How are ICTs used as tools in raising public awareness, and what makes them effective

A case study of the work of ODPEM in Kingston, Jamaica

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This master's thesis is carried out as a part of the education at the University of Agder and is therefore approved as a part of this education. However, this does not imply that the University answers for the methods that are used or the conclusions that are drawn.

Abstract

The last couple of decades the world has seen an incredible development within the field of Information and Communication Technologies (ICT). Not only has the number and quality of ICTs increased, but also its reach, penetration and the amount of new and different ICTs. It is also increasingly a part of everyday lives in most countries of the world. Simultaneously to this development there has been an increase in disasters and the loss of livelihoods and lives due to them. The disasters are affecting poor and developing countries disproportionally due to their vulnerability. Hence incorporating disaster management into the development agenda is vital for both to achieve sustainable livelihoods and development.

Within disaster management addressing issues of risk and vulnerability is the main priority. In such work it is data collection, communication, cooperation, coordination and raising public awareness is vital. Hence effective information management is key. For there to be effective information management issues such as reaching a defined addressee, being comprehensible, multi-source, relevant, on time, reliable and standardised have to be addressed. ICT is beneficial in many ways; it is beneficial due to its availability, reach, penetration, multiplicity, accessibility, speed, robustness and portability. ODPEM is the main disaster management agency in Jamaica when they incorporate ICT as a tool into their disaster management work and work regarding raising public awareness, it will enhance these activities. The general public are increasingly influenced by ICTs during their days, accessing such technology to disperse important information about disaster preparedness can raise public awareness as well as enhance disaster management.

Acknowledgements

Firstly, I would like to thank my supervisor Øystein Sæbø, from the University of Agder, for his support, encouragement, motivation and guidance. He has been a great help to me throughout the whole period of my thesis work.

I would like to thank Michelle Edwards of ODPEM who helped me in my field work and guided my to the people who would be most relevant for my thesis. I would also like to thank the others I interviewed at ODPEM for the help and good information that I received from them. I would like to thank the employees of the Salvation Army which I had the opportunity to interview, for sharing their knowledge and experiences with me. I would also like to thank Marcia Alexander of the Red Cross for her part in my fieldwork.

Finally, I would like to thank my family and friends who have been big supporters and motivators throughout my thesis work.

List of abbreviations, maps and appendices

CARICOM   - Caribbean Community

CDEMA   - Caribbean Disaster and Emergency Management Agency

GIS   - Geographical Information System

GPS   - Geographical Positioning System

ICT   - Information and Communication Technology

ICT4D   - Information and Communication Technology for Development

NEOC   - National Emergency Operations Centre

ODPEM   - Organisation for Disaster Preparedness and Emergency Management

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Introduction

There has been an incredible development within the field of information and communication technology (ICT) the last couple of decades, especially the last 10 years. Not only has the ICTs increased in number, reach and quality, but the amount of different ICTs available has also increased immensely (Kleine & Unwin 2009; ITU 2013). ICT has become an important part of everyday life in many countries. Together with the increased development of them, there is now euphoria about ICTs potential within development practices (Kleine & Unwin 2009). The use of the opportunities within the use of the mobile phone is particularly interesting.

A challenge related to this development is the uneven distribution of both the technology and the knowledge. A focus on economic gains, through new markets and cheaper labour, and simple transmission of technology and knowledge to "hurry up" development, is not the way to go. The opportunities presented by the ICTs and the development within that field can encourage inclusion and lead to empowerment amongst the poorest and most vulnerable communities. A focus on sustainable livelihoods and development should be the intent of ICT in development practices. ICT has for decades been part of the development agenda, however now is the time for a shift from economic growth and basic needs to rights and self-empowerment (Unwin 2009, Wilson n.a., Tucker 1999).

To achieve such a goal incorporating local context and cultural diversity into the development activities and projects is important. ICT can then enable development practices to reach a larger number of people at low costs, it can enable more democratic form of communication and knowledge production as well as self-empowerment.

Alongside the development of ICTs there has also been an increase in natural disasters and the number of people being affected by them. The disasters bring large destruction, physical, economical and social, with them, affecting the poorest countries the most. More than 11% of the people exposed to natural hazards live in low human

development countries, yet they account for more than 53% of all natural disaster deaths (UNDEP 2010; Ahrens & Rudolph 2006).

Natural disasters are a combination of risk of hazard and vulnerability. There are three main factors that are affecting the intensity and vulnerability towards a hazard, they are natural cycles, environmental degradation and climate change. Man-made climate change is a particular factor in creating more intense hazards and increased vulnerability towards them, and needs to be taken seriously and integrated into disaster management. Regarding vulnerability, many poor countries and communities fall into this category. Vulnerability regarding disasters is due to limitations or lack of capacity to reduce risk and to cope with the effects. Several factors lead to vulnerability. They are exposure and susceptibility to hazards, poverty, conditions of human settlements and infrastructures, public policy and administration, globalisation, and even development and development practices (DFID 2005; ISDR 2002). Even though the hazards and the disaster that stem from them are deemed "natural" does not mean that they actually are. For instance, not only can hazards be man-made, but they also affect vulnerability, so when a disaster occurs these two non-natural elements make up a natural disaster.

Disasters impact and disrupt the physical, economical and social dimensions within a country or community. Therefore there is a need for disaster management to be integrated into the development agenda. Just by looking at the MDGs, there is a clear relationship between achieving them and the effects of disaster. Disasters constantly hinder the achievement of the MDGs in vulnerable countries and communities. Disaster management should be part of strengthening livelihoods as well as reducing susceptibility to hazards and vulnerability.

Problem statement

The need for effective communication, cooperation and coordination between various stakeholder within communities, countries, regions and international stakeholders within disaster management is vital. Alongside communication, cooperation and communication, is the necessity to collect and analyse important data on vulnerability,

hazards and disaster to learn an improve disaster management. ICT would therefore be key tools within disaster management.

There are four phases to disaster management; mitigation, preparation, relief and recovery (Dorasamy et.al. 2011). Effective information management within all four phases will be vital for decreasing loss of livelihoods and lives. Hence, the effective use of ICT would be important as well. Effectiveness of information management involves measures such as reaching the defined addressee, being comprehensible using multiple sources and technologies, being relevant, being on time, being reliable, and the information being standardised (Stolzenburg 2007). ICT can improve and enhance the effectiveness of information management and therefore play an important part within disaster management.

It is important when working with information management and the use of ICTs to take into account the development discourse, making the activities relevant to the context and focusing on empowerment. The solution to effective disaster management cannot be seen as a simple transfer of technology and knowledge. ICT will not be the answer, but rather a helpful tool on the way within a solution. It can improve and enhance the work being done within disaster management. The more holistic an approach and the integration of ICT into development practices, the better the effect of ICT as tools will be.

An important part of disaster management is public awareness. Not only is it important to make the public aware of hazards and the dangers of disasters, but also it is part of empowering the general public and achieving sustainable development. There are five important actions that can be taken to improve public awareness. Firstly, collecting and disseminating relevant and adequate information and knowledge is necessary. Secondly, establishing effective educational programs for both the general public and within higher education is a step to take. Thirdly, it will be important to institute regular and effective communication amongst all partners in raising public awareness and education. Fourthly, strengthening the relationship to media and increase their participation and contribution, and finally improve organisational communication (Fraser 2005).

What I want to address in this thesis is how ICT can be incorporated into the work and activities of raising public awareness so that it can enhance such work and benefit the general public. There is not much literature on the influence, affect or effectiveness of ICT in raising public awareness. However with the development being seen across the world with regards to ICT, and experiencing developing countries also being influenced by this development and the reach and penetration of different ICTs in these countries increasing, it is important to look at how to integrate and take advantage of the development of ICTs within disaster management and public awareness. It is clear that they can have an important affect on the work being done, and enhances public awareness about preparedness, risk reduction and coping capacities. My thesis has had this background as a starting point focusing on what is happening in Jamaica.

Research objective and questions

Research objective

How are ICTs used as tools in raising public awareness in Kingston, Jamaica, and what makes the use of such ICTs effective?

Research questions

1. How does ODPEM collect and disperse information on hazards and risks?
2. What ICTs are used and how?
3. How are ICTs used as tools in raising public awareness in Kingston, Jamaica, and what makes the use of such ICTs effective?
4. What challenges do the ODPEM face with newer ICT and what opportunities can ICT provide regarding raisin public awareness within disaster preparedness?

Research area

Jamaica lies in the Caribbean, which contains an array of different cultures, languages, political agreements and trade agreements, whilst at the same time facing similar hazard risks with limited resources. Jamaica has a population of approximately 2, 6 million people and is the 3rd largest island in the Caribbean. It is a country that experiences political stability and is an upper-middle income country. However, they still struggle with poverty, unemployment, environmental sustainability and extreme hunger. These are all issues that they are working on and a priority within the country.

