Global and local issue of climate change environmental sciences essay

On January 19, 2005, in Kobe, Japan, global scientists agreed that climate change is " the single most important threat to the planet's survival." (Crichton 2005) An increasing group of experts concurs that the climate is changing and a main influence is being provided by human activity. Apart from this fact, another worrying hypothesis is that the change in climate may occur sooner than predicted. Small islands are noted to be socially, economically and physically vulnerable by their very nature. The limited resources and their size makes it even difficult for them to adapt to climate change. Owing to its status as a small island state, Malta is considered highly vulnerable as it is densely populated and its ability to enjoy economies of scale is limited. The Intergovernmental Panel on Climate Change (IPCC) upheld this view when it articulated that:" Small islands, whether located in the Tropics or higher latitudes, have characteristics which make them especially vulnerable to the effects of Climate Change, sea level rise and extreme events."(IPCC WG2). According to UN benchmarks, the impact of climate change on Malta is said to be moderate when compared to the worldwide situation as the main key concerns are considered to be " drought, increased risk and intensity of flooding, deterioration of fresh water resources, soil and coastal erosion, desertification, changes in sea level, and progressive loss of biodiversity and resilience of natural ecosystems." (National Climate Change Strategy, 2010).

1. 2) The Insurance Industry, Too Little but not Too Late

Arguments and debates on the impact of climate change on the society in the future will continue to occur. Debates concern various industries, but with major importance to the insurance industry. History provides evidence

of catastrophes and other weather-related costs for the entire global economy with particular interest to the insurance industry. Till now, insurance companies have proven that they are well-equipped and financially strong to respond to such financial shocks. Although being ready for catastrophic events, the insurance industry has not taken such weather-related events seriously enough. " Climate Change is likely to bring us all an even more uncertain future. If we do not take action now to understand the risks and their impact, the changing climate could kill us all." (Maynard, 2006)"... The warming that we are experiencing is likely to bring about two main changes: a change in the average climate around the world, and a change in the incidence of extreme events. Warmer weather and seas will bring with them a range of impacts including: rising sea levels (from thermal expansion of the oceans), changing distribution of carriers of disease (such as mosquitoes), an increased incidence of hot days, changes in rainfall patterns (making it harder to plan for dry seasons), and a more acidic sea. Extreme events such as storm surges, flash floods and cyclones/storms could all potentially be exacerbated by the other changes in the climate. While there are regional differences in how Climate Change will manifest itself, in general it is likely that Climate Change will lead to both worse flooding in the rainy seasons, and worse droughts in the dry seasons. It is also likely to lead to more hot days which would affect the elderly, the poor and the sick. Sea-level rise is already affecting coastal infrastructure, coastal populations and increasing the pressure on scarce land resources."(Tompkins, Nicholson, Hurlston, Boyd, Hodge, Clarke, Gray, Trotz, Varlack, 2005.)The increases in temperatures as a result of climate change, would also bring about higher frequency of extreme storms not just in Atlantic, but around the world. This

is evidenced by record typhoon seasons in Asia. The impact of warmer sea surfaces would bring about an increase in windstorm landfall, and with such combinations, insurers must take into consideration such impacts in their risk modelling and pricing. Insurers when dealing with such events must consider various scenarios that could give rise to a claim. For example it is a fact that today, around three billion people (half the world's population) live by the coastline. By the year 2025 such figures are likely to double, assuming current trends. Malta's major economic activity and infrastructure is either situated in coastal areas or heavily projected towards them. Thus, such people are more prone to erosion and at risk of sudden changes in sea levels in addition to the slow change expected from gradual melting. A rapid melting of glaciers, could have a devastating effect as " one sixth of the Earth's population currently rely on glaciers for their water supply." (Maynard, 2006)Climate Change undoubtedly will result in a 'risk multiplier' as such events would amalgamate with other trends leading to a higher existing tension and insecurity. The insurance industry is known to price its products according to past loss experience relying mainly on statistics and probabilities. With such changes in climate, past events are no longer a reliable forecast of future events and this would lead to an increased ambiguity and uncertainty in the pricing models. This implies that nowadays, insurers depend highly upon catastrophic analysts who assess an insurer's possible maximum catastrophe loss to provide pricing guidance. Risks related to climate change rose dramatically on a global scale in recent decades. With the increase in both the population and the income growth taking into account also the expansion of human settlements into high-hazard areas, the number of people and the level of wealth exposed have

steadily grown. The insurance industry has already started suffering from weather-related events and losses are said to have risen over the past-quarter century. These rising losses are threatening the process of development as high-risked countries must frequently borrow for disaster reconstruction, raising their indebtedness without necessarily contributing to economic growth or poverty. Figure 1 : Great natural catastrophes 1950-2008. The chart represents the overall losses and insured losses-adjusted to present values. Source: (Munich Re, 2008.)Insurers are already facing themselves with higher costs (as illustrated in the above Figure 1) resulting from higher risks such as claims relating to hurricanes. In 2004 and 2005, about seven hurricanes hit the Gulf Coast, and in 2005 catastrophic losses to United States insurers amounted to 61. 2 billion according to Tim Wagner's report: Impact of Climate Change on Insurance.

