with so much rain, in order to deal with too much and too little rain they have installed a pump through which they can pump the water out of the field during abundant rainfall and during less rainfall they can pump it from the channels into the field if needed.[65] Human capital is applied in terms of knowledge to be able to install a pump and financial capital to buy a pump. It can be identified as an example of an adaptation strategy as it is a long term solution. One can also respond by growing more water or drought resistant crops, which is outlined next.

5.3.2 Responding by adaptation strategies in crop production

Planters are more vulnerable to change, as they are independent they have to take individual risks and manage their own challenges which they are facing in a changing climate:

> 'I am aware of global warming, and I should be because I am a planter and I have to deal with these issues. The dry and rainy season don't exist anymore, it has changed into an unstable situation already for twenty years now and even the temperatures have gone up, it has become a lot warmer.
> It has become difficult for me, let me give you an example; in early days we used to know when the dry season would start, we used to know when the rain would come and stop. So we would know when to plant seeds and when to harvest. Today this is not the case, you have to really pay attention and try to do everything you can to possibly in all kind of ways to adapt to the changing circumstances. Producing crops has become increasingly difficult, prices have risen in fact. But in order to keep my prices low I try to increase the number of crops I produce otherwise I couldn't sell my crops as easy, thus it has become a challenge to produce more in the same amount of time. But it is also necessary to really pay attention to the weather, once there is an opportunity I should start planting seeds. As the weather has become less stable producing crops has become an increasingly big challenge. For instance what I try to do as well is grow more types of different crops. Therefore I have more chance to produce more crops.'[66]

Crop diversification is a coping strategy which spreads the risk over more crops therefore becoming more resilient to the changes. It is an inventive solution. The government has defined one of its strategies as to develop water and drought resistant crops which would be an adaptation strategy as the same amount of crops can be grown during changing circumstances by developing crops that are equally resilient to the change.
However as the former respondent stated, farmers don't feel supported by the government. All modern irrigation techniques are hardly applied in Surinam and mainly the opinion is that they are on their own or organized in a cooperation:

> 'The government is doing very little in fact. Farmers as us are on their own, we don't get subsidies like in your country. The ministry of Agriculture Livestock and Fishery (LVV) is discussing a lot about high standards in agriculture and so on, but they don't prioritize small farmers. It might be so that they are involved in methods applied for export; for the big industries. But overall money is lacking to realize these necessities. The government occasionally compensates the rice price, but for us small farmers that is not the case and has never been so.'[67]

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[64] Ro, Market Seller, Evening Market, April 2, 2012
[65] Ms. Soelash, WNZ Market Seller, April 15, 2012
[66] Rud, Market Seller and Planter, March 17, 2012
[67] Mohan, Market Seller and Planter, Agriculture Cooperation Market, April 29, 2012

Another market seller explains that these are methods not applied on large scale, 'crop improving methods are being investigated but on very small scale, that is what they do at LVV but it is not in the process at all yet to apply these methods as mainstream in the country'. He underlines that this would be necessary though. But this will take a lot of time and as long as it is not really prioritized in Surinam things will not go ahead, 'that is how the government operates', he concludes.[68]
Another farmer explains how he is selective in which crops he grows:

> 'Let me give an example, for instance if it will rain too much, for one week long, my crops will be under water, and the harvest will be lost, than my price increases.
> The point is; it is a challenge to get rid of the abundant water. Most farmers will know the field after they have grown crops on it once, so farmers will grow crops more often on higher ground so that water is more easy to drain. Another option is to grow crops that can resist both too much and too little rain and the increased temperature as well. I grow a lot of this fruit *Markoesa*[69] it doesn't really suffer from the rain. I also grow a variety in crops.'[70]

Choosing to grow only water resistant crops is a strategy to increase one's resilience and reduce the risk of harvest failure. Anjou explains as well she has chosen not to grow green vegetables any more as they need a lot of water and cannot sustain for a long time, it is hard to grow them so a better choice is to buy some of these vegetables and grow only more resilient crops.[71] Growing a variety of crops, rather than one type of crop is an example of crop diversification which is for several reasons preferable; it reduces as mentioned the risk of a total harvest failure and the soil will not get exhausted as it is used to grow different types of crops.
Most farmers are selling their crops on the Agricultural Cooperation Market. In an informal discussion with the son of the director of the cooperation it became clear that this cooperation looks after the farmers interests. Main aim of selling crops in a cooperation is that they have an increased change selling their crops for a fair price. The cooperation is especially aimed on small farmers and they are together responsible for the market hall; large scale producers are not welcome on the market. It also became clear that the cooperation is not responsible or does not promote in how crops are grown, but is to serve the interests of the farmers to guarantee a place where crops can be sold in a secured and equally fair place.

These examples show how changing weather conditions are influencing the daily lives of these planters, however these changes affect all other planters in a similar way as well. It also shows the inventive mind of these individuals how to justly adapt to the changes in order to face the challenges and be able to sustain in their livelihood. It becomes clear how one uses his own incentive solution to diversify their livelihood resources and reduce one's vulnerability as is also explained by Moser's (1998) Assets and Vulnerability Framework. Table 5.1 outlines the response strategies as presented in this chapter analyzed by Moser's Assets and Vulnerability Framework.