Jamaica is a Small Island Developing State (SIDS), and due to the country's location is highly vulnerable to risk from both human and natural disasters. The whole of Caribbean experiences multiple types of disasters every year caused by hazards like volcanic eruptions, hurricanes and landslides. Such hazards also affect Jamaica, the most frequent being hurricanes and landslides. Just last year in 2012 Sandy hit Jamaica and caused great damages. Integration of climate change and disaster risk policies, as well as focused attention towards mitigation and adaptation activities are vital for the well being of the country's population.

Regarding Jamaica's ICT status, they have good ICT infrastructure to facilitate different ICTs across the island, though there are issues with coverage and broadband access in

rural areas, due to infrastructure, accessibility and economy. In ITU's publication "Measuring the Information Society" (2013b), Jamaica is ranked as number 93 on the ICT development Index, with an IDI of 3,68 (p.24). ITU measures the IDI based on 11 indicators corresponding to ICT access, use and skills, and ranges from 0-10 (ITU 2013b). This indicates that Jamaica has some ICT infrastructure but has potential to develop it even further. The use of computers with Internet access, and mobile phone subscriptions show the reach of ICT such as these across the country. Individuals with computers at home with access to the Internet were in 2012 46,5% of the population. Individuals with mobile phone subscriptions in 2012 were 96,4% of the population (ITU 2013b).

Jamaica is a country that experiences poverty, unemployment and disasters, yet with the reach and penetration of ICTs such as the mobile phone, using such tools to enhance and improve disaster management and raising public awareness has a great potential. The Jamaican Government and organisations working with disaster management, such as the ODPEM, are focusing their attention on the potential of ICT in disaster work, and developing communication and information systems to improve their work even more. This is the backdrop for my research, and the reason I chose Kingston, Jamaica to focus my research on. It is an upper-middle income SIDS with good potential and possibility to enhance and develop their ICT infrastructure, both for developmental issues, and disaster management.

ODPEM

The Organisation for Disaster Preparedness and Emergency Management is the main disaster management organisation in Jamaica. The National Disaster Act of 1993 gives the ODPEM mandate to advance disaster preparedness and emergency management measures in Jamaica that facilitate, coordinate, develop, and implement integrated management systems. The tasks of the ODPEM are to develop and implement policies focusing on enhancing national disaster management, encourage and support preparedness and mitigation activities in all parishes, provide early warning, emergency response, relief and recovery operations in the event of a disaster, to advocate and support risk reduction activities, raise public awareness about disaster management,

conduct hazard identification and risk assessment, research social behaviour regarding mitigation and response, and establish and maintain cooperation and agreements with partner agencies and organisations, both nationally and internationally (ODPEM, 2008b).

Thesis outline

This thesis consists of 5 chapters, the first one being this introduction. The second chapter is Methodology. It will cover what research design and strategy I chose, my mode of sampling, and what methods I have used to collect and analyse my data. I will also look at the limitations and ethical issues surrounding my research.

The third chapter is my literature review. There I will look at what the literature says about ICT4D, its history and importance within development today. I will also discuss different discourses of development and place which discourse my research applies to. Then I will look at the importance of integrating disaster and disaster management into the development agenda, before finally looking at how ICT can be used, and benefit, disaster management.

In the fourth chapter I will present my findings and review my research questions. I will look at how information about vulnerability, hazards and disasters are collected and dispersed to the general public. I will then continue to look at what ICT is being used in such activities and how it is used, before discussing how effective it is as a tool to enhance activities regarding raising public awareness about disaster management. Finally I will discuss both the challenges and the opportunities ICT bring with it regarding raising public awareness about disasters.

The last chapter will be the conclusion where I sum up my findings and refer to further research that can be done.

Method

In this chapter I will present the methods that I have used in my thesis. This will cover my research strategy and design, study scope, sampling, data collection and data analysis. I will also present ethical considerations I had to take and limitations to my research.

Research Strategy

In my research I have chosen to employ a mixed method research strategy. This means that I am using both quantitative and qualitative methods. The reason for my choice is due to the focus of my research. I wish to find out how ICTs are used as tools in raising public awareness as well as what make these ICTs effective in this matter. To do that I wished to both talk to employees of different agencies and organisations to hear what they were doing and how they were using ICT in their work, as well as the general public to fin out their opinions of the use of ICT in raising public awareness. The mixed method strategy fulfils the need in my research to give a more complete answer (Bryman 2008, p.613). With the employees I applied qualitative methods to get a greater understanding of what they were doing and how they viewed their work themselves. When reaching out to the general public I employ both qualitative and quantitative methods. I wanted both to know what they meant about the use of ICT, about what they viewed as benefits and challenges, however I was also interested in quantitative measures such as, how many owned a mobile phone, and how many had access to the internet. To accomplish this the mixed method strategy was chosen.

Research design

The design I have chosen is case study as I am concerned with a specific case, the use of ICT in raising the public awareness by ODPEM. Bryman (2008) state that a case study is concerned with the complexity of a singly case. According to Bryman (2008) what distinguishes a case study from any other research design is its focus on enlightening every aspect of a case. For this research I am looking at how ICTs are used as tools to raise public awareness and what makes them effective in this work. The case is also placed in a single location, Kingston, Jamaica. There are many aspects of to my research

objective, and to get the most complete picture a detailed study was most applicable. Yin (2003) states that case studies are appropriate when the focus is on a contemporary phenomenon. As my main focus is on ICT, this makes the case study even more relevant for me.

Study scope

My fieldwork was done over a period of three months in Kingston, Jamaica. I addressed employees of ODPEM, which is the main disaster management organisation in Jamaica, and which is also responsible for coordinating actions during and after a disaster. They also cooperate closely with the Government, technical agencies and other organisations. I also talked to employees of the Salvation Army and the Red Cross to get more comprehensive data regarding the use of ICTs in raising public awareness. In addition to interviews with them I also gave out questionnaires to a random selection of people to get an idea of the general opinions surrounding the use of ICTs in raising public awareness.

Sampling

Regarding interviewees with employees of ODPEM, the Salvation Army and Red Cross, purposive sampling was used. I wished to contact these specific organisations due to their role in disaster management in Jamaica. According to Bryman (2008) purposive sampling is samples that are chosen because they are relevant to the research questions. Regarding the questionnaires I sent out I used probability sampling. Bryman (2008, p.168) defines it as "a sample that has been selected using random selection so that each unit in the population has a known chance of being selected". It was a simple random sample that resulted in the responders of the questionnaires.

Data collection

Semi-structured interview

The interview I employed was a semi-structured interview. The reason for this was that I wished to cover specific subjects throughout the interview, but still keep it open for the interviewed to insert their opinions, definitions and understandings of different issues without me standing in the way of that. The interview was kept flexible and to a certain extent some issues were open for interpretation, as Bryman (2008) mentions,

qualitative interviews are interested in the interviewee's point of view. I applied this interview to all the employees in the different organisations that I met with. It allowed them to talk freely about what they were doing in regard to using ICT in their work, as well as letting them define, or have an opinion about, what was effective and what was challenging. In this way I got a better understanding of the interviewee's understandings of these concepts.

Questionnaire

To get the opinions of the general population I employed self-completion questionnaires. This means that the responders answer complete the questionnaires themselves (Bryman 2008). I gave out a total of 80 questionnaires through random sampling. Out of these 80 I got 51 in return, which compose the basis of my findings relevant to the general public. My questionnaire consisted of both quantitative and qualitative questions, to get the most complete picture of what the responders had to say about the use of ICT as tools within raising public awareness. It is clear that my sample size is inadequate for its purpose; I will come back to this issue in the limitations section.

Documents as sources of data

During my research I also reviewed and analysed documents. As I was interested in what researchers defined as effective use of ICT within disaster management I decided to also review the literature. In this way I was able to compare what the literature defined as effective and what the interviewee's defined as effective. That way I was able to view the similarities and differences between research and reality. Being able to view this difference sheds some more light on the matter and gives another aspect to my research.

Data analysis

As I have applied both qualitative and quantitative methods to my research, my method of data analysis will reflect this. I have had to use two data analysis methods to be able to analyse and discuss my findings. I applied both grounded theory analysis and univariate analysis to my data. Regarding my interview I recorded and transcribed them before analysing them by categorising themes and subjects for later discussion. The questionnaire was coded and applied to SPSS for simple univariate analysis. I wanted to

do more complex analysis of the questionnaires as well, however the sample size limited me.

Limitations

The biggest limitation with my research has been my sample size, both regarding the semi-structured interviews as well as the questionnaires. The sample size limited the amount of information I got to create a complete overview of how ICTs are used as tools regarding raising public awareness. I wished to talk to more relevant actors within disaster management in Jamaica, for instance with some of the technical agencies, government officials as well as volunteers for the different organisations. I would also have liked to observe some of the work they did with the general public in terms of training and sensitisations sessions. However due to my limited time, and due to the fact that it took place around Christmas, reaching everyone and organising interviews was difficult.

Regarding the questionnaires, that was a choice I made late during the fieldwork, which limited the reach and time I had to hand them out and get them back again. I wished to look more at relationships and causes behind the choices that the general public made, regarding for instance why they chose some ICTs over other for their source of information. It would have been exiting to look at to see if there existed any such relationships. Also with a bigger sample my findings would have been more relevant to the general public, however the results that I have found can imply that there might be some applicability to them, yet further research is needed to confirm that.