Chapter 2 : Literature Review

2. 1) Physical Effects of Climate Change

If greenhouse gas emissions were to be stopped instantly, rise in temperatures and sea temperatures will still be experienced for various decades due to inertia in the climate system. Thus Climate Change is inevitable. Climate is changing as a result of human activity. This is suggested by scientific evidence.'Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level.'(Arndt, Bringer, Johnson, 2010)Latest climate science and the more scientific evidence at hand prove that the world's climate is being altered mainly due to mankind's influence. Humans'

material dominance is leading to a faster and ongoing change in the world's environment and this change is occurring earlier than forecasted. Arndt, Bringer and Johnson in 2010 stated that over the last three decades, scientific evidence suggests that the average global temperature has increased by 0. 74ºC. On average, each of these last three decades has been warmer than the previous, and each decade has established a new record with the 2000s being the warmest. Figure 2: Hemispheric and global average temperatures. Source :(National Climatic Data Centre, 2011). These figures are both showing the combined marine surface and global land temperature record from 1850 to 2011. A main highlight that can be extracted from these figures is the period 2001-2010 was 0. 20°C warmer than the previous decade 1991-2000. The two graphs are illustrating that the warmest year of the whole series has been the year 1998, with a temperature of 0. 55°C. This whole scenario is the result of the earth's atmosphere warming up due to greenhouse gases trapping the energy received from the sun. These natural gases keep the atmosphere warm enough to sustain life, but the higher the greenhouse gases are concentrated, the more the atmosphere warms. The industrial revolution, brought various changes to the way business was carried out. Methods have changed through the use of burning fossil fuels, agriculture practices and land use leading to rising levels of greenhouse gases in the earth's atmosphere. With gases increasing the warmth, atmospheric concentration of carbon dioxide (CO2) has led to the melting of glaciers in the Alps and Andes and other parts. Other changes due to this fact were the slipping of the Pacific Islands beneath the waves, arid lands in the Amazon and the spreading of deserts. Since 1960, Malta experienced two severe droughts in 2000-2001 and 2001-2002.

2. 2) Impact of Climate Change on Insurance

Traditionally, the insurance industry accounts for risk by basing its reserves on historical records, hazards and loss occurrences. The past twenty years have shown a substantial rise in the economic costs of disaster which are of particular concern to the insurance industry. In this last decade, there were various initiatives to engage the insurance industry in debates regarding the effects climate change on the economy, since the global insurance income is more than $2 trillion dollars a year. Such efforts produced little success as this industry involves various large competitive organisations each with their own perspectives and opinions but inclined more to short term results rather than long term strategies. The insurance industry is ruled by two main factors- the ability of the insurance industry to finance risk and the expectation that the insurance underwritten will be profitable. Increasing population and rising property values together with a changing climate are calling the insurance industry in question to meet the insurance needs of those situated in coastal areas more prone to catastrophic losses. There were record water levels and floods in Switzerland , Austria and Germany in 2005 and insured losses amounted to $1. 7 billion. In 2008, worldwide disasters amounted to $181 billion in economic losses and 236, 000 deaths. According to United Nations (UN) report issued in 2009, this was two three times the average of the current decade. Lloyd's of London chairman placed climate change as the number one issue for the insurance market on an international scale. Allianz, Europe's largest insurer, claimed that climate change stands to increase insured losses by 37% within a decade and in the case of a bad year losses would top $400 billion. Malta's vulnerability to climate change is estimated to increase from a score of 1. 9 in 2004 to a 2.

2.'This report concludes that Malta's economic vulnerability to Climate Change is expected to range from just under moderate to moderate to high'. (Sammut and Micallef, 2004)

2. 2. 1) Impact on Life Business

Apart from environmental hazards, climate change would undoubtedly impact upon human activities and their lives. As stated by the National Statistics Office (NSO), Malta was densely populated at 1, 309 persons per square kilometre by the end of 2008. The high population density, the ageing population together with the fact that Malta is an island, are factors which will surely contribute to the effects of climate change. It is a fact that the most vulnerable to climate change impacts are the elderly, the very young, those suffering from chronic-respiratory diseases, the poor, the socially isolated, and those suffering from mental health conditions. Malta, as well as the rest of Europe, will be vulnerable to impacts of climate change due to heat waves, floods, infectious diseases, and deterioration of air quality and as mentioned earlier, ageing population. These are the consequences of climate change which may cause suffering and may also lead to death. Ambient temperature and mortality are correlated. Testing this relationship in a local context proves that the optimum average temperature during which mortality rate is at a minimum in the Maltese population is found to be around 27°C. Above or below such temperature mortality rises. At higher temperatures, mortality rates increase more rapidly than at lower temperatures.'It is estimated that mortality risk increases by between 0. 2% and 5. 5% for every 1°C increase in temperature above a location specific threshold'.(World Health Organisation (WHO), 2008). The WHO concurs also

that 'The Summer of 2003 saw a particularly intense and prolonged heat wave which swept over Europe, claiming at least 70000 excess deaths in 12 European countries. The cost to life insurers as a result was an enormous one'. It is estimated that around '7000 Americans a year die of melanoma from sun exposure and yet fear of the sun is relatively low because it is a natural risk, a sort that evokes less concern than risks which are human-made'. (Harvard School of Public Health, 2004). It is important that institutions for the elderly and hospitals offer some degree of air-conditioning.'In a survey conducted during 2008 by the Directorate of Health Care Services Standards on Heat Wave Measures in Homes for Older Persons, only 61. 5% of homes for elderly persons were found to have air-conditioning facilities, and only 7. 7% of homes had a cool room. 30. 8% had their roofs insulated'.(Department of Health Care Services Standards, 2008)Thus insurance companies must investigate and demand suitable measures and practices before handing out life policies as, based on the foregoing statistics and information, in the future, risks of claims resulting from climatic hazards will tend to increase.