[68] Ro, Market Seller, Evening Market, April 2, 2012
[69] *Markoesa* is a typical Surinam type of fruit
[70] Mohan, Market Seller and Planter, Agriculture Cooperation Market, April 22, 2012
[71] Anjou, Planter and Market seller, WNZ-1 Market, May 13, 2012

Table 5.1 Assets and Vulnerability Framework: Farmer's and Market seller's Asset Responsiveness

Response strategy	Type of response	Assets	Vulnerability	Impacts	Benefit/ Disadvantage
> Spreading of sowing period	> Coping strategy	> Human: Knowledge > Social: Farmers cooperation	> Changing weather pattern	> Loss of harvest	- Increased workload + Reduced risk of harvest failure + Sustainable land use
> Crop improvement	> Adaptation strategy	> Human: knowledge > Social: Farmers cooperation	Ibid.	Ibid.	+ Quality priority due to reduced quantity
> Livelihood diversification	> Alternative strategy	> Human: knowledge	> Various (depending on livelihood)	> Various	+ Reduce risk by spreading income + Dynamic - Not always possible
> Same price; smaller bundle	> Coping strategy	> Inventive knowledge	> Changing weather pattern	> Reduced harvest	+ Indirect price compensation
> Pump irrigation	>Adaptation strategy	>Technological knowledge > Financial	> Changing weather patterns: > Drought > Irregular rainfall > Increased temperature	> Loss of harvest > Loss of fertile land > Loss of water resources > Loss of Income	+ Decreased climate dependency + Increase in crop production + Sustainable land use - Expensive
> Crop diversification	> Coping strategy	> Financial > Material (field capacity) > Knowledge	Ibid.	Ibid.	+ Spreading of risks + Sustainable land use + Dynamic - Workload
> Higher located field	> Coping strategy	> Financial: field > Knowledge	> Increased rainfall	> Loss of harvest and field	+ Reduced impact of rainfall
>Water/Drought resistant crops	> Adaptation strategy	> Human > Financial >Technological > Social	> Changing weather patterns: > Drought > Irregular rainfall > Increased temperature	> Loss of harvest > Loss of fertile land > Loss of water resources > Loss of income	+ Increased resilience

Conclusion

The aim of this research has been to identify how the changes, causes and consequences of climate change in Paramaribo are perceived and experienced and how is responded to these perceptions.

Four questions have been formulated: to identify the perceptions of climate changes, the perceived causes thereof, the perceived and experienced climate induced consequences and the responses to these changes and consequences. The focus has been on urban citizens in Paramaribo, governmental institutions and small farmers and market sellers.

The focus on perceptions is essential and relevant for at least two important reasons. Climate change is a complex and hard to grasp process, it has not been the aim of this study to prove scientific evidence based facts that climate changes are happening; on global scale the politics on climate change have been introduced as very complex time consuming and overall conflicting geopolitical interests that are underlying causes for the controversial and hindering climate change debate. Another reason is the agency oriented approach; this study is an anthropological qualitative research in which the focus has been on individuals. One's agency and one's capacity to strategically use and apply one's available assets determines one's vulnerability or resilience to the changes and as they perceive and experience changes they are assumed to act on them as such. Perceptions of climate change not the actual threats or changes are driving individuals to respond. In this way perceptions and responses become an integrated part of the social dynamic of climate change.

Responses have been analyzed as response strategies through which one is able to increase one's responsive or adaptive capacity or increase one's resilience to the imposed risks subsequently reducing one's vulnerability. Main concepts thus are responsiveness, vulnerability and climate changes, causes and consequences. Thereby has been made use of the analytical asset and vulnerability framework of Caroline Moser in which mainly five distinctive assets are analyzed. Responsiveness has been formulated partly following the definition of Davies (in terms of coping and adaptation). Which are in this research distinguished by coping, adaptation and alternative response strategies.

On country level Surinam has been identified as top ten vulnerable country to the effects of sea level rise, due to its low lying coastal area in which eighty percent of the population is concentrated. Main global outcomes of climate change which are identified as climate change phenomena are the global rising temperature and glacial retreat leading to sea level rise and changing weather patterns leading to extensive periods of drought and intensive irregular precipitation patterns as well as increased occurrence of storms. Climate change on global level has been identified as the outcome of human induced greenhouse gas emissions into the atmosphere which lead to the increased greenhouse effect resulting in global warming of the atmosphere leading to the climate to change. Climate change is outlined as a complex process, on global scale responsiveness takes on slowly due to conflicting interests hindering an effective approach to deal with the adverse effects of climate change. A global binding legal climate treaty is still not in reach, however an adaptation fund has been developed to which developing countries including Surinam can apply to.

Government perceptions on the changing climate in Surinam are defined as the threat to sea level rise in the coastal urban area which increasingly puts pressure on governmental policies and changing weather patterns, defined as irregular and less but intensified rainfall and unpredictable drought period. The season have not been changed, the character thereof has. Perceived increased risk of flooding since the major disastrous flood of 2006 and storms are also putting pressure on urban Paramaribo and food security in terms of agriculture. The government is increasingly aware of the challenges they face as a result thereof.

From an individual perspective the changes are perceived mainly as changes in weather patterns and increased temperatures and sea level rise. It is perceived as if the seasons are shifting. Causes have been identified as (1) polluting industries mainly outside Surinam in countries such as China, (2) human intervention in nature disturbing the stable climate (sometimes referred to as leading to glacier melt), (3) religious cause; men has lost the relationship with God, it is God deciding that the changes have to occur. Therefore one can conclude that the underlying causes of climate change are not explicitly known. Respondents are to a limited extent aware of the complex process that leads to climate change.

The main perceived consequences from a governmental perspective have been identified as increased risk of flooding, difficulties with crop growing as a consequence of changing weather patterns and salt water intrusion due to coastal erosion, riverbank erosion and increased periods of drought and a changing character of the seasons leading to reduction in total days of rainfall impacting agricultural livelihoods and outside work indirectly having consequences for the national economy. Moreover human induced consequences are water nuisance in Paramaribo North mainly as a result of outdated pumps, not well maintained channels and clearing of mangroves due to unrighteous given out domain land for construction parcels in combination with increased rainfall and coastal erosion as a consequence of climate change the problems have been intensified. Along the riverbanks consequences of erosion and loss of land are also experienced and stated from the government as a result of the rising sea level and changes in climate.