Another limitation to my research is in my questionnaire. There I did not question the responders about what they knew about disaster preparedness and what actions to take, but whether what they used to get that information and effective they felt it was. With a bigger focus on what they new I would have been able to not only look at what made ICTs effective tools regarding raising public awareness, but also if the general public learned from the information given out. I did however get some implications that there was increased awareness and people paid more attention to the information that is being dispersed.

Literature Review

In this section of my paper I am going to look closer at three parts of the theory and literature regarding my research. They are ICT4D, its history and development as well as the discourse surrounding development itself; the link between disaster management and the development agenda, why it is an important part in development management and how it can be integrated; and lastly how ICT is used in disaster management, its importance and application. I will finish with presenting the importance of raising public awareness and introduce my research on the use and efficiency of ICT for raising public awareness.

ICT4D

During the last decades the world has seen an incredible development within the field of information and communication technology (ICT). The amount of technologies available has increased immensely. For instance, in 1995 26 million people had a computer and access to the Internet, in 2007 this number increased to 1.3 billion (Kleine & Unwin 2009, p.1046), and today the amount of people with computers and access to the Internet is, according to ITU (2013a), 2.7 billion people. Similarly in 1995 there were 215 million mobile phone subscriptions, in 2007 this number increased to 3.3 billion (Kleine & Unwin 2009, p. 1047), and today there exists 6.8 billion mobile phone subscriptions, almost as many as the worlds population (ITU 2013a).

It is not only the amount of technologies available that has increased, but also the amount of *different* technologies to spread information with. The quality of the technologies has also improved and is continuously being developed, along with the necessary infrastructure, making ICT quicker, more reliable and cheaper. With new, more, and better technology follows more platforms to reach people on, making ICT widespread and accessible to a greater amount of people than ever before.

Due to this advance there exists euphoria about the potential use of newer ICT for development, or ICT4D. Kofi Annan stated in 1997 that;

> Recent developments in the fields of communication and information technology are indeed revolutionary in nature ... In such fields as agriculture, health, education, human resources and environmental management, or transport and business development, the consequences really could be revolutionary. Communication and information technology have enormous potential, especially for developing countries, and in furthering sustainable development (in Kleine & Unwin 2009, p. 1047).

Mobile phones, for instance, is seen as a particularly good resource for development as it is seems to offer the greatest benefits for the poor (Kleine & Unwin 2009). This is not only due to the amount of mobile phone subscriptions, but also because of its reach and penetration amongst the poorest people (ITU 2013a).

A challenge to ICT4D, however, is the uneven diffusion of technology and knowledge. This diffusion is not only geographical, but also social (Kleine & Unwin 2009, Heeks, 2009). There are communities and individuals who barely have access, or have no access at all, to ICTs. Kleine and Unwin argue that this in effect excludes them from the 'global knowledge society', as well as the social and economic society (2009, p.1048). Heeks (2008, p.26) emphasis this fact when he states that the "*economic, social, and political life in the 21st century will be increasingly digital, and those without ICTs will be increasingly excluded*". The poorest are being left out and falling behind. Still, many researchers see a possibility for newer ICT to leapfrog older technologies, such as landlines, and help the poorest countries catch up with industrialised countries.

One can argue that using phrases such as 'leapfrog' and 'catch up' can imply a too simplistic view on the issue of ICT4D and development itself, and that these phrases are too 'Western' ideas. To 'leapfrog' and 'catch up' may imply that development is linear and hence poorer countries are inferior to industrial ones and in need of upward development (Wilson; Avgerou 2010). Are they really in need of 'leapfrogging' and 'catching up', and does not this undermine their basic needs and knowledge? This will be discussed later on in the paper, but it is important already now to acknowledge that meeting the basic needs of the poorest populations on earth are of great importance, and that transmission of technology and knowledge is not the answer. Yet, ICT can be useful tools in assisting the poorest communities with their basic needs. Unwin (2009) also

argues that due to the rapid development of ICTs the last few years it is important to make sure that ICT does not become yet an avenue where they are disadvantaged.

ICT is not a new concept, throughout the history of mankind communication has been important, and technology to convey information has been developed and evolved. But also historically information and technology has been under the control of certain populations and diffusion has been widely uneven. During the colonial era the diffusion was highly cultural. In the colonies the transfer of technology and the control and ownership of them, lied in the hands of Europeans. Only they were trained in using the technology, and entrepreneurship was encouraged. On the other side, the local communities and populations were denied training and entrepreneurship was discouraged. A dichotomy was created between the 'civilised' and the 'backward', a view that is still held today by some (Kleine & Unwin 2009).

In his inaugural address President Harry Truman put development on the global agenda. Focus on the poor and poor countries and how to get them out of poverty became a new global development discourse. This development discourse focused on economic growth through modernisation and technological innovation. He mentions in his address how development is closely intertwined with technological progress. This is confirmed in Rostow's model of economic development where he also emphasizes the importance of technology and technological innovation. In this discourse development assistance is the same as technological assistance (Kleine & Unwin 2009).

This belief in technological development to overcome poverty was either naïve or cynical; naïve, in that the belief in such a simple solution would work; cynical in that it could be viewed as Western countries finding new markets (Kleine & Unwin 2009). This is also mentioned by Unwin (2009), who discusses the impact of capitalism and capitalist enterprises impact on the development agenda. Capitalism has been a driving force of globalisation, where the search for cheaper raw material and labour as well as possibilities for expanding markets has led the way (Unwin 2009). As ICT has developed so has a greater scale and speed of accumulation of capital developed, increasing parallel to the technological innovation. As Unwin writes "information and communication have always been valuable, and those in positions of power have regularly sought to develop

technologies to ensure that they retain advantageous access to it" (2009, p.16). Heeks also argues this point, saying that IT has been, and still is, a tool for delivering economic growth to the private sector (Heeks 2008, p. 26).

Along with capitalism and globalisation, intellectual property rights have emerged. Both information and knowledge are commoditised, and with the further development of ICT this commoditisation increases (Unwin 2009). Unwin shares his concern about the use, and abuse, of intellectual property such as copyright and patents, as a threat to the open Internet (2009, p.24). He also argues that powerful interests ensure not only the control of information and knowledge, but also who uses it in order to maintain their power (2009).

Due to the potential of ICT for development, the work and research in the field goes on. There lives an ideal of how ICT can be best incorporated into development agendas and projects, and there has been a shift of focus from gaining capital for the richest countries to the needs of the poorest populations (Unwin 2009; Kleine & Unwin 2009). Yet many of the projects have failed and in the global picture some have even accentuated the inequalities rather than reduce them.

The practice surrounding integrating ICT into development projects might have some answers to where the problem lies. For many decades the traditional development practice has involved bringing information from the 'knowledge elite' (Kleine & Unwin 2009) to the less well-informed groups. It has been mostly top-down, externally imposed projects, which have focused on the transmission of information and technology. Many of the initial ICT projects in the early 2000s were ICT centres. They were quick to start up, they gave tangible evidence of the their achievement, they provided information to the poorer communities, and sales for ICT companies (Heeks 2008). However these centres were replications of what had existed in Europe, and the information available to the poorer populations were seldom relevant. Transmission of information and technology, and top-down practices are not the solution. They have failed again and again. Inclusion of the communities these projects are for is important. Listening to their needs, their knowledge, and including them in the process, or even letting them take control and initiating projects of their own, is the way to go.

In which ways and in what arenas can ICT be used for development? Before answering that question it is important to discuss what is meant by development in this context. Which discourse one chooses to follow will have a great impact on the choices made in development practices, as well as which kind of practice one decides on. Also, depending on the discourse chosen, the outcome and measurement of success of projects will be different. In the field of ICT for development the 'for' (or '4') forces us to be explicit of what we mean by development and which discourse we follow (Kleine & Unwin 2009).

As mentioned, President Harry Truman's inaugural address is by many seen as the starting point of the international development agenda, and a new way of looking at international relationships. In point four of his address, President Truman talked about the issue of development and how we, as a global society, had a responsibility to take care of and help the poorest countries and communities of the world. His main focus within development was an economical one, believing that economical growth would end absolute poverty (Rist 1997).

Central to the idea of development is progress and growth, a progress and growth from poverty and exclusion, to wealth and inclusion. There is a belief that if politics, economy, science and technology are brought together the world could be rid of poverty and become a better place (Unwin 2009). However, this is a very European concept and cannot be applicable in all circumstances or in other regions.

Within the development agenda classifications such as 'developed' and 'underdeveloped' has come about, where industrialised countries are the yardstick for development (Wilson n.a.). The underdeveloped have in a lot of literature been classified as people living in poverty who are handicapped when it comes their own development and therefore victims of underdevelopment. Development would then mean an increasing wealth from resources within their own countries that they have been unable to access, manipulate and use themselves (Rist 1997). This then justifies intervention by developed countries, as they are the ones viewed in this discourse as those who can make the resources available.