2. 2) Impact on Non-Life Business

Organisations are also considered to be at risk where climate hazards are concerned.

a) Business

Owing to increasing flooding, communication and transport networks as well as infrastructure would be affected. Due to the fact that global infrastructures are interdependent, there is also the risk of the domino-effect; where the damages of one network would have negative implications

on others. An example is when there is a power cut due to power station problems; bringing about an interruption in the operations of a business. Hurricane Katrina raised public awareness that transportation can come to a standstill as a result of loss of energy infrastructure. Risk averse managers are opting to buy business interruption coverage as a result of the increasing exposure. Such managers are including also contingent business interruption coverage meaning that their business is protected also from losses resulting far away from their insured premises. Insurers must consider also the location of the business being insured in relation to climate risks as, for example, 35% of the world's oil refineries, 11% of airports and all seaborne trade are situated along side coastal zones meaning that they have an elevated risk. This summer, many areas in Malta experienced repeated power cuts that have cost businesses substantial amounts in lost trade. Apart from halting business operations, such power cuts could result in damages to equipment used in the running of the business.'The commercial and industrial sectors together account for more than 50% of the total electricity generated'.(Enemalta, 2009)This means that repetitive power cuts could easily result in claims detrimental to insurance companies. According to the Chartered Insurance Institute, London, small-and-medium sized enterprises (SMEs) are more vulnerable and not prepared for climate shocks. Since Malta's major business market involves such SMEs, local insurers stand the risk of heavy claims. A case in point is the storm that occurred in early September 2012, which resulted in flooding that affected businesses adversely; figures show that businesses' claims were the highest of all types of claims amounting to €3. 2 million out of the €5 million claims and 65% of

this storm payout was inrelation to damage to property and equipment among a range of commercial claims.

b) Property

Climate Change brings about sea level increase and intrusion of sea water inland. These all impose substantial risks to property. For example, the annual damages suffered by UK properties resulting from river and sea flooding amounts to a total of £1. 3 billion. For England and Wales alone, damages awarded are projected to rise between £2 billion and £12 billion in 2080 if no mitigation is conducted. In line with the 2012 statistics for Malta, property damages resulting from flooding amounted to €1. 05 million. Considering the small size of the country, this could be considered a high amount. This may be deemed the result of the mismanagement construction planning methods adopted in Malta. According to hydrologist Marco Cremona, apart from the intensity of rainfall, the change in land use will contribute to a rain event of moderate to high intensity resulting in flooding. This is, in part, the result of continuous building over a span of 20-30 years with 'more than 30% of the country's surface area now consisting of impervious surfaces like roofs and roads. It is a known fact that this transformation of porous surfaces such as fields and garigue has not been complemented with adequate rainwater storage, as required by law resulting that even a moderate rain event will turn out in flash floods in most areas of Malta.' (Cremona, 2012).

c) Health

As already mentioned in the Life Business section, climate change will have an influence on our lives. While some climate hazards could lead to death

such as injury after a flood or cardiac arrest during a severe heat wave, the main consequences of climate change are expected to be on health. These consequences are expected to be manifested in terms of disability, morbidity, hospitalisation and a reduction in quality of life. It is no surprise that people suffering from cardio-respiratory and mental health conditions are particularly vulnerable to climate change effects. It is important to note that today, in Malta, cardio-respiratory diseases and mental health conditions are already the cause of considerable morbidity. Climate Change does not imply that new diseases will erupt, but normally accentuates already present human health effects or aggravates them. The change in climate acts in combination with other factors such as urbanisation, air pollution, water availability and other various effects that could affect human health adversely which sometimes could be profound. A case in point is that outlined above whereby flooding is not only the result of heavy precipitation, but also the combined result of urbanisation and built infrastructure. Similar to other countries, Malta is also likely to suffer from a number of human health effects if no corrective action is taken. Summers are already experiencing higher temperatures with more frequent and intense heat waves. Winter precipitation patterns are altering; they may decrease by a few percentage points but rainfall is predicted to become heavier. When dealing with precipitation patterns, drainage systems need to be considered. Urban drainage systems were designed on historic climate data and will not meet the challenges of the future, leading to an increase in local insurance claims. Air quality is also impacting human health where Maltese children are increasingly found to be suffering from asthma over the last two decades. In the light of diverging habitats in the Maltese islands, mosquitoes and insects

are changing distribution. Some of these insects are well-known carriers of infectious diseases and may give rise to outbreaks of diseases such as malaria. During the autumn of 2012, the Maltese islands were concerned with climate change vector-borne diseases such as Chikungunya fever emerging from the Asian tiger mosquito which can inflict fever, joint pain, muscle pain, headaches, and nose and gum bleeding. Higher ambient temperatures are also correlated with certain food-borne illnesses such as Salmonellosis. It is scientifically proven that rises in temperatures are associated with '5-10% higher salmonellosis notifications for every degree increase in weekly temperatures. Local data show that for every two degree rise in minimum temperatures, an additional case of Salmonellosis occurred'. (Gatt, Calleja, 2010)

2. 3) Impact of Climate Change

The need to understand the effects that climate change might have on the insurance industry is increasingly gaining in importance. A study conducted by the Centre for the Study of Financial Innovation together with Pricewaterhouse Coopers analyzed the various types of risks being faced by 400 insurance companies. This study states that in 2007 climate change risk was ranked in the 4th position. This highlights serious doubts on whether or not insurers' response is retarded in adapting adequate measures against climate change impacts. The most common impact of climate change suffered by the Maltese Islands is that of flooding. Consequences resulting from the effects of floods could have various implications and Maltese insurers must cope with the effects that flooding could bring with it. Flooding is becoming an inconvenient seasonal truth for the Maltese who

unfortunately have no choice but to accept it. Flooding is considered to be one of the most widespread hazards and the Intergovernmental Panel on Climate Change (IPCC) concurs that an increase of climate change would cause an increase in floods in various parts of the globe. From all environmental hazards, flooding is considered to be the most frequent and widespread in the world. Various types of floods of different magnitudes bring about huge annual losses spread among damages and disruption to economic livelihoods, businesses, infrastructure, services and public health. According to the International Federation of Red Cross (IFRC) and Red Crescent Societies, in the 10 years from 1993 to 2002 flood disasters"... affected more people across the globe (140 million per year on average) than all the other natural or technological disasters put together"(International Federation of Red Cross (IFRC), 2003).