Consequences of climate change as perceived by individual respondents have been mainly the risk of floods, storms that pose risks to housing, erosion of land posing risk to land, coast and riverbanks and water nuisance as a consequence. Farmers perceive consequences of changing weather patterns as threatening to crop growing; erosion of land, salt water intrusion, droughts and irregular rainfall have consequences for agriculture. Increased crop prices and unstable harvest as well as land loss and damage to fertile land are the consequences.

From a government perspective several response strategies have been identified: namely the development of alternative agricultural methods (such as growing less vulnerable crops) identified as a coping strategy for farmers and to increase food security as a response to changing weather patterns; integrated coast management (as an adaptation strategy to sea level rise) which involves a combination of concrete dikes and a restoration or conservation of a natural mangrove coast serving as a buffer zone in front of the dike as well as assigning of protected coast areas and adjustment in existing legislation; Awareness programs to raise awareness on climate change issues. Other response strategies that have been identified are the implementation of early flood warning systems in flood prone areas in the Surinam River, the construction of dams along the Coronie and Commewijne river and the recent renovation works at the Waterside which are identified as coping and adaptation responses to sea level rise and river bank erosion. On political level Surinam is developing a national law on environment, is applying for the UNFCCC adaptation fund and is developing a national action plan on climate change. One of the major assets for Surinam on this level is their national forest.

Responses on individual (and governmental) level have been analyzed through an analytical framework (assets and vulnerability framework), in which main assets have been identified which have been applied as to respond to perceived and experienced climate change outcomes (in the framework defined as vulnerability) and their main impacts. The benefits and disadvantages of these identified response strategies are outlined as well.

Response strategies on individual level mainly are identified as to elevate homes or to build homes on higher ground above sea level which are identified as adaptation strategies and relocation to the south which is identified as an alternative response strategy. Farmer

response strategies have been identified as to spread the sowing period, crop improvement, livelihood diversification, crop price adjustment, installments of pumps for irrigation, crop diversification, higher ground crop growing and growing of water-, drought- and temperature resistant crops. These responses have merely been identified as responses to changing weather patterns which is perceived as the main climate change outcome impacting agriculture.

The focus on perceptions has been important in this research, major outcome from theory is that social qualitative data mainly is missing. Climate change is in academic literature and disaster risk analysis studies in majority presented from a technological (static) and nature scientific approach such as leading reports of the Intergovernmental Panel on Climate Change, while the outcomes of climate change; the changes, causes and consequences are indispensably being imposed on the social and dynamic world in which different cultures, different people live and make up their livelihood and frame their own perceived version of the world in which they live in. It is therefore importance to study climate change impacts and risks from a social perspective thereby focusing on local impacts and local responses. Perceptions of the world and people's environment differ depending on place, culture and social-religious and economic background among others as has also been presented in literature of Marino and Schweitzer (2009) and Nuttal (2009). Implementing instead of overlooking local knowledge or local/indigenous response strategies therefore is a bottom-up and actor oriented approach which could majorly contribute to climate change impact and response studies as well.

Moser's Asset Vulnerability Framework in itself is extensive by implementing five assets; it is useful as an analytical framework but is not designed for specific climate change vulnerabilities. In terms of coping and adaption studies these concepts are context specific obviously, the weakness of restricting to these concepts is that not all responses can be included and sometimes responses could be a combination of strategies and furthermore these concepts are often used using different definitions making them interchangeable. A third response has been identified in this research in contrary to Davies' coping and adaption strategy focus, thereby proposing that these are not the only type or responses which would be restrictive in the analysis in this research. People could not have a choice to migrate or to relocate or to shift to another type of livelihood, which as alternative responses are not to be underestimated and are equally important to include as well.

The outcomes of the consequences and these responses in Surinam are similarly from the adverse consequences as has been presented in literature on cases such as the climate sensitive regions of the Sahel and *Ocucaje.* However a difficulty with implementing effective response strategies in Surinam has shown as mainly the lack of financial, political and human capital. The right knowledge is merely missing, technology to install or improve farmer's resilience moreover is not available, politically the government has different priorities and research data on actual impacts of climate change mainly is not complete. Towards the future the urgency to implement effective and overarching response strategies will be essential for the well being of Surinam's future development. Choosing sustainable and cost effective solutions is essential just as developing planning frameworks in which adaptive measures are incorporated and the main risks are incorporated to effectively deal and adjust to the changes to come.

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Annexes

List of Respondents

Kharmi – Lives in Surinam and the Netherlands, February 4, 2012

Sulasdi - Ft New Amsterdam, February 6, 2012

Alberga - Director Open Air Museum Ft New Amsterdam, February 6, 2012

Miriam – Zus & Zo reception staff, February 11, 2012

Karien – Alberga reception, February 16, 2012

Ramon – Construction, February, 17, 2012

Sjors – former National Army, February 20, 2012

Unkown – Vaco Security Guard, February 22, 2012

Rashan – Market seller East Market, February 22, 2012

Galicia – Market woman, February 22, 2012

Wilfred – Scrape Ice-cream vendor, February 25, 2012

Astrid – Riverside restaurant, February 27, 2012

Hendrik – Water taxi, February, 28, 2012

Ganesh – Journalist and head of department Dagblad Suriname, February 29, 2012,

Waldo – Taxi driver Albina-Paramaribo route, March 5, 2012

Richard – Streetpainter, March 7, 2012

Eddie – National Army officer, March 14, 2012

Martha – Market woman East Market, March 14, 2012

Rud - Market Seller and Planter, March 17, 2012

Sunil - Market seller and planter, March 22, 2012

Hanjoman - Taxi driver, March 27, 2012

Clarence - Taxi driver, March 27, 2012

Serebad - Market Seller and Planter, March 29, 2012

Ro - Market Seller, Evening Market, April 2, 2012

Anand - Market Seller and Planter, April 5, 2012

Ms. Jankersipersad - Department Awareness NIMOS, April 4,

Mr. Bhoelai – WNZ (Agriculture Cooperation Market) Market seller, April 11, 2012

Ms. Soelash -WNZ (Agriculture Cooperation Market) Market Seller, April 15, 2012

Ms. Jankersipersad - Department Awareness NIMO,S April 16, 2012

Eddie - National Army, April 17, 2012

Winston – Political party, April 18, 2012

Imro - Afternoon market, April 18, 2012

Imro - Afternoon market, April 20, 2012

Mohan - Market Seller and Planter, Agriculture Cooperation Market, April 22, 2012