This discourse reflects the early view on development. Developed countries, with the USA in the lead, defined a problem they saw in the poorest countries and also developed a solution (Wilson n.a.). With the industrialised countries as the yardstick for development, there was a hope that it would be possible for the underdeveloped countries to catch up (Wilson; Rist 1997). This hope of catching up implies that there are development stages and a linear progress to go through to achieve development (Wilson n.a.). This viewpoint has been highly critiqued by many authors and researchers who argue that it is too simplistic and does not take into consideration sociocultural differences and the complex international structures and politics (Wilson; Kleine & Unwin 2009; Rist 1997).

The traditionally main focus on development has been on economic development, as President Harry Truman is an example of. The reason for this is that poverty itself was in the beginning only looked at as an economical problem (Unwin 2009). This view has also been dominant in development discourses where the underdeveloped have been seen as economically backwards (Rist 1997). This was a clear and precise problem with a similar clear and precise solution, economic growth. It was assumed that there was a possibility to make a significant change.

The European Economic Order became the solution to underdevelopment as it addressed the issue of economic growth and basic needs (Rist 1997, Unwin 2009, Kleine & Unwin 2009). The aim of development was to increase production, and this economic development discourse assumed that everyone would get the same according to their output (Rist 1997). This is not the reality as there will always be differences and inequalities between individuals and societies when it comes to economic gain due to sociocultural differences and different national policies and regulations.

As mentioned, a lot of the critique towards this discourse has been on its simplicity and lack of context. Unwin (2009) argues that poverty is not only an economical issue, there are many more factors involved which are shaped by the cultural and social context of the different societies. Rist (1997) has a similar argument about how there is no consideration for the historical and social context of the different societies. Hobart (1993, in Wilson n.a., p.3) argues that this discourse "produces ignorance, since the

underdeveloped are positioned such that they come to depend on the information and knowledge of the development experts to assist them in their quest for progress and catch up". Wilson (n.a.) adds to the critique that local understanding knowledge and experience is in this setting devalued.

The development discourse is clearly a problem, not only does it simplify the issue of poverty, but it also disregards and puts limitation on human and local capacities. Tucker emphasises this point and states "Overpowered by the hegemonic discourse of the West, Third World societies are stunted in their capacity to articulate their own identities and worldviews" (1999, p.13). The biggest problem with this discourse is that it is, as mentioned earlier, a European concept. Western economic models influence it with few possibilities for alternative use, and it has created dependency amongst the poorest countries receiving aid. Development is not transcultural, and economic policies and socioeconomic accomplishments of the west cannot be replicated (Tucker 1999).

Globalisation and these development practices reflect Western capitalism and reproduce Western hegemony by minimising costs and maximising the market through access to cheaper labour and new markets. This hegemony is also reflected in the traditional dissemination of information and knowledge and the creation of dichotomies between knowledgeable experts and the less knowledgeable, North and South, developed and underdeveloped (Unwin 2009, Wilson n.a., Tucker 1999). There is a need for a discourse derived from mutual acceptance, inclusion and respect between the richer and the poorer countries and societies.

ICT has always been a part of development discourses and practices. In President Truman's inaugural address he puts forward development as a technical modernisation. This was of course linked to economic development where he saw technological innovations as tools towards modernising the economy and societies, and eventually would lead to increased growth and productivity (Kleine & Unwin 2009).

Until the latter part of the 20th century ICT was important in the development discourse, but during the late 1900s it emerged as a distinctive field (Unwin 2009). Mansell and Wehn (1998 in Kleine & Unwin 2009) encouraged governments to develop national ICT

strategies, and these strategies where to focus on economic growth, in line with the development discourse of the time. 'Catch up' and 'leapfrogging' became much used terms in this field. A lot of the time 'catch up' and 'leapfrogging' are mentioned in research papers ICT is highlighted as a possible way to accomplish that (Wilson n.a.). Even though it has been widely criticised for implying distinctive stages of development, it is still found in ICT4D research. There is a need to question the discourse and its assumptions to be able to able to find alternative approaches and outcomes.

During the last two decades the approaches to development has shifted from economic growth and basic needs to rights and self-empowerment. It has changed from "identifying and meeting needs, to enabling people to recognize and exercise rights" (Cornwall & Nyamu-Musembi in Kleine & Unwin 2009, p. 1056). Following such an approach and reaching the goal of self-empowerment is incredibly difficult due to the existing development assistance structures. Yet, even though it is little, there is some progress. ICT can for instance be important in minimising the exclusion of the poorest populations. Due to its speed and power, development practices and activities can be undertaken at greater scales than previously. ICT can enable development practices to reach a larger number of people at low costs. ICT can enable a more democratic form of communication, and knowledge production. According to Kleine & Unwin (2009) and Heeks (2009), advances in mobile telephony have an enormous potential for the democratization of digital technology. Yet another area where ICT can be very useful tools in enabling self-empowerment is in the expansion of citizen journalism. This can be seen in social networking and blogging amongst other things. The potential lies in the speed and reach of information on the Internet across the world.

Due to the potentials of ICTs and how they can enable empowerment amongst the poor, Unwin (2009) argues that ICT4D should be based on a primarily moral agenda. The goal should not be to gain new markets and access cheap labour, it should not focus on economic growth, but it should focus on the inclusion of the poorest societies and their empowerment. New technology can be a part of transforming the traditional development models described in this paper.

What has been mentioned several times already here, and which is on of the main critiques of the traditional development discourse is the external imposing of top-down solutions that are primarily European in nature. What is needed is a more participatory approach. When discussing development practices, the needs of the community and how to approach them, there should be input from the locals to help them develop a local solution to a local problem. The local context is incredibly important; with no regards to that development projects and practices are likely to fail. Working with local communities, including them and valuing their knowledge and experiences, would be a great asset to any development work. In that way information and practices would be more relevant to the community and the context that they are in (Wilson n.a.). There is a need to respect cultural diversity, yet not justify injustice.

There is of course critique directed at the use of ICT4D as well, some similar to the general critique against the traditional development discourse. For instance Wilson (n.a.) critiques that ICT4D is just a technical solution to underdevelopment without regard for the complexity of international and national politics, as well as the local context. Access to ICT does not imply access to necessary information or the capability to understand and use it. Telecenters are an example of the transmission of technology and information with little or no relationship to the context of the area. As Rose (1999 in Wilson n.a.) points out, there is a problem of constructing appropriate technology and information. Valuable information will be regarded differently from context to context, and especially between cultures. It is important to include and not overlook local knowledge, also the knowledge and information found outside of the ICT realm (Wilson n.a.).

Another area of critique is directed not at the practices themselves but at the international donor agencies. Even though some organisations and groups include the local communities and make the practices relevant to the context they are in, the funding they get are from international donor agencies who might have different agendas and can determine the issues that are to be dealt with. Still today, what are deemed appropriate development practices are very much in the hands of international donor agencies, national governments, global corporations, and others in power (Kleine & Unwin 2009). Large amounts of websites dedicated for development are for instance

rarely visited and exemplifies the failure of making ICT4D relevant. By being more inclusive and value the different context and knowledge, successful projects and activities can come out of it. For instance activist videos on YouTube can have an impressive momentum.

Some will argue that ICT is not the most critical development issue and that basic needs such as food and healthcare are much more important (Wilson n.a.). However some will argue that ICT is no longer an issue you can choose to include or not, and that ICT is becoming a new area of division and exclusion to the extent that it has to be taken seriously and included into development practices (Unwin 2009). If one choose to value ICT important in development practice it is vital to not assume that ICT would be the solution to all poverty related problems. ICT disadvantage is only another factor of poverty (Wilson n.a.).

A lot of the critique towards ICT4D can be seen as critique to ICT4D 1.0 (Heeks 2008). The ICT4D practices were influenced by the traditional development discourse focusing on economic gain and liberal democracy, implementing top-down projects that more or less were replications of earlier European practices. There was a lot of innovation diffusion without regard for the local context. However there is a change being seen, which is regards much of the critique towards ICT4D. There is a bigger focus on using ICT to empower poor people and marginalised communities, and new practices have developed. For instance ICT4D has developed and opened up for practices like e/m-government, online and mobile activism, online and mobile education and the use of ICT for economic growth and disaster management. This is the development discourse this paper is a part of.

My focus in this paper is on the use of ICT in disaster management, in particular public awareness programmes. In this next section I will therefore look at the discussion that has been going on about the importance of including disaster management in the development agenda. Disaster affects billions of people, most of them highly vulnerable and living in developing countries, and it affects all levels of society. Hence it is of great importance that disaster management is integrated into the development agenda.

Disaster and Development

During the last decades there has been a dramatic rise in disasters and the number of people being affected. Between 2000- 2010 there had been around 2 500 disasters, which have affected billions of people (UNDEP 2010). Natural disasters cause great damages by destroying infrastructure, displacing populations, and have major effects on the ecosystems and the people who rely on them for their survival. Not only does it bring physical destruction, but natural disasters also have huge costs attached to them. According to ISDR (2002) the cost of a natural disaster will reach $300 billion annually by 2050. This price tag does not only include the direct costs of damages, there are also great secondary economic losses in many of the countries most affected that is included, I will come back to this later.