Chapter 3: Methodology

3. 1) Introduction

The available literature concerning the impact of climate change on the insurance industry was reviewed and secondary data relevant to this study was elicited. On this basis, hypotheses were formulated which were deemed to be best served by the application of a mixed method design applying both quantitative and qualitative research tools. Consequently, primary data was obtained from the feedback derived from the distribution of questionnaires and through a number of interviews which were carried out; thereby satisfying the exigencies of triangulation in that more than one research instrument was used to corroborate or deny the existing facts and the novel results derived. This data gave rise to the main aim of this research study:

the findings and conclusions on the real impact of climate change on insurers with particular reference to the influence of floods. So as to enhance the credibility of the findings, triangulation was further employed in the selection of the subjects who participated in this study. The participants consisted of the main traditional components of the insurance industry which are mainly representatives of insurance companies and brokers, the Malta Insurance Association (MIA) which is the local non profit-making organisation that represents the views and common interests of all insurance companies in Malta, both indigenous and foreign, and also the people in the streets who buy the insurance policies (policyholders). Prior to conducting this research, the UREC Proposal Form was submitted to the University Research Ethics Committee (Appendix 1). Following which, a letter of informed consent (Appendix 2) was sent to all prospective participants so as to provide them with the background to the study being carried out and also to invite them to participate as well as to enlighten them as to their rights as participants.

3. 2) Quantitative and Qualitative Research

To carry out research, there are a number of methods that could be used; these constitute a broad spectrum which essentially falls within two approaches: the Quantitative Approach and or the Qualitative Approach. Quantitative analysis is mainly modelled on scientific methods and is primarily applied to test hypotheses, look at cause and effect and make predictions. Conclusions of such analysis tend to be quite objective as they are, in the main, based on statistical findings and other types of measurable empirical data. Thus, to implement this approach the dissertation subject must be capable of being analysed mathematically by using either

mathematical models or statistical tests which are traditionally presented in forms of charts, tables and graphs.(Miles & Huberrnan, 1984). On the other hand, qualitative analysis involves the understanding and interpretation of social interactions. Qualitative research is usually based on data which cannot be expressed in the form of numbers such as averages and percentages or maximum and minimum values. Such research is, hence, generally more subjective but tends to give deeper responses that are richer in research implications(Miles & Huberrnan, 1984). The research area addressed by this dissertation was considered to be best served by a mixed research design with a stronger emphasis on qualitative analysis as the main data sources included beliefs, opinions and feelings of the participants particularly where the interviews were concerned since, as the targeted interviewees were limited in number, the quantitative approach was deemed inappropriate as it would not have produced valid results.

3. 3) Research Tools

For the purposes of this research both direct and indirect responses were utilised. Direct questions were posed to elicit data concerning the information being provided by insurance companies on climate change, the risk management strategies insurance companies are adopting to counteract climate change, etc. This type of information seemed to be best acquired by the use of face-to-face interviews. Indirect feedback was acquired from the responses to questionnaires wherein respondents had to choose from various questions: dichotomous, multiple response, scaled, etc. These questionnaires were distributed to policyholders and other non-professional people.

3. 3. 1 Interviews

There are various types of interview methods which could be used including face-to-face interviews and telephone interviews. For this research study, face-to-face interviews were chosen so that high quality data with a good level of response could be obtained. (Appendix 5) Face-to-face interviews give the interviewer more flexibility to probe deeper and a higher chance to explore unanticipated issues. Furthermore, accuracy is deemed to be higher when compared to other techniques as any misunderstood questions and related queries could be easily explained by the interviewer. Face-to-face interviews also allow eye contact, tone of voice awareness, as well as the observation of facial expressions and body language; these aid in providing extra information to the interviewer. Another advantage attained by face-to-face research is that it can be recorded with the permission of the interviewee; thus providing higher accuracy and completeness of data. A main drawback of this type of interview is that it is very time consuming in all three stages: in the preliminary stage, the interviewer must make an extra effort especially in setting up an appointment with the interviewee; in the second stage, the interview duration could take up more than an hour; and, in the third stage, transcription of the interview is normally calculated in hours. Face-to-face interviews can be conducted in a number of ways. There are three principal types: Structured - this interview is composed mainly of tight structured questions and each interviewee is asked the same type of questions. Unstructured or open interview - this type of interview is more informal allowing the researcher to explore unanticipated areas. Semi-structured - this type of interview was chosen for this research study for the reason that some of the questions were open with the intention that some

issues could be freely expressed and the rest of the questions were tighter as to get clearer and simpler responses.