Sabajo - Chairman Pomtaier Cooperation and Planter, April 24-25, 2012

Mohan - Market Seller and Planter, Agriculture Cooperation Market, April 29, 2012

Shailesh - Market Seller and Planter, Agriculture Cooperation Market, April 29, 2012

Shailesh - Market Seller and Planter, Agriculture Cooperation Market, May 6, 2012

Mr. Prof. Dr. Naipal - Climate Change Researcher, Anton de Kom University, Paramaribo, May 9, 2012

Ms. Drs. de Meza, Policy officer Directorate Environment, ATM, May 18, 2012

Staff member, Directorate Environment ATM, May 18, 2012

Ms. Anjou – Planter and market seller WNZ 1, May 13, 2012

Winston – Fisherman, May 23, 2012

Mr. Ashok – Landsbosbeheer (Awareness program, Ministry of RGB), May 23, 2012

TOPICLIST: GOVERNMENT BASED ORGANIZATION

Date:
Name Organization:
Name Contact person:

Introduction

Objectives/Background organization

-
- …

Policy within organisation

-
-
- …

Main working area of Organization

-
-
- …

Current projects, Main problems encountered, Interventions, Adaptation strategies,

-
-
- …

Causes of detected problems, change in working method,

-
-
- …

Raised questions

-
-
- …

INWONERSINTERVIEW:VOORZIENINGEN IN LEVENSONDERHOUD

Persoonsgegevens zullen vertrouwelijk behandeld worden aldus volledig geanonimiseerd

Naam onderzoeker: Casper de Vries, MSc, Universiteit Utrecht, Nederland

Dit interview richt zich op het arsenaal aan voorzieningen zowel materiaal als sociaal waarmee u als bewoner in de stad zich in het dagelijks leven voorziet in het levensonderhoud. Onderwerpen die aan bod komen zijn:
werk, inkomen, bezit, sociale relaties, educatie en kennis en tot slot risico's en veiligheid.

1. Werk

1.1 Wat zijn uw hoofdwerkzaamheden?
1.2 Verricht u hiernaast nog nevenactiviteiten?
1.3 Kunt u terugvallen op andere werkzaamheden?
1.4 Hebt u familieleden die in het buitenland werkzaam zijn?
1.5 Hebt u overige inkomsten via familie in het buitenland?
1.6 Hebt u familie die werkt in de landbouw, veeteelt of tuinbouw?
1.7 Wat kunnen redenen zijn om in de stad, het binnenland of buitenland te wonen?
1.8 Bestaat de mogelijkheid tot het verrichten van andere werkzaamheden?
1.9 Als gevolg van verandering in het door u genoemde klimaat, zoals regenval ed. kunt u verder aangeven hoe deze veranderingen invloed hebben op uw werkzaamheden?
1.10 Speelt het klimaat een rol bij uw keuze om te wonen op een bepaalde locatie?
1.11 Vindt u het belangrijk om zelfvoorzienend te zijn in voorziening van transport, voedsel en drinkwater bijvoorbeeld? (waarom?)
1.12 Ondervindt u op een of ander manier hinder van het veranderend klimaat in uw werkzaamheden en inkomen?

2. Sparen en Financiering

2.1 Vindt u het belangrijk om te kunnen sparen?
2.2 Met welke doeleinden heeft u spaargeld?
2.3 Waarvoor worden leningen afgesloten?
2.4 Hebt u de mogelijkheid om een lening af te sluiten?
2.5 Op wat voor manier kunt u een financiering of lening krijgen?
2.6 Waarvoor zou u overwegen een financiering af te sluiten?
2.7 Hebt u leningen in het verleden afgesloten?
2.8 Op wat voor manier heeft u hier profijt van?
2.9 Wat is de meerwaarde van een microkrediet ten opzichte van een reguliere lening/financiering
2.10 Hebt u landbouwgrond voor het verbouwen van eigen gewassen?
2.11 Hoe gaat u om met de momenteel dure groente prijzen?
2.12 Heeft verandering in het klimaat uw prioriteit om te sparen veranderd?
2.13 Hoe ervaart u de te hoge groente prijzen?
2.14 Heeft het klimaat op enigerlei invloed op de financiering die u heeft, zij het bijvoorbeeld dat uw bezit uw huis of auto onderhevig is aan invloed van weersverandering?

3. Sociaal

3.1 Hebt u veel contacten in de stad?
3.2 Op welke momenten kunt u terugvallen op familieleden?
3.3 Bent u actief in een belangenorganisatie?
3.4 In wat voor opzichten kunt u een beroep doen op de overheid?
3.5 Welke voorzieningen verschaft de overheid?
3.6 Kent u mensen bij de overheid die u diensten kunnen verlenen?
3.7 In wat voor opzichten kunt u terugvallen op anderen dan uw familie om u diensten te kunnen verlenen?
3.8 Wat is voor u de meerwaarde voor het onderhouden van sociale relaties?
3.9 Hoe ondersteunt u familieleden of andere sociale contacten?
3.10 Heeft verandering in het klimaat zoals u noemt op enigerlei invloed in de band die u onderhoudt met uw familie en vrienden, dient u bijvoorbeeld vaker beroep te doen op hen?
3.11 Sinds wanneer kunt u aangeven dat u hier indirect rekening mee houdt?