Of importance regarding natural disasters is the fact that countries and populations are affected disproportionally. There is an increasing number and seriousness of disasters affecting poor countries and communities (DFID 2005; UNDEP 2010). The most vulnerable groups within a country or community, including the very poor, women, children and elderly, are also disproportionally affected. Part of the reason is that many of these vulnerable groups reside in high-risk areas and are also very dependent on natural resources from the environment. More than 11% of people exposed to natural hazards live in low human development countries, yet they account for more than 53% of all natural disaster deaths (DFID 2005; Ahrens & Rudolph 2006). The main reason behind these high numbers is linked to their vulnerability that limits, or has eliminated, their risk reduction capacity.

When assessing the impact a natural disaster has had on a country, the main focus is on direct economic, physical and human losses. As mentioned, developing countries are disproportionally represented in disaster losses, this includes not only human losses, but also physical and economical. For instance, the percentage of economic loss in relation to the Gross Domestic Product is much greater in developing countries than developed countries. In 2012 the USA, China and Italy were hit hardest by natural disasters in pure costs, but compared to the how the costs related in percentage to the GDP, low and low-middle income countries were on the top (Guha-Sapir et.al. 2013,

p.14). These effects do not only hit developing countries the hardest, but small island developing states are most prone to such damages, which is evident as the top three countries hit hardest economically regarding GDP are all small island states (Guha-Sapir et. al. 2013, p.14).

However, direct losses are only part of the picture, often just a small percentage of the total loss. Many indirect and secondary effects go unrecorded (ISDR 2006; Schipper & Pelling 2006). From an economic standpoint indirect impacts could include the loss of production time or market share, and secondary impacts could include increased debt and inflation (Schipper & Pelling 2006). In many cases within the informal sector women's work is hit the hardest, however it is difficult to assess and is critical to the long-term household recovery (ISDR 2002. p.2). Another serious economical affect of natural disasters is the allocation of capital within the national budget towards relief and rehabilitation (Schipper & Pelling 2006). However, these indirect and secondary damages, though difficult to assess, should not be neglected, as they often are more disruptive for a society than the initial direct damages.

So, what is a disaster? According to CRED (Centre fro Research on the Epidemiology of Disasters) a disaster needs to fulfil one or more of these criteria:

- 10 or more people have died
- 100 or more people have been affected
- A country declares a state of emergency
- A country calls for international assistance (Guha-Sapir et.al. 2013, p.7)

They also distinguish between different types of disasters (Guha-Sapir et.al. 2013). The two main types of disasters are natural disasters and technological disasters. In the course of this paper the focus is on natural disasters. Natural disasters comprise of different sub-groups; geophysical, meteorological, hydrological, climatological and biological, all of which are related to the natural environment and climate.

A disaster cannot only be defined by what it comprises, but should also include why it occurs. A disaster does not occur by itself. A natural hazard is the first part to a disaster.

Without any risk or exposure to natural hazards there is not any danger of natural disasters. However a hazard does not make a disaster, it has to be met by other criteria as well. Vulnerability is the last piece of the puzzle. When a vulnerable population is exposed to a natural hazard, it is likely that this hazard can turn into a disaster. The risk level for a disaster is the vulnerability of a population plus the intensity and probability of a hazard (ISDR 2002). Due to their vulnerability they will have, as mentioned earlier, limited or lacking risk reduction mechanisms, and a hazard could exceed a country's or a community's coping capacity. That is what causes a disaster. As defined by DFID (2005, p.2);

> "A disaster is a severe disruption to a community's survival and livelihood systems, resulting from people's vulnerability to hazard impacts and involving loss of life and/or property on a scale which overwhelms their capacity to cope unaided"

Increasing the risk reduction capacity and coping capacity in the face of a disaster within developing countries, and building resilient societies and economies is a priority in the international agenda, which is evident by the increased research and focus on disaster management the last couple of years.

Part of the equation leading to disaster is hazards. According to Ahrens & Rudolph (2006, p.207) hazards are:

> "Potentially damaging physical events, phenomena or human activities which may cause the loss of life or injury, damage property, disrupt processes or lead to environmental degradation".

Good coping capabilities are required for a country or a community to withstand the effects of a hazard. The limitations of such coping capabilities are often what turn a hazard to a disaster.

As mentioned previously, the focus in this paper is on natural disasters. A natural disaster often stems from a natural hazard. The word "natural" implies that the hazards are weather related or geophysical. The same way as there were different sub-categories of natural disasters, there exists the same sub-categories of natural hazards; geophysical, meteorological, hydrological, climatological and biological. One can argue to

what extent natural hazards are entirely natural as hazards often are the result of interference between people and the natural environment (Stolzenburg 2007).

To use the UNISDRs definition of a natural hazard it is;

> "Hydro-meteorological, geophysical and biological occurrences in the biosphere that may evoke a damaging event, by taking into account that they are a result of the combination and interaction of natural factors of human activity" (Stolzenburg 2007, p.7)

In this paper the focus is on natural disasters, but looking at natural hazards isolated from the other types of hazards as one of the causes of disasters, does not portray a correct picture. Natural hazards are not isolated from other types of hazards, and often it is the combination of these that increases the intensity of the combined hazard threat on a country or community (DFID 2005).

The intensity and vulnerability towards a hazard affects the risk of disaster. So what affects the intensity and vulnerability towards a hazard? There are three main factors for increased hazard intensity and vulnerability. They are natural cycles, environmental degradation and climate change. Natural weather cycles can affect increased hazard intensity. First of all increased hazard intensity can come as part of the natural cycle. Secondly, some areas are exposed to continuous hazards that can damage natural elements such as mangroves, reefs, dunes and soil stability (ISDR 2002). The damage of such elements not only increases the intensity of hazards, but can also create susceptibility to new hazard such as land- and mudslides and increases the vulnerability towards hazards. Areas that have not previously been exposed to hazards may be after such damages.

As the environment clearly plays a vital role for human-well being, degraded and poorly managed ecosystems can lead to increased intensity and vulnerability towards hazards. The people and communities who have control over, or are dependent upon, these ecosystems can cause deforestation, land degradation and other natural resource degradation (ISDR 2002). Not only does local or national management affect the environment, but it is also affected by global environmental change, which is being driven by human development and growth (Schipper & Pelling 2006). Examples of this

are urbanization and migration (which puts a lot of pressure on the environment and often leads to degradation), globalisation (increased request for natural resources) and climate change. Environmental degradation increases the intensity an vulnerability towards a natural hazard and is often the factor turning the hazard into a disaster (ISDR 2002, p.4)

The third factor that affects the intensity and vulnerability to hazards is climate change. Climate change is one of the biggest problems facing human development today. According to IPCC (2007, p.30) climate change is any change in climate over time whether naturally or man-made. Drivers of climate change are changes in the atmospheric concentration of Green House Gases (GHGs) and aerosols, land cover and solar radiation. When these drivers change they affect the balance of the climate system and cause climate change (IPCC 2007).

GHG emissions have grown rapidly since the industrial revolution. Industrialised countries are over-using non-sustainable resources that are causing, amongst other things, pollution, leading to changes in the environment and the climate (ISDR 2002). There is now a consensus amongst the majority of researchers that climate change and in particular global warming is man-made (ISDR 2002; IPCC 2007; Lomborg 2007). Human activities result in long-lived GHGs, and the most important one of them is CO2. Concentrations of anthropogenic GHGs in the atmosphere have increased markedly since 1750 (IPCC 2007). The effect of human activities on the climate has in particular been one of warming, but they have also had an affect on wind patterns and precipitation (IPCC 2007).

The changes seen in extreme weather events the last 50 years have been more hot days and nights, including frequent heat waves, increased heavy rainfall and extreme high sea levels, and increased tropical cyclone activity, especially in the North Atlantic (IPCC 2007). These weather events are "*very likely*" to continue to increase in both frequency and intensity (IPCC 2007). Climate change, and the extreme weather events that follow, impacts natural resources and human health the most, two aspects that are vital in the poorest countries and communities (Schipper & Pelling 2006). Therefore, although climate change is a global event, the effects are disproportional affecting the most

susceptible and vulnerable populations, who in most cases also are the poorest populations.

Natural cycles, environmental degradation and climate change, all affect the intensity and vulnerability toward a hazard. Some of these effects on hazard intensity and vulnerability are man-made, so by focusing on activities and projects to reduce this, one can reduce the risk of disaster as well.

Hazards affect the poorer countries and communities disproportionally. This is due to the vulnerability and limitation or lack of capacity to reduce risk towards hazards and disasters. As I have mentioned hazards, which can be part of natural cycles or caused by environmental degradation and climate change, affect the vulnerability of countries and communities. The disasters that may follow such hazards show how natural disasters are anything but natural. Not only can hazards be man-made, but they also affect vulnerability, so when a disaster occurs these two non-natural elements are often part of the equation.