3. 3. 2 Questionnaires

On the other hand, questionnaires were used to attain information from the general public. (Appendix 3 & 4). Questionnaires are an effective way of attaining a general picture from a large and representative sample and provide the interviewer with similar response but through a different approach which could be more reachable (in number of respondents) and less time consuming. In questionnaires, response is less biased as everyone answers the same question. Usually questionnaires are adopted for surveys as they allow people to answer at a time convenient to them. An important aspect of questionnaires is the element of anonymity which may perhaps provide the researcher with more honest answers. A typical defect of questionnaires is that if questions are poorly worded or biased, then the data obtained might not give an accurate picture. Another hitch relevant to questionnaires is that the response rate could be poor especially if respondents are busy or do not see a benefit in answering. Closed questions could be detrimental to this type of research as it makes it difficult for people to expand on their answers. Apart from hand written questionnaires, online questionnaires were also made available so as to obtain more information by reaching a wider audience and making it easier for them to answer at their convenience.

3. 3. 3 Pilot Study

Attaining high quality results required that both the interviews and the questionnaire be pilot-tested prior to the conduction of these research

methods. Pilot-testing was carried out with the supervisor as well as with some relatives and lecturers. Pilot-testing is vital when conducting a research study as it is a process by which the interviewer can achieve feedback and the chance to edit and correct the questions proposed by revising them so as to obtain more valid and reliable results. After this process was concluded, some of the questions had to be amended in terms of their structure and sequence so as to eliminate any lack of clarity or ambiguity. (Refer to Appendices 3 & 4).

3. 4) Triangulation

Good research practice obliges the researcher to triangulate, that is, to use multiple methods, data sources and researchers to enhance the validity of research findings. Triangulation is typically perceived to be a strategy for improving the validity of research or evaluation findings. According to Miles and Huberman" . . . triangulation is supposed to support a finding by showing that independent measures of it agree with it or, at least, don't contradict it."(Miles & Huberman, 1984)For the carrying out of this research, the element of triangulation was applied. Patton describes the point of triangulation as". . , to study and understand when and why there are differences."(Patton, 1980)Data triangulation refers simply to using several data sources, the obvious example being the inclusion of more than one individual as a source of data. Thus, three main parties constituting the local insurance industry were identified as ideal research material for the purposes of this study. These three parties includethe buyers: questionnaires were drafted and distributed to members of the general public who buy insurance policies; the sellers: interviews were carried out with

representatives of the insurance companies; and, a market organization: an interview was held with the Malta Insurance Association (MIA). Consequently, as suggested by Smith and Kleine, the research would include"... different images of understanding, thus increasing the potency of evaluation findings."(Smith & Kleine, 1986)Triangulation would, therefore, provide the benefit of convergence. The notion of convergence is that data from different sources, methods, investigators, and research subjects will provide evidence that will result in a single proposition about the social phenomenon discussed.

3. 5) Limitations

Primary data is vital and crucial when conducting a research study. This type of data had to be collected so as to comply with the objectives of my dissertation as it contributes to building and understanding of how various stakeholders tackle the issue of climate change in relation to the insurance industry. This was attainable only with the collaboration of every individual that concurred to taking part in this research study. Several limitations were experienced when conducting the interviews. Limitations encountered include the fact that not every prospective interviewee collaborated and accepted to take part in this research together with the difficulty encountered to set up an appointment with the respective interviewee which was very time consuming. Additionally, some of the responses obtained were unclear and ambiguous or the interviewees did not provide enough information so as to support their statements. When dealing with questionnaires, limitations encountered included the difficulty of drafting a structure of questions with a logical flow comprehensible to the common

man. Another limitation experienced was that a like questionnaire had to be drafted in Maltese as various policyholders either did not understand English or felt more comfortable answering in Maltese. Nowadays, online surveys tend to be preferred as they are less time consuming, more reachable where audience numbers are concerned and high in data quality when compared with paper questionnaires. When attempting this option, the main limitation was that online surveys have space for ten questions only and the original questionnaire had to be structured to fit the online questionnaire template.

3. 6) Conclusions

Notwithstanding the limitations, following the collection of the compiled questionnaires and after conducting the interviews, the data and comments were recorded and transcribed. The results were analysed and illustrated in the following chapter on the actual findings.

Chapter 4 : Analysis and Results

4. 1) Introduction

As a society, day-to-day lives have been structured around historical and current climate conditions. People are accustomed to a normal range of conditions and may be sensitive to extremes that fall outside of this range. Climate change is nowadays considered to be one of the major threats that the world is facing today. The undertaken research clearly illustrates this as the majority of the people in the study rated high scorings when asked to rate from 1 to 10 with 1 being a very low rating and 10 the highest rating possible as demonstrated in Figure 3. Some of the general public also added in their comments that this phenomenon is gradually gaining in importance

as time passes. Figure 3 : Climate Change as one of main threats to the World. On the other hand, responses from local insurers are showing a different perspective as these have stated that they are not considering climate change as one of their key risks; hence, it is not being included in their risk management strategy. One participant also added that the company reacts to such climate events as they arise, making the company re-active and not pro-active to such scenarios. Figure 4 : Flood losses are on the rise. Source: (Sigma Database, 2011). It is clearly noticeable as also illustrated by Figure 4 that the biggest concern for insurers regarding climatic hazads is the yearly occurrence of floods and water damages, with the 15th September 2003 storm maintaing the record in claims. With regards to claims, it seems that as local insurance companies are small and regional they did not suffer from any increase in relation to floods but relatively to a new climate change feature that hit Malta: the hail storm. This seems to be the main reason why the issue of climate change, mainly floods, is being taken a bit more lightly by local insurance companies especially when compared to international insurance and reinsurance market which insures worldwide risks.