4. Opleiding

4.1 In wat voor opzichten vindt u het volgen van onderwijs belangrijk?
4.2 Wat is uw hoogst genoten opleiding?
4.3 Indien u kinderen heeft, wat is hun beroep?
4.4 Hebt u op een andere manier dan in het onderwijs dingen geleerd waar u in het dagelijks leven profijt van heeft?
4.5 Hoe is het onderwijs in Suriname geregeld, betaald u schoolgeld?
4.6 Wat kunnen redenen zijn waardoor scholen gesloten zijn?
4.7 Op wat voor manier speelt verandering in het klimaat hier een rol in?
4.8 Speelt het enigerlei een rol bij de keuze of locatie van uw opleiding voor u of uw kinderen?
4.9 Sinds wanneer kunt u aangeven dat dit voor u een rol speelt?

5. Materieel

5.1 Wat zijn voor u belangrijke bezittingen?
5.2 Wat voor hulpmiddelen gebruikt u bij uw dagelijkse werkzaamheden?
5.3 Van welke transportmiddelen maakt u gebruik?
5.4 Hoe heeft het klimaat invloed op enigerlei wijze op uw bezit en keuzegebruik van transport?
5.5 Is deze invloed en keuze veranderd in de afgelopen tijd?

6. Veiligheid/Risico's

6.1 Welke risico of impact ervaart u voor bovengenoemde assets als direct dan wel indirect te linken gevolg van veranderingen in het klimaat?
Per onderdeel 1 t/m 6 kan deze vraag behandeld worden.
6.2 Op wat voor manieren treft u veiligheidsmaatregelen rondom uw huis?
6.3 Op wat voor manier houdt u rekening met onveilige situaties buitenshuis?
6.4 Wanneer voelt u zich minder veilig buitenshuis?
6.5 Wat voor risico's of onveilige situaties kunt u aangeven die uw dagelijks leven beïnvloeden? (Verkeer, Natuur, Geweld, Vervuiling/Ziekte)
6.6 Heeft u wel eens te maken met ziekte?
6.7 Hoe houdt u rekening met uw gezondheid?
6.8 Wat zijn factoren die uw fysieke gezondheid kunnen beïnvloeden?
6.9 Is uw gevoel van veiligheid toegenomen of afgenomen?

6.10 Welke factoren dragen bij aan een gevoel van onveiligheid?
6.11 Hoe gaat u hiermee om?
6.12 Welke natuurlijke factoren beïnvloeden uw dagelijks leven?
6.13 Zijn deze factoren toegenomen of afgenomen?
6.14 Bent u in staat om te verhuizen als dat nodig mocht zijn?

7. De Woonwijk: Wateroverlast en Verkaveling

7.1 Kunt u aangeven hoe u omgaat met wateroverlast?
7.2 Speelt wateroverlast een belangrijke rol in uw woonomgeving?
7.3 Sinds wanneer woont u hier?
7.4 Met welke reden bent u hier destijds gaan wonen?
7.5 Gelden deze reden nog vandaag?
7.6 Wie is verantwoordelijk voor het verhelpen van wateroverlast in de wijk?
7.7 Bij wie kunt u hiervoor terecht?
7.8 Naast de ervaren wateroverlast wat is uw grootste punt van zorg omtrent deze?
7.9 Hoe hebben de huizen- en grondprijzen zich ontwikkelt?
7.10 Hoe kijkt u aan tegen het bouwen van nieuwe woningen op nieuwe kavels waarbij in Noord oa. mangrove bomen gekapt moeten worden?
7.11 Wat vindt u van de verkavelingprojecten waarbij het voor meer mensen mogelijk wordt een huis te financieren?

INWONERS ENQUETE: HET KLIMAAT

Persoonsgegevens zullen vertrouwelijk behandeld worden aldus volledig geanonimiseerd

(Delen van) deze vragenlijst mag/mogen niet vrijelijk overgenomen worden!

Onderzoeker: Casper de Vries, Master Student aan de Universiteit Utrecht in Nederland Contact: casper_de_vries@hotmail.com (auteur enquête)
In het kader van voltooiing van de studie: Latijns Amerika en Caribische Studies

Instructie: volgt u de aanwijzingen zoals aangegeven:
Door uw keuze(s) te markeren met een '!' of 'V' en desgewenst toe te lichten of voluit te schrijven (u kunt altijd meer ruimte gebruiken dan aangegeven binnen de kaders).
U heeft altijd ook de mogelijkheid uw antwoord geheel blanco te laten, indien u dit wenst.

Bij voorbaat hartelijk dank voor uw deelname, bij verdere vragen kunt u contact opnemen.

Algemeen

Datum:

Naam	Leeftijdcategorie	Beroep/Studie	Man/Vrouw	Woonwijk

1. Prioriteitenschaal

Verdeeld u de negen gegeven prioriteiten over plaats 1 t/m 9, waarbij de 1e plaats uw hoogste prioriteit heeft. Heeft u bijvoorbeeld 'Familie&Vrienden' op de tweede plaats gekozen, dan vult u een 2 in onder het betreffende kopje. U mag iedere positie maar een keer toekennen. U mag uw keuze toelichten.

A. Werk/ Carrière	B. Behoud eco-systeem e.g. Nat. Park/Bos	C. Stabiele droge en regen tijd	D. Anders (welke prioriteit is niet genoemd)	E. Familie & Vrienden	F. Huis en eigen perceel	G. Cultuur e.g. Unesco Erfgoed	H. Autobezit	I. Gezondheid

1.2 Toelichting bij punt 1 t/m 9:

1.3 Zorgpunten indicatie

Geeft u met een cijfer van 1 tot 5 per onderdeel aan in welke mate u bezorgd bent:

1: erg bezorgd, 2 beetje bezorgd, 3 bezorgd noch onbezorgd, 4 beetje onbezorgd 5 erg onbezorgd. Geeft u ook bij voorkeur aan welke drie onderwerpen u in volgorde meest bezorgd. U mag uw keuze toelichten.