Vulnerability is what turns a hazard into a disaster. People's exposure and susceptibility to hazards by itself will not cause a disaster, but if the people are vulnerable, meaning their coping mechanisms and risk reduction capacities are limited or lacking, a hazard could quickly turn into a disaster. A country's or a community's vulnerability reflects their social, economical, political and environmental situation, which is linked to both national and international policies (DFID 2005; Ahrens & Rudolph 2006; ISDR 2002). One can say that vulnerability is the degree to which these systems are susceptible and resilient to the impact of natural hazards.

As mentioned, the most vulnerable populations are the poorest populations. An increasing number and seriousness of disasters are affecting the poor countries and communities disproportionally. More than half of disaster deaths occur in developing countries, even though they only represent 11% of people exposed to hazards (DFID 2005, p.1). What causes this vulnerability, and why are the poorest populations the most vulnerable?

A combination of several factors leads to vulnerability; exposure and susceptibility to hazards, poverty, conditions of human settlements and infrastructures, public policy and administration, globalisation, and even development and development practices. Also, inequality and development practices that do not take into account the susceptibility to hazards, would affect a country's or a community's vulnerability. All these factors affect the coping mechanisms and risk reduction capabilities of a country, which in turn make them vulnerable (DFID 2005; ISDR 2002).

Exposure to hazards and susceptibility to hazard impacts, as I have already discussed, is a part of what causes vulnerability. Hazards can cause vulnerability as well as exacerbate vulnerabilities. Natural cycles, environmental degradation and climate change are all part of this.

Another factor of vulnerability is poverty. DFID (2005) argues, alongside other researchers, that poorer people tend to be more exposed and susceptible to hazards as well as suffering greater relative losses. These populations often do not have the capacity or the knowledge to cope with, or reduce the risk of, hazards. Poverty and vulnerability are also integrally linked to one another. Poor people are often dependent on the surrounding environment and its resources, causing them to exploit natural resources, or even forcing them to live in risk prone areas. This increases the risk and exposure to hazards such as floods, droughts and landslides (ISDR 2002). Repeated exposure to such disasters can lead to chronic poverty; the poor exploit the environment making them vulnerable to hazards, their vulnerability causes the hazard to become a disaster forcing them to exploit the environment even more, and so on (ISDR 2002 p.5).

The poor often live in high-risk areas. Due to poverty and social and economic pressures many are forced to live in dangerous locations because nothing else is as cost efficient or as close to employment (ISDR 2002; UNDEP 2010). For the past three decades there has been a rapid urban growth. The urban populations in developing countries had tripled to 1.3 billion in 2002 (ISDR 2002, p.6), and in 2010 the number had doubled to 2.6 billion people (DESA 2011, p.1). Rapid urban growth is one of the factors contributing to increased vulnerability by causing pressure on scarce land, deforestation, lacking urban

infrastructure, and soil degradation leading to unstable slopes and hillsides (ISDR 2002, p.6).

National governance and administration will affect the vulnerability of a country. In poor and developing countries that lack administrative, organizational, financial and political capacity to cope with disasters, vulnerability is high (Ahrens & Rudolph 2006). To be able to cope with disasters, and disaster risk, policies and regulations must be in place. Failure within government institutions to implement and enforce public policies that would be beneficial for the economy, social development and sustainable livelihoods, would increase their susceptibility and vulnerability towards disasters (Ahrens & Rudolph 2006).

It is not only national policies and regulations that affect a country's vulnerability, but also international ones. International trade and capitalism is, according to Schipper & Pelling (2006), two factors that have severe impact on developing countries vulnerability. Inequality within international trade undermines rural livelihoods in poorer countries. Capitalism and the competition for foreign direct investment are causing some developing countries to neglect labour rights and environmental standards to achieve the greatest monetary gains and become a part of the international arena.

O'Brien & Leichenko (in Schipper & Pelling 2006, p.28) argues that international policies and regulations not only increases a country's vulnerability by affecting their coping mechanisms, but it also leads to "double exposure". Than means that, for instance, a farmer could be vulnerable to both market fluctuations and natural hazards. If the farmer already were struggling within the market, a disaster would aggravate the situation even more. While other farmers who are not as vulnerable to any of those situations would come out of the same situation very well, reinforcing the path to poverty for the more vulnerable.

Even though development sounds like a good thing, development, and failures within development, can increase vulnerability towards hazards (DFID 2005). It could be, as mentioned, government and institutional failures due to shortage of skills or corruption,

as well as national and international institutions influenced by powerful countries with powerful interests (DFID 2005, p.3). Increased vulnerability can come from other development processes as well such as rapid liberalisation of agriculture markets, running down of state-run social protection schemes, decline of informal safety net mechanisms and poor quality and maintenance of vital infrastructure (DFID 2005, p.3) Other development processes can lead to environmental degradation, for instance, pollution, deforestation, and destruction of protective mangroves, making countries more susceptible and vulnerable to hazards and disasters. As argued by Schipper and Pelling (2006, p.23):

> "Development has increased people's exposure to hazard via the creation of unsafe urban hill slopes, coastal fringes or other marginal areas. Privatisation, public sector retrenchment and liberalisation have pushed many people into poverty, while simultaneously reducing the state's capacity to provide social safety nets, thus increasing vulnerability to disaster"

Even efforts to reduce risk can increase vulnerability. Relocation schemes are one example of this, where families and communities are moved and their social networks and livelihoods are disrupted (DFID 2005). Humanitarian relief can also exacerbate risk, as in many cases the money and funding that goes to relief work is allocated from other development issues, and focus on sustainable development is not a priority, leaving less money and focus on that area (Schipper & Pelling 2006).

All these factors, exposure and susceptibility to hazards, poverty, conditions of human settlements and infrastructures, public policy and administration, globalisation, and even development and, lead to increased susceptibility and vulnerability towards hazards and disasters. Disaster and vulnerability are also circularly linked. As vulnerability can lead to disasters, so can disasters contribute to and exacerbate vulnerability, such as unemployment, political instability, national economy, and risk reduction and coping capacities.

There is definitely a close correlation between environmental degradation, increased demographic pressure, human vulnerability and the intensity of a hazard and the impact of disaster.

Many view disaster as beyond human control resulting in an attitude of powerlessness. However, as discussed, disaster is not a natural phenomenon. Disasters are the result of the combination of susceptibility to hazards, hazard intensity, vulnerability and limited, or lack of, coping mechanisms and capacity to reduce risk. It disrupts all aspects of the livelihoods and functioning of a country or community, and in recent decades there has been a dramatic rise in disasters and numbers of people affected. As discussed above, the most severely affected are developing countries due to their high degree of vulnerability. They are highly susceptible to hazards and due to poverty, poor governance, social instability and lacking coping mechanisms and risk reduction activities they are highly vulnerable.

As mentioned earlier, increasing and improving the coping mechanisms and risk reduction capacities of vulnerable countries is high on the international agenda. Why is it important that disaster management be incorporated into the development agenda? First of all, there is need for a short look at what disaster management is. Disaster management is not only relief efforts it is also risk reduction. It is important not only to react when a disaster hits, but also prepare for them (Ahrens & Rudolph 2006). Stolzenburg (2007, p.22) divides disaster management into four phases, mitigation, preparedness, response and recovery. Here risk reduction encompasses mitigation and preparedness. Risk reduction needs to be incorporated into the human, social, economic and environmental dimensions (Ahrens & Rudolph 2006; ISDR 2002). This is because of the reach and impact of disasters. They impact and disrupt every human and social dimension, hence risk reduction programmes and policies must be in every dimension so that capabilities increased and vulnerability decreased.

Change in climate is affecting natural hazards, and vulnerability to hazards is increasing due to rising poverty, growing global populations and other underlying development issues. The measures taken to reduce risk should be aimed at reducing vulnerability, and as argued vulnerability is a developmental issue. Risk reduction, and disaster management in general, should be at the centre of the development agenda. Disaster reduction policies need to be implemented, and sustainable development should be the focus (ISDR 2002).

Looking at the relationship between disasters and the goal of achieving the Millennium Development Goals (MDGs) emphasises the importance of disaster management in development efforts. Disasters have direct consequences for meeting the MDGs (Ahrens & Rudolph 2006; DFID 2005; Schipper & Pelling 2006). Not only do disasters hold back progress towards achieving the MDGs, but also, as discussed above regarding vulnerability, disasters can be rooted in development failures.

All MDGs are affected by disasters. While MDG 1 seeks to eradicate poverty and hunger, it is exactly those two issues that are affected the worst during a disaster, which in most cases only exacerbates the problems. Within families sending children to school after a disaster could be a struggle, either due to shifts in priorities or the destruction of infrastructure (MDG 2). Disasters affect women and girls disproportionally with heavier responsibilities and workloads, poorer health, which is also associated with increased domestic violence and sexual harassment (MDG 3 & 5) (DFID 2005, p.3). Children are amongst the most vulnerable populations when a disaster occurs, affecting MDG 4.