4. 2) Insurance and Government's role

A common belief between the respondents is the meaningful partnership between local Government and the insurance industry which would result in the best chance of success. This should lead to appropriate land use and building policies for affected areas, with construction in high risk areas discouraged. Both figures below are showing the effect of having buildings built in close proximity to the coastline. Figure 5 : Marsascala promenade in

the old days. Source: (Anecdotes from Malta, 2012). Figure 6 : Present situation in Marsascala promenade. Source: (Times of Malta, 2012). As is evident in Figure 6 the current park and nearby houses are submerged under streaming water coming from both floods and sea water rise. This was not the case in the past as illustrated in Figure 5 as houses were built further away from the sea and, when the sea level rose, houses were not damaged. This is not the case in the present days as sea water, due to climate change, is rising higher in close areas and reaching the buildings. The insurance industry on its part should engage in creating incentives and awareness with policyholders to respond appropriately to manage such risky located buildings and should consider applying new warranties together with terms and conditions in their policies. Another important aspect that the study clearly illustrates is that, in Malta, the current insurance companies only consider Birkirkara, Msida and Hal Qormi as flood areas but areas like Marsascala and Balzan, which are relatively increasingly influenced by flood events, are not considered as such. Currently there is a different scenario rather than the ideal situation presented above. From responses received, the most common flood defence systems adopted by residents in areas highly prone to flooding include cemental steps or even in certain cases merely a piece of wood and sometimes also added cement under the pavement to raise ground level. Even though these are temporary measures, they are not sufficient in case of an unexpected or more voluminous than usual flood. This is also evidenced from the data collected as out of 16 houses that flooded, 12 of them have some sort of flood defence. This means that home owners are not adopting the right measures to prevent the entrance of water in their buildings and thus resulting in claims for insurance

companies. Respondents are currently relying heavily on Government intervention rather than trying to resort to other alternatives. The most common mitigation ideas attained from respondents almost all involve Government aid such as the cleaning of valleys, better management of roads and more reservoirs. One of the interviewees clearly indicated the Government as the stakeholder most at risk from climate change as such events can impact the assets and the country as a whole. The Government has an essential role to play in developing a strong governance model - those procedures, rules and regulations that can work to bring greenhouse gas emissions under control and also in mitigating factors arising as a result. In fact, with the right set of Government incentives to help focus their attention, the business community, which is already beginning to recognize challenges and opportunities - and looking to both adapt and innovate - will see even more possibilities for capitalizing on economic opportunities while achieving environmental gains.

4. 3) Awareness and Education

Awareness and education are essential elements in response to climate change. Effective communication and education are required to identify problems, encourage participation, invite innovation in problem solving, and promote the adoption and embracement of climate change adaptation policies as people’s understanding of the reason behind their introduction improves. All parties who responded to the study indicate that lack of awareness and information are acting as barriers in solving the problem. It is important to ensure that Malta achieves a cultural change amongst its stakeholders who look at sustianability as a model rather than a burden to

which they subscribe. A clear indication, from responses received, on the lack of information and knowledge in the insurance market, is the fact that, as illustrated in Figure 7, 60% of the respondents do not know if their policy covers them against floods. Figure 7: Awareness of policy covers against floods. As a primary action to promote awarness, one of the interviewees declared that a promotional campaign has already begun in 2012/13 and these initiatives will be pursued in the future too. Several problems have been encountered as the communication of climate change adaptation is complex for a number of reasons. Firstly, people find it difficult to plan in the long term for their own future let alone for matters which happen outside their life time. Thus, people are rarely motivated to act by threats to their long-term survival. Secondly, experience has shown that educational campaigns are most often either taken for granted or given marginal importance. Consequently, weakly conceived educational campaigns do not deliver the objective that they purportedly had to address.

4. 4) Research and Technology

Technology today, as was well described by one of the interviewees, is considered to be the spinal cord of the insurance industry. Foreign insurers have access to sophisticated catastrophe models and geographic information systems and databases which enable them to assess risk at individual address level. A funny but very interesting fact is that until very recently the largest British insurance companies had much better flood maps than the British Government. From the study undertaken, all of the respondents declared the importance of technology and its help in providing better security. But when discussing technology on a local level with regards to

climate change, local insurance companies limit themselves to the predictions of the Meteorological Office. Unlike the local scenario, foreign insurance companies are utilising technology to its full potential. The lack of information, on flood prone areas as previously discussed, has led Swiss Re to provide detailed flood hazard information. This was recently done by designing highly technological software for enabling flood solutions worldwide. When trying to develop a similar climate change adaptation strategy on a local basis, limitations were encountered as rightly stated by one of the interviewees including the lack of modelling technology which is still such that the resolution renders it next to impossible to model climate change and adaptation scenarios on a geographical terrain as small as Malta. The way foward has already began with the University of Malta building a very strong climate change discipline within the Faculty of Science which is significantly active with regards to research and modelling on climate change and adaptation.

4. 5) Opportunities

New scenarios present new challenges as well as new opportunities. Research conducted shows that 69% of the respondents (Figure 8) think that Malta requires some form of climate insurance to cover them against new climate risks and also current hazards such as floods. This result should be taken into consideration by local insurance companies and try to optimize the current climate situation and come up with new policies. Such point is also backed up by another result from the study, where 76% of the respondents said that if there were no barriers that prevent them from covering their assets against environmental risks, they would do so. Figure 8:

Malta requires Climate policies. Another area that relates to climate change and insurance is health insurance. In Chapter 2, the impact of climate change on health was analyzed and the results that repondents provided consolidate the finding of this study. 37% of the public declared that they were encouraged to take out a health policy after suffering or becoming aware of the risk that floods can have on their health. Insurance companies should try and analyse such scenarios in an attempt to increase the market share of health insurance in the local market by reaching out to people who are interested but are not aware of such facilities.