A. Lucht vervuiling	B. Water vervuiling	C. Straat afval	D. Zeespiegel stijging	E. Verandering in regenval	F. Klimaat verandering

1.3 Toelichting bij uw indicatie:

2. Regenval

Vult u onderstaand schema in door uw keuze(s) te omcirkelen of erachter aan te vinken

Regenval	
2.1 Hoe is de regenval in vergelijking met 10 jaar terug?	A. Hetzelfde (licht evt. toe): B. Veranderd (licht evt. toe):
2.2 Hoe is de verdeling van de kleine en grote droge en regentijd in vergelijking met 10 jaar terug?	A. Hetzelfde (licht toe): B. Veranderd (licht toe):

2.3 Heeft de regenval invloed op (meerdere antwoorden zijn mogelijk):	A. Geen invloed B. Huizenbouw C. Groenteprijzen D. Overig:
2.4 Is de regenval tegenwoordig:	A. Hetzelfde B. Meer C. Minder
2.5 Wat voorziet u voor de regenval in de toekomst?	A. Stabiliseert naar oude situatie B. Escaleert verder C. Het zal niet verder veranderen D. Dat is niet te zeggen
2.6 In welke mate bent u bezorgd over deze verandering in regenval?	A. Erg bezorgd B. Bezorgd C Bezorgd noch onbezorgd D Onbezorgd E Erg onbezorgd
2.5 Kunt u aangeven wat u denkt dat de oorzaak kan zijn *en* sinds wanneer deze veranderingen gaande zijn?	

3. De Suriname rivier

3.1 De waterstand van de Suriname rivier ten opzichte van 10 jaar geleden is:	A. Hetzelfde B. Hoger C. Lager
3.2 Bent u op de hoogte van de renovatieplannen van de waterkant?	A. Ja B. Nee
3.3 Wat denkt u dat de hoofdreden van renovatie is?	A. Herstelonderhoud van de waterkering B. Verfraaiing i.v.m. Unesco werelderfgoed C. Verhoging van de waterkant
3.4 Stelling (markeert u met een 'V' of '!' achter uw keuze): *'De Suriname rivier vormt (A) een dreiging / (B) geen dreiging voor overstroming'*	
3.5 De staat van de rivier oever is:	A. Goed onderhouden B. Heeft onderhoud nodig
3.6 De rivier oever heeft een:	A. Natuurlijke waterkering B. Bestaat uit een stenen waterkering C. Beiden
3.7 Bent u op de hoogte van de bouw van een dijk langs de Suriname rivier?	A. Ja B. Nee
3.8 Bent u op de hoogte van de bouw van	A. Ja

een brug over de Corantijnrivier?	B. Nee
3.9 Wat vindt u belangrijker?	A. De bouw van een dijk B. De bouw van een brug
3.11 Waarom is de waterstand van de rivier hoger?	A. Regenval B. Anders (licht toe):
4. Wateroverlast in de woonwijk	
4.1 Wat is de reden van wateroverlast in Paramaribo Noord?	A. Er is geen wateroverlast in Noord B. Waterafvoer C. De nabijheid van de zee D. Anders:
4.1 Wat vindt u van de locatie voor nieuwe aanbouw van huizenbouw in PMB noord?	A. Zinvol B. Onverstandig C. Geen mening D. Anders:
4.2 Stelling: *'Het is goed dat o.a. mangrovebomen langs de kust gekapt worden op dure onbebouwde grond met als doel verkaveling voor huizenaanbouw, want er zijn nieuwe woningen nodig.'*	A. Ja (licht toe): B. Nee (licht toe):
4.2 Stelling: *'Men zegt dat Paramaribo Noord in een tijdbestek van 20 jaar onder water kan lopen, maar dit berust op onwaarheid'*	A. Eens (licht toe): B. Oneens (licht toe):
4.3 Wat kunnen oorzaken zijn voor het eerste deel tot de komma van bovenstaande stelling in 4.2?	A. Weet ik niet B. De stelling is niet juist C. Oorzaken zijn (licht toe): - - -

4.4 Markeer uw keuze met een 'v' of '!': *'Paramaribo licht (A)* ***onder /*** *(B)* ***boven*** *de zeespiegel'* *C. Weet ik niet*	
4.5 De reden dat delen van woonwijken af en toe deels onder water staan is toe te schrijven aan (meerdere antwoorden zijn mogelijk):	A. Slechte afvoer B. Toegenomen regenval C. Niet goed functionerende sluizen D. Afval zoals plastic flessen in het straatbeeld E. Hoge rivierwaterstand F. Anders:

5. Klimaatverandering

5.1 Sinds wanneer bent u op de hoogte van het begrip 'Klimaatverandering'?	A. Sinds circa … jaar B. Nee
5.2 Klimaatverandering is:	A. Een fabeltje (bangmakerij) B. Iets van de toekomst C. Iets van het verleden D. Is er altijd al geweest E. Is een hedendaagse realiteit F. Anders:
5.3 Suriname draagt bij aan klimaatverandering:	A. Nee, alleen het buitenland B. Ja, heel veel en dit is positief C. Ja, maar heel erg weinig en dat is positief D. Nee, want het is een natuurlijk proces E. Anders:
5.4. De gevolgen van klimaatverandering voor Suriname zijn:	A. Verwaarloosbaar B. Zullen plaats vinden pas over 20 jaar C. Die vinden nu al plaats (licht toe): D. Anders:
5.5 De oorzaak van de gevolgen van	A. Alleen in Suriname