Disasters cause direct and indirect damage to health infrastructure, making it a struggle to achieve MDGs 4 and 6. Many people in developing countries are reliant on the surrounding environment, coupled with increased pressure on it either by the need for food or increased urban populations, disaster would have a sever impact, and also exacerbate any already existing pressures (MDG 7). Finally, disasters set back many developing nations economically, this is most true for small island states, and any partnerships that are made with other countries or international organizations could be affected (MDG 8) (DFID 2005, p.3)

Due to all these set backs towards achieving the MDGs because of disasters, it is evident that development management needs to be incorporated into development efforts. Also efforts towards reaching the MDGs are slowed by resources and funding being allocated from development projects to short-term disaster response (Schipper & Pelling 2006). However, many development specialists see disaster only as a small concern for the majority of developing countries, and only a large concern in the most hazard prone countries. Hence disaster management, along with the funding, tends to be looked at as a humanitarian issue, a relief issue (DFID 2005).

Why do development policies and experts tend to overlook disaster management? According to both DFID (2005) and Schipper & Pelling (2006), the reasons relate to incentives, institutional and funding structures, assumptions about risk reducing capacities and inadequate exposure to and information on disasters. Incentives are against disaster management because of its long-term, low-visibility process, with no guarantee for any tangible rewards in the short-term (DFID 2005; Schipper & Pelling 2006). There is also a perceived competition with humanitarian relief efforts, as the rewards are visible in the short-term. Both donors and politicians are more responsive to short-term emergency relief efforts than longer development efforts to reduce vulnerability (DFID 2005; Schipper & Pelling 2006; ISDR 2002). Another important issue to be aware of is that relief efforts can exacerbate risk due to its focus on short-term results. In the midst of relief and recovery efforts, the local leadership, governance and technological capabilities that would be important for the long-term recovery, can end up being sidelined and overlooked (DFID 2005).

However, short-term emergency relief efforts are just that, short-term. It is an important part of disaster management, but it is only part of the solution. As has been discussed throughout this section of the paper, disasters run much deeper than the visible direct impacts. Disasters have sever indirect impacts that are much more harmful and disruptive, especially in the long-term, for developing countries. So the need to focus and fund all aspects of disaster management is vital for the most vulnerable countries and communities.

Inadequate exposure to, and information on, disasters and disaster issues is also a big problem needing immediate attention. As Schipper and Pelling argue (2006, p.26):

> "When disasters are seen as the outcome of accumulated risk produced by years of vulnerability and underlying hazard, the case for preventive action can be made more plainly. Contributing to such problems of perspective is a lack of data on vulnerability, hazard, risk and disaster losses"

Not only is the information lacking but also the information given has been inadequate. Yap (2011) argues that the information that has reaches the general public portrays disasters as events of large magnitude and enormous loss of life and property. This

affects the mind-set of those working with normal development decisions regarding infrastructure and production making them unaware to the potential hazards or vulnerability the may create.

The issue of climate change, which is related to disaster risk, is also a discourse that tends to be overlooked, both within the development agenda, as well as within disaster management (Schipper & Pelling 2006). This is due to the uncertainty of climate change's effect on extreme weather events. However it is certain that it effects the environment and hence peoples susceptibility and vulnerability towards hazards, and there is also some certainty that it has an affect on increased intensity of storms and tropical cyclones (IPCC 2007). Addressing climate change in disaster management is important.

How should disaster be addressed in the development agenda, and what is the best way to integrate it? Disaster penetrates all human and social dimensions, integration of disaster management is important. If applied correctly disaster management should strengthen livelihoods, as well as reduce susceptibility and vulnerability to hazards. Just by including small administrative changes such as risk assessment into development projects can make a big difference. However, bigger actions are needed to truly integrate disaster management into the development agenda.

ISDR (2002, p.7) writes that disaster management is "gender-sensitive, multi-sectoral and interdisciplinary in nature and comprises a wide variety of interrelated activities at the local, national, regional and international level". Hence, a variety of fields and spheres need to be addressed in development policies to reduce disaster risk. There is need of political commitment, financial planning, institutional reform, improved analytical and methodological capabilities, gender-sensitive regulatory and legal measures, education and awareness (ISDR 2002, p.7).

Obtaining the commitment from public authorities is vital for any kind of implementation or action to take place. In many hazard prone countries it is exactly the lack of commitment from public authorities that exacerbates their vulnerabilities. According to ISDR (2002) what is needed is increased inter-sectoral coordination at all

levels, risk management strategies, allocation of appropriate resources including development of new funding mechanisms, and policy integration. DFID (2005, p.6) concur with ISDR and argue, "Agreements with governments on programme and project level funding, and to some extent on direct budgetary support, offer potential entry points for promoting disaster risk reduction".

The next step that should be taken is capacity building and strengthening of institutional arrangements at all levels (ISDR 2002, p.9). This step should include the development and integration of a holistic disaster management plan. It should address risk assessment, early warning systems, training and public awareness programmes, including emergency response management, recovery resources, and the strengthening of community based organisations (CBOs) (ISDR 2002). Sustainable management of the environment should also be included in the plan.

As Schipper and Pelling (2006) argue, mainstreaming and integration of such disaster management policies and plans lead to a more holistic plan of action that would benefit all human and social spheres. Yet some believe that such mainstreaming is unnecessary, as adequate development would reduce risk. However, as discussed above, development efforts have tended to not address disaster risk and left it to humanitarian emergency response. Disaster management needs to be incorporated into development efforts so that there is a conscious commitment to it (Schipper & Pelling 2006). By addressing both disasters and development simultaneously, development efforts can be more successful, and the lives of the most vulnerable would be improved.

Not only should there be national and local commitment to disaster management, but there should also be an international commitment (Schipper & Pelling 2006). The Hyogo Framework for Action 2005-15 is an example of this. There were many international disaster reduction policies that were made during UN's International Decade for Natural Disaster Reduction (1990-1999). Initially the IDNDR was criticized for focusing too much upon hazards and not enough upon vulnerability, but midway they changed and human actions and human vulnerability was treated as the main cause of disasters (Schipper & Pelling 2006, p.32). Public interest in disaster management has definitely increased since the IDNDR.

Fostering better understanding and knowledge of the causes of disaster, and continue research on the relationship between climate, natural hazards and related vulnerabilities, is an important aspect of integrating disaster management. By improving international cooperation, the transfer and exchange of experiences and relevant data and information would be easier and achieving greater understanding of disasters would be easier (ISDR 2002).

Finally, improving public awareness and public participation on how to reduce vulnerability to hazards, is vital. According to ISDR (2002 p.8-9) what is needed is formal and non-formal education, public information, education, multi-disciplinary and inter-sectoral partnerships and public awareness programs, which include educational programmes, teachers training, resource centres, and expansion to all levels of society with special attention on professionals and community based leaders and organisations.

All these actions towards integration of disaster management come under sustainable development. According to Ahrens and Rudolph (2006, p.208):

> "Sustainable development can be understood as a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations"

The capability to live a sustainable livelihood and achieve sustainable development depends on the capacities of a countries government to reach agreements and implement policies that incorporate disaster management, as well as peoples own health, freedom and rights (Ahrens & Rudolph 2006). Supporting people's ability to resist hazard impacts and reducing vulnerability are important aspects of sustainable development.

Reducing risks towards natural hazards and climate change can support sustainable development, and by focusing on people's ability to resist such impacts disasters can be reduced and even prevented. The support from government and other important national institutions can enable local adaptation and mitigation capacities. One way of

achieving this would be by including natural resource management within local communities (ISDR 2002, p.5).

Educating and informing the general public of disaster risk and risk reduction efforts is vital for reducing vulnerability towards disasters. Education and information is vital in all aspects of development as informed people make better choices and can contribute to the common goal of sustainable development. So far I have discussed the possibilities of ICT in development to enhance development projects, and the importance of disaster management in the development agenda. Now, in this next section, I will look at the use of ICT in Disaster Management, as well as its importance in public awareness programmes, as this is the focus of my research.

ICT in Disaster Management

As previously examined, disasters have major impacts on the people and countries involved. Amongst the most vulnerable disasters not only destroy infrastructure and nature, but also impacts livelihoods and social networks, and strains the capability and capacity needed to deal with the long-term effects. As Dorasamy et.al. (2011, p.1) lists, these are some of the attributes of a disaster; its sudden occurrence, its demand for quick reactions, the creation of uncertainty and stress, the threat it is towards organisation, and the escalation of intensity. Disasters are crisis situations that occur suddenly and can cause great suffering, both short term and long term. Amongst emergency managers, responders and the international society, there is greater emphasis on the importance of mitigation, preparation, prevention and response to hazards. It will not always be possible to prevent hazards, however acting on the vulnerability of the people and country can reduce their impacts.

The need for effective communication, cooperation and coordination between various stakeholders within communities, countries, regions and the international society is great. It is a necessity before, during and after a disaster in order to access, analyse and disperse vital information and knowledge. Such information is as important as other basic needs such as water, food and medicine. The right information needs to be communicated to the right person at the right time, or else lives, livelihoods and

resources would be lost. Hence, Information and Communication Technologies (ICT) are some of the most important tools within disaster management.