4. 6) Conclusion

As was evaluated in this chapter after analyzing conducted surveys and interviews, climate change is seen to result in several negative impacts which, however, are also leading to new opportunities that insurance companies must start to consider, adapt to and cope with. Thus, the next step is to take action both from the insurance market perspective and also from the aspect the State’s role in this scenario. Hence, the following chapter, will discuss pro-active ways of incentivising change and mitigation actions where this issue is concerned and the adoption of new policies and regulations to control this phenonmenon for the protection of society as a whole.

Chapter 5 : Discussion of Results, Conclusion and Recommendations

5. 1) Introduction

That climate change is taking place, and projected to continue for at least several decades even with ambitious efforts to reduce emissions, is well

supported by evidence. No one knows the exact impact of climate change, but what is known is that it presents the society, and the economy, with an increasing level of uncertainty as it seeks to manage its risk. This means that the insurance industry can no longer treat climate change as some peripheral workstream, simply to tick the regulatory and compliance box, or to support its public relations strategy. Instead, understanding and responding to it must become 'business as usual' for insurers. Insurance companies must develop plans and policies which are resilient to future uncertainties by taking a risk-based approach.

5. 2) From reaction to pro-action

Climate change is implying that exposures are changing and new ones are emerging. The insurance industry similar to other industries, would usually react to a loss and pay claims. The industry should invest in both time and money in business focused academic research. Considerable work is needed to convert scientific predictions into practical guidance for the industry. In this context, a practical example is the hail storm that took place in January 2013. This new feature to the Maltese islands brought about a huge amount of claims with one local insurance company stating that in ten minutes the number of claims equated the total amount of claims received in a normal month. Thus, this scenario has led to insurance companies starting to consider such new climatic exposure as a new treat to the Maltese islands as it is predicted that this type of event can become a yearly occurrence and scientific research is being carried out so as to be ready when such event takes place again."…. This is certainly the case of this tiny island called Malta where the size of the island compounds the concentration risk further, and

the climatic changes are likely to affect the country as a whole."(Director General of the Malta Insurance Association, 2013.)Thus, it is believed that the insurance industry should take a new approach to underwriting by looking ahead and not simply base decisions on historical patterns as has traditionally been the case. With more and more accurate scientific information now available, insurers are increasingly able to respond to the scientific predictions of each season ahead. Exposures are expected to increase in respect to property and business interruption as also emphasised by the Director General of the Malta Insurance Association, thus implying that the insurance industry will want to regularly review conditions of coverage against risk appetite and do more to educate the public about changing exposures. On educating people, according to results obtained from the conducted research, 60% of the general public do not know if their insurance policy covers them against floods and 74% of the respondents do not know of any local insurance companies that provide cover against climate perils and, in addition, the majority of these people still think that " act of god" is uncoverable. Figure 9: Do insurance companies provide policyholders with information on climate risks and their effects on policyholder's personal holdings? Local insurance companies are way behind in educating people and providing them with information on such risks as Figure 9 is showing. This is clearly manifested in the research findings where 83% of the public who took part in the research stated that their insurance company has never provided them with information related to impacts of climate change (especially floods) on their assets and that their insurance company never encourged such policyholders to take measures to lessen these impacts. Hence, insurance companies, as also pointed out by a Senior

Manager at GasanMamo, must eliminate the barriers of " lack of education and awarness" and promote ideas and measures as "... climate change would inevitably provide opportunities to the insurance market", and so the insurance industry should take advantage of such situation and aid by providing incentives for policyholders to reduce risk. The Maltese Insurance Association can also help in this educational process as the Director General well pointed out," .... The MIA can raise the level of public awareness and the need for added protection through risk transfer by informing the public that climatic changes are a hazard (or risk) to be reckoned with. This can be achieved through media campaigns and the use of its own website..."(Director General of the Malta Insurance Association 2013.)On its part, the MIA has already started an informational campaign in 2012/13 and continued by adding that "... these initiatives will be pursued in the future too." Such new scenarios would present new opportunities as society adapts to the impact of climate change; new technologies would be required and insurance of these developments would be needed. Figure 10 : Are people aware that climate change can have an impact on health or life? When discussing opportunities, the study also highlights another important aspect which insurance companies must analyse deeply and take advantage of this situation that climate change presents them with. From 72% of the policyholders who are aware that floods can impact their health and life as shown in Figure 10, 37% of these people, that is just more than half of them, are encouraged by this factor to take out a life or health policy. This is a great opportunity for local insurance companies to address such issues and provide their clients with suitable covers.

5. 3) Mitigation and Adaptation

Adaptation is the change in behaviour, resources and infrastructure of the functioning of a system that reduces vulnerability. Figure 11 : Conceptual diagram for climate change impacts, vulnerability and adaptation. Source: (Isoard, Grothmann and Zebisch 2008). Regardless of actions and mitigations, certain climate changes are still bound to occur due to inertia of climate system. Therefore it is essential that areas that will be affected adversely take steps to adapt. The IPCC's Fourth Assessment Report defines adaptation as" any adjustement in natural or human systems in response to actual or expected climate stimuli or their effects, which moderates harm or exploits beneficial opportunities."(IPCC, 2001)Adaptation is not exclusively focused on moderating harm from climatic effects, but also on the exploitation of " beneficial opportunities". As established in the Introduction to this dissertation, Chapter 1, greater storm surges caused by both higher sea levels and stronger storms in some regions can be expected. To adapt to these effects, one option is to invest in hard defences such as flood barriers or infrastructures such as the National Flood Relief Project (NFRP) which was proposed by the previous Government. Building codes can also be strenghtened to incorporte a number of flood and storm proofing measures. From responses received, policyholders mostly mentioned the cleaning of valleys, better management of roads and also property elevation as main mitigation actions. Drainage systems and gutters can be upgraded to cope with larger water volumes and another feature that emerged from the data obtained is that new buildings should incorporate wells to store water. Critically, early warning systems and sound evacuation strategies were also mentioned and can help in reducing human exposure to flood events. While