klimaatverandering in Suriname bevinden zich in:	B. Alleen in het buitenland C. Meer in Suriname dan in het buitenland D. Meer in het buitenland dan in Suriname E. Anders:
5.6 Klimaatverandering is voor mij:	A. Een prioriteit, want het beïnvloedt mijn dagelijks leven (licht evt. toe): B. Een prioriteit, want het zal de toekomst van mijn kinderen beïnvloeden (licht evt. toe): C. Geen prioriteit, het speelt voor mij geen rol D. Anders:
5.7 Stelling: *'Schoon drinkwater in Suriname zal er de komende eeuw in overvloed zijn, want de ongereptheid van het Amazonegebied voorziet ons land daarin'*	A. Mee eens B. Niet mee eens (licht evt. toe):
5.8 Hoe bent u geïnformeerd over klimaatverandering in Suriname (meerdere antwoorden mogelijk)?	A. Via Internet B. Via de Krant C. Via de Televisie D. Via voorlichtingscampagne E. Via de overheid F. Via bepaalde organisaties G. Via bekenden H. Via documentaires I. Via een verblijf in het buitenland J. Via het werk K. Via een rechtstreekse waarneming L. Via een gevolgde cursus M. Ik ben niet geïnformeerd N. Anders (namelijk):
5.9 Als er sprake zal zijn van evacuatie van bevolking in overstroomde of bedreigde gebieden als gevolg van algehele zeespiegelstijging in de toekomst dan zal dat aantal in procenten niet hoger liggen dan:	A. 2% B. 10% C. 50% D. 80% E. 95% F. Geen idee G. Ander percentage:

5.10 Suriname is kwetsbaar voor klimaatverandering:	A. Nee, dat is onjuist B. Dat is juist, en behoort hiermee tot een minderheid van landen C. Dat is juist en behoort hiermee tot een meerderheid van landen
5.11 Klimaatverandering:	A. Is een niet realistisch proces B. Is een natuurlijk proces C. Is een door de mens veroorzaakt proces D. Is een door de mens versterkt proces
5.12 Klimaatverandering is een proces wat:	A. Onomkeerbaar is (licht toe) B. Te stoppen is in de toekomst (licht toe) C. In theorie morgen te stoppen is (licht toe) D. Wat nu nog, maar in de toekomst niet meer te stoppen is (licht toe)
5.13 Klimaatverandering dient benaderd te worden door:	A. Het te stoppen (licht toe) B. Door het proces te vertragen (licht toe) C. Enkel door aanpassen aan de gevolgen (licht toe)
6. De droge en regentijd	
6.1 De regen in de droge tijd is:	A. Gelijk gebleven B. Afgenomen, het droge seizoen wordt droger C. Toegenomen, het regent vaker D. Dat is niet te zeggen
6.2 De regen in de regentijd is	A. Gelijk gebleven B. Afgenomen, het regen seizoen wordt droger C. Toegenomen, het regent vaker D. Dat is niet te zeggen
6.3 De prijzen van groente op de markt zoals komkommer, bladgroente en tomaat zijn:	A. Gelijk gebleven B. Gedaald C. Duurder, maar begrijp niet waarom zo plots D. Duurder, en begrijp de reden (evt toelichten):
6.4 De temperatuur in de droge tijd is:	A. Gelijk gebleven

	B. Toegenomen, de zon is heter C. Afgenomen, het is koeler
6.5 De temperatuur in de avonduren is:	A. Afgenomen, het is frisser B. Toegenomen, in de avond is het warmer C. Gelijk gebleven, ik ervaar geen verandering
6.6. De temperatuur in Suriname is:	A. Gelijk gebleven B. Gemiddeld gedaald C. Gemiddeld aan het stijgen D. Weet ik niet
6.7 Tropische ziekten als Malaria, Denque en Gele koorts zijn:	A. Afgenomen, bescherming is verbeterd B. Toegenomen, ondanks bescherming C. Gelijk gebleven, ondanks bescherming D. Weet ik niet
7. Zeespiegelstijging	
7.1 Zeespiegelstijging is:	A. Een fabeltje B. Iets van de toekomst C. Een hedendaagse realiteit voor Suriname D. Een hedendaagse realiteit in het buitenland E. Anders:
7.2 Een gevolg van zeespiegelstijging is:	A. Land dat vruchtbaarder wordt B. Land dat minder vruchtbaar wordt C. Anders:
7.3 Als zeespiegelstijging in de toekomst een bedreiging vormt om veilig te kunnen leven in de stad:	A. Trek ik naar het binnenland B. Verhoog ik mijn huis en erf C. Verhuis ik naar het buitenland D. Blijf ik in de stad want ik heb hier mijn werk/studie E. Anders:
7.4 Men zegt dat zeespiegelstijging land onder water doet lopen en een bedreiging voor de kustbevolking vormt omstreeks in het jaar:	A. Duizenden jaren geleden B. 2012 C. 2020 D. 2030 E. 2050 F. 2100 G. Weet ik niet H. Dit berust op onwaarheid en is onjuist
7.5 Zeespiegelstijging is:	A. Te voorkomen door de juiste maatregelen te treffen

	B. Niet te voorkomen, daarom moet ons land zich er op voorbereiden C. Anders:
7.6 Zeespiegelstijging vormt een bedreiging voor (meerdere antwoorden mogelijk):	A. Nickerie B. Commewijne C. Gehele zwampgebied D. Paramaribo E. Alleen op kleine eilandjes elders F. Anders:
8. Uw mening omtrent:	
8.1 Zou er zoiets moeten bestaan als een: 'Nationaal Plan Klimaat Verandering'?	A. Nee, dat zegt mij niets en is niet nodig B. Dat zegt mij niets, maar lijkt me wel nodig C. Dat bestaat al in Suriname en is nodig D. Dat bestaat al maar is niet nodig Anders:
8.2 Gezien de risico's van de gevolgen van klimaatverandering vind ik dat de volgorde van prioriteitsmaatregelen vanuit de overheid moet zijn:	A. bescherming, aanpassing, terugtrekking B. terugtrekking, bescherming, aanpassing C. aanpassing, terugtrekking, bescherming D. Andere voorgestelde volgorde:
8.3 Het bouwen van dijken en dammen vind ik:	A. Geen prioriteit, want.. B. Een prioriteit, want.. C. Geen prioriteit want dat is te duur D. Geen prioriteit want de waterkering voldoet E. Geen prioriteit want er is geen gevaar F. Anders:
8.4 Het bouwen van en herstellen van bestaande water verdedigingsstructuren in de stad Paramaribo vind ik:	A. Geen prioriteit, want.. B. Een prioriteit, want.. C. Geen prioriteit want dat is niet duurzaam D. Geen prioriteit want dat heeft geen zin

	E. Geen prioriteit want kost te veel geld F. Geen prioriteit want er is geen gevaar G. Anders:
8.5 Efficiënt gebruik van de waterbronnen zoals de distributie van drinkwater dient:	A. Verder verbeterd te worden B. Is al voldoende verbeterd C. Hoeft niet verbeterd te worden, er is genoeg D. Anders:
8.6 Stelling: *'Mangrovebossen dienen een onderhavige functie, verkaveling van land is van meer belang door de aangroei van de stad'*	A. Mee eens want,.. B. Mee oneens want,.. C. Mee eens, want stedelijke groei is noodzaak D. Anders:
8.7 Mangrovebossen verdienen:	A. een beschermde status, want.. B. geen beschermde status want..
8.8 Aanbouw van nieuwe bebouwing in de stad dient plaats te vinden in:	A. Geen mening B. In noord, daar is grond duur C. In zuid, daar is veel ruimte D. Aanbouw dient beperkt te blijven E. Op bestaande grond F. Door hoogbouw toe te passen G. Anders:
8.9 Aandachtspunten in de stad zijn (meerdere antwoorden zijn mogelijk):	A. Onveiligheid door criminaliteit B. Onveiligheid in het verkeer C. Vuil op straat/rivier zoals plastic D. Herrie en overlast E. Vervuilde lucht door verkeer F. Wateroverlast G. Overmatige regenval H. Tropische ziekten zoals denque I. Achterstallig onderhoud van het wegdek J. Niet juist functioneren van (licht toe):

	- K. Verkeersopstopping L. Anders: - - -
8.10 De top drie aandachtspunten in de stad voor mij zijn:	Op 1.: Op 2.: Op 3.:
8.11 De verantwoording om juist te handelen naar klimaatverandering ligt op de eerste plaats bij:	A. De overheid B. Mezelf C. Het buitenland D. Anders:
8.12 Stelling: *'Om juist om te gaan met klimaatverandering is voorlichting belangrijk'*	A. Mee oneens B. Mee eens C. Mee oneens, ik ben al op de hoogte D. Mee eens, ik ben onvoldoende op de hoogte E. Mee oneens, het is niet aan de orde
8.13 Stelling: *'Klimaatverandering is nu niet aan de orde, maar als het in de toekomst aan de orde is krijgt het vanzelf prioriteit, Suriname kan hier dan adequaat mee omgaan'*	A. Mee eens B. Mee oneens, er dient nu al mee om te gaan C. Mee oneens, geld schiet te kort D. Mee eens, er zijn nu andere prioriteiten E. Anders:
9. de Weg naar Zee	
9.1 Stelling: *'De Weg naar Zee ondervindt hinder van de oprukkende zee'*	A. Weet ik niet B. Mee eens C. Mee oneens
9.2 Stelling: *'De Weg naar Zee moet koste wat kost behouden blijven'*	A. Mee eens B. Weet ik niet C. Mee oneens
9.3 De hoofdoorzaak van de wateroverlast van de Weg naar Zee is:	A. Een slecht functionerende dam B. Een slecht functionerend pompgemaal C. De oprukkende zee D. Anders:
9.4 Open vraag: Het gebied rondom de Weg naar Zee is	-

hoofdzakelijk van belang als (geef uw eigen antwoord):	-
9.5 Open vraag: Meerzorg is een gebied wat snel onder water loopt bij enige regenval daarom moeten er:	- -
9.6 Open vraag: De oorzaak van het snel onderwater lopen van Meerzorg komt door:	- -
10. Het bos	
10.1 Het bos in het binnenland heeft als belangrijkste functie:	A. Goudwinning B. Houtproductie C. Toevoer van schone lucht D. Behoud van flora en fauna E. Opname van CO2 F. Anders:
10.2 De ontbossing van het bos is:	A. Kleinschalig B. Grootschalig C. Neemt alleen maar toe, is nog kleinschalig D. Neemt alleen maar toe, is al grootschalig E. Anders:
10.3 Hoe zou Suriname zich kunnen profileren in internationale klimaatonderhandelingen?	
11. Tot slot	
Heeft u nog vragen, suggesties of opmerkingen?	
Heeft u het invullen van deze enquête als zinvol ervaren?	
Mocht u de resultaten van het onderzoek willen ontvangen, dan kunt u hier uw e-mail adres noteren. In de periode juni tot en met augustus 2012 vindt de verwerking van de onderzoeksresultaten plaats.	Uw e-mail adres:
Ik wil u heel oprecht bedanken voor uw verleende medewerking!	

Fieldwork Pictures

(Picture 1: Me in a Water taxi on the Surinam River)

(Picture 2: Erosion of the Surinam Riverbank at the Waterside)

(Picture 3: High Tide, Surinam River)

(Picture 4: Sunset at the Surinam River, Paramaribo)