mitigation can be coordinated on an international level, conversely adaptation will require many local actions. As part of the mitigation process that would lead to adaptation, insurers who are permitted to use risk-based pricing can incentivise adaptation that genuinely reduces risk. Where data is sufficiently disseminated it is often possible for insurers to differentiate between risks. The presence of risk reduction methods such as appropriately adapted buildings can indicate a lowering of the severity of claims and, hence, justify premium reduction. Conversely, a regulatory regime that precludes risk-based pricing can lead to inappropriate responses from the public and businesses. As a side note, GasanMamo Insurance highlighted that usually enterpreneurs are the ones who demand cover against climate perils "... as they would have business interests and would involve much higher costs. For example after the recent hail storm, many businesses phoned to check whether damages to solar panels are covered." Insurers providing liability insurance can also incentivise professionals to include climate change in their advice by recognising that those who do not do this are open to legal challenge in the future that may lead to professional indemnity or errors and omissions claims.

5. 4) Government Response

The definition of floods was changed in April of 2006 so as to cater for the Maltese scenario. This occurred after the European Commission was proposing a new law on the assessment and management of floods. The objective of this law is to reduce and manage flood-related risks to human health, the environment, infrastructure and property via coordinated action between the European Union (EU) Member States. The original proposal

presented by the Commission only made reference to flooding from river basins and, therefore, had little or no relevance to Malta. However, this situation was remedied thanks to the timely amendments presented by the, back then, MEP Dr. Simon Busuttil. Commenting on the proposed directive Dr Busuttil said. " Flooding is becoming an increasingly common occurence in Malta and throughout the whole of Europe resulting in huge economic losses and sometimes even loss of life. Thus, this law will be important because it will coordinate European efforts to reduce such occurrences. Malta could not afford to be left out." Dr. Busuttil also referred to the close collaboration, which took place with the Malta Insurance Association (MIA) in putting forward the relevant amendments, as the MIA is an active member of Insurance Europe, a pan-European Federation of Insurance Associations. . From the questionnaires carried out, rather than insurance measures, the general public is requiring more intervention from the Government. Suggestions that people listed includes better management of roads, more reservoirs and the cleaning of valleys. The Government had started to take action to mitigate such problems by transposing the EU’s Floods Directive, which requires Member States to assess all water courses and coast lines which are at risk from flooding, to map the flood extent and quantify the assets and humans at risk in these areas and to take adequate measures to reduce this flood risk. The directive also sets a roadmap through which every country has to first carry out a preliminary assessment by 2011 to identify coastal areas at risk of flooding, to draw up flood risk maps by 2013 and establish flood risk management plans focused on prevention, protection and preparedness by 2015. The MIA can also help out in such process as"... the MIA also has a role in working closely with the local authorities in lobbying

and putting forward any recommendations that could help in making the existing infrastructure a safer place – such as the clean-up of waterways, canals, valleys – all measures intended to reduce the negative impact and physical damage sustained by property."(Malta Insurance Association, 2013)According to GasanMamo's Senior Manager, the Government is the main stakeholder at risk when discussing climate perils as climate change would be impacting the assets and the country as a whole. According to him, " the Government and the insurance industry must work hand in hand with each other. The insurance market may provide the Government with years of experience while the Government on its part can provide the insurance market with expertise." This is well highlighted in Figure 12. Figure 12 : Climate partnerships between Government and the Insurance Industry. Source: (Geneva Report on Insurance Industry and Climate Change, 2009.)After water conservation and flood mitigation have been almost abandoned by the Government whose lack of planning in such areas was reaching crises proportions, particularly in the area of flood control, work on a major flood relief project for several areas of Malta has been taken in hand. This National Flood Relief Project will cost €56 million and is estimated to be ready by Summer 2014 and aims to mitigate rain-water management for flood relief and water conservation as stated by the previous Prime Minister Lawrence Gonzi. The NFRP consits of five project components with different systems of tunnels, reservoirs and culverts and reconstruction of bridges that will aid to channel rainwater away from flood-prone areas, conserving as much water as economically feasible. Hence, this project is aimed to tackle the whole problem that the Maltese islands face as it includes the major suggestions that the general public listed as adequate mitigation measures.

The NFRP includes the construction of 16 km storm-water tunnels from various flood-prone areas in Attard, Balzan, Lija, Iklin, Birkirkara, Msida, Gzira, Zebbug, Zabbar and Marsascala. The project includes also a 650, 000 cubic metre reservoir that will increase the annual potential for water conservation.

5. 5) Conclusion

Climate change brings new risks but also new opportunities for the insurance sector. The sector has the potential to catalyse global effects to adapt to the risks associated with climate change, and incentivise appropriate risk management. Although, at the moment, only few and often small-scale piloting solutions have been implemented in developing countries, the insurance sector is uniquely positioned to provide necessary services for countries and businesses facing climate risks, especially in the developing world. The Director General at MIA, insisted that " ... It is important for the MIA to take this message to the public that Insurance Companies have the necessary expertise to help manage this risk." The insurance sector has the concentrated expertise necessary to address some of the technical challenges associated with changing historical weather patterns, pricing and managing climate risks, or identifying risk reduction opportunities.