Disaster management aims at reducing the social and physical impacts of disasters, and involves multiple areas and stakeholders (Rao et.al. 2007). Most researchers, Rao et.al (2007), Stolzenburg (2007) and others, agree that there are four phases to disaster management: mitigation, preparation, response and recovery. Mitigation aims at preventing and reducing the impacts of hazards and vulnerability, while preparedness aims at developing and improving the capacity to respond and cope with a disaster. Response focuses on immediate emergency services to save lives and livelihoods, while recovery has a more long-term approach aiming to restore damages and return to a proper level of functioning (Stolzenburg 2007; Rao et.al. 2007).

These four phases may easily overlap as some elements of disaster management falls under several phases. As Dorasamy et.al. (2011, p.1) argues, these four phases could rather be seen as functional areas. For example, Stolzenburg writes:

> "Since actions in the Mitigation Phase aim to limit negative impacts of natural disasters, it can also be seen as an integral part of the Preparedness and Recovery Phase. Moreover, effective mitigation may even prevent that disasters are brought on by natural hazards – thus making the Response and Recovery phase unnecessary in the next iteration." (2007, p.22)

ICT is vital in these four phases of disaster management as their effectiveness, according to Stolzenburg (2007, p.22), depends on "the availability, accessibility, and comprehensiveness of information related to the hazard". In the mitigation phase the aim is to prevent and reduce the hazards and vulnerability. Here ICT can be an important tool for data collection and analysis, creation of models for risk and vulnerability assessments, and dispersing information to all stakeholders, as well as used for adaption and monitoring of weather and climate (Stolzenburg 2007). In the preparedness phase the aim is to develop and improve capacities to respond and cope with a disaster. In this phase, ICT could be an important tool in response mechanisms and procedures, rehearsals, and raising public awareness. The use of ICT such as television, radio and mobile phones for broadcasting and the access to information via

ICTs such as the Internet make up part of effective disaster management (Stolzenburg 2007).

In the response phase ICT can be the difference between life and death. Good flow of information between responders, the government, the public, and those who are hit the hardest, demands effective ICT. In remote areas with poor communication systems, response work can experience great obstacles and the work they need to do would be hindered and slow. During the reconstruction phase collection of data about the impact, damage and destruction the disaster has caused would be important for the reconstruction. During this phase there is also an opportunity to learn from what was done, and how things are being rebuilt, to be better prepared for the next disaster (Stolzenburg 2007).

An important part of disaster management is the management of relevant information. Stolzenburg talks about the four W's of information management; "Who takes When and Where What kind of action" (2007, p.11). The goal of information management within disaster management is to convey important, and correct, information to the right people at the right time, making ICT a vital tool. As mentioned, ICT is vital in all four phases of disaster management and can enhance disaster efforts through providing real-time data, enhance coordination and communication, and therefore lead to quicker reactions and actions to disaster. Dorasamy et.al. (2011) argue that these factors are key elements in creating appropriate capacity and coping mechanisms.

The important role of ICT is starting to emerge and be accepted into disaster management allowing for new and innovating thinking about the use of ICT (Ospina & Heeks 2010). There is incredible potential in the use of ICT, yet as some researchers such as Stolzenburg (2007, p.6) points out, there are also weaknesses, as seen in the 2004 tsunami disaster where the information flow and use was inadequate. Not only were the governments in the affected communities unable to inform their own citizens of the danger, but seismologists in Australia and the USA were able to predict the tsunami yet unable to contact the policy makers, local decision makers or endangered communities. However, the use of mobile phones the Internet after the tsunami hit was vital in the relief and rescue work. For the ICT in disaster management to be effective

there is a need to make it more reliable and resilient to hazards, as well as enhancing communication between the local, national, regional and international levels, and integrate disaster management local, national, regional and international policy.

As Rao et.al. (2007) claims, ICT, and especially newer ICT, has had a major influence in the progress of disaster management in the last decade. A lot more social and physical damages would have occurred had it not been for the integration of ICT into disaster management. The potential for ICT to have an even greater impact on disaster management is definitely there, as long as it is developed side by side with increased knowledge and data about hazards, disasters and vulnerability.

According to Yap (2011) a disaster presents a particular context for ICT as data needs to be gathered, analysed and dispersed, often under time pressure. In developing countries with high vulnerability there is a special need for ICT to enhance timely and effective communication, rapid communication between different stakeholders, common disaster management strategies and transparency and accountability (Yap 2011, p.13). Yap also argues that there is a need for people centred approaches. Not only do people need the knowledge and know-how of how to operate different ICTs, know when it would be applicable to use them and who to contact, and what information to share. But there is also a need for the most vulnerable and endangered communities and people to be aware of, and have knowledge about, hazards and disasters, about their own vulnerability, and how to increase their coping capacities and decrease their vulnerability. There is a need amongst the most vulnerable to understand the information that is given them and to act on it. This is one way of empowering them.

Stolzenburg (2007, p.12) puts forward some requirements for effective information management in disaster management. Other authors and researchers support these requirements as well, such as Frasers (2005), Yap (2011) and Dorasamy et.al. (2011). The information given out during disasters need to reach a defined addressee, be comprehensible, multi-sourced, relevant, on time, reliable and standardized.

Reaching the right addressee is not as straightforward as it may seem, for often it would not even be the same person or group throughout the whole disaster management cycle.

Not only is there a need to define who the addressee is at any given time, but unreliable infrastructure that are vulnerable to hazards can also be very challenging (Stolzenburg 2007, p.12). When the addressee is defined and the infrastructure is not an issue the next requirement is that the information is understandable. Identifying all relevant partners in communication is important. As Stolzenburg (2007) pointed out, it is important to identify the relevant addressees. Amongst the relevant partners, or addressees, are technical experts, disaster response officials, government officials as well as the media and the general public. The addressee needs to know what is being communicated and from there know what to do next. The need for education on hazards, disasters and vulnerability is therefore important. This can be done through formal education as well as public awareness raising. It is important for personal, as well as local, empowerment and capacity building, so making hazards, disasters and vulnerability understandable to everyone, both literate and illiterate, is of great importance (Fraser 2005; Stolzenburg 2007).

A great advantage when dispersing information is by using several ICTs. Multi-sourced information has a greater chance of reaching the defined addressees, reaching the greatest amount of people, as well as limiting the possibility of information not reaching the public due to any technical failures (Fraser 2005; Stolzenburg 2007). One problem within disaster information is that much of it is partial, dated, sporadic or fragmented. For example in Trinidad and Tobago when hurricane Ivan hit the news media went out with information to the public to evacuation shelters that had been prepared for them, the problem was that they did not tell them where these shelters were (Stolzenburg 2007, p.14). Dispersing relevant information to all stakeholders is important in disaster management or else they will remain highly vulnerable.

Another of the requirements was that the information should be delivered at the right time. Real-time data is necessary to be able to take the right actions in time to cope with the oncoming disaster. Approaching disaster events should be tracked and real-time information about it should be dispersed to all endangered communities and people as well as relevant response teams (Stolzenburg 2007, p.14). Timely information could save lives and livelihoods, especially during the response phase. The information that is dispersed should be reliable. If the information is incorrect, that could have devastating

effects on lives and livelihoods, as well as peoples trust in organisations and governments who are responsible for the information given out. If those authorities start to be questioned the lack of trust that would grow would be devastating for disaster management (Fraser 2005; Stolzenburg 2007).

During the disaster management cycle rapid and coordinated communication is vital. If there are any issues with the communication systems loss of livelihoods and lives would be more severe than they are now. As Stolzenburg (2007) mentioned Fraser (2005) also argues that effective, reliable, timely accurate and sensitive information is important to the four phases of the disaster management cycle. Not only will it save livelihoods and lives, but it will also create important trust between the general public and local and national authorities.

Lastly, the information that is collected, analysed and dispersed should be standardised. Within disaster management many different groups are involved. Organisation, response teams and governments cooperate within disaster management, this cooperation does not only reside within a country, but also exists within regions as well as within the international society. For the information collected in different parts of the country, region or world that could be of importance for a particular occurrence or further studies, standardised information is vital (Stolzenburg 2007).

Stolzenburg argue "the dynamic between management of disaster-related information and ICT is multi-dimensional and complex" (2007, p.20). She puts forward three basic and interconnected approaches within disaster management, they are; the disaster management cycle, the spatial approach and the policy approach. By taking a closer look at each of these approaches we can see how ICT is important and can play a vital role within disaster management.

As already described, there are four phases to the disaster management cycle; mitigation, preparedness, response and recovery. In each of these phases ICT can play a vital role. Within mitigation ICT could be used for remote sensing, collection, research and digitalization of data with Geographical Information Systems (GIS), public awareness raising through for instance television, the Internet and other ICTs, as well as

expert training through online material, video conferences and online courses (Stolzenburg 2007, p.23). Within the preparedness phase ICT could again be used for raising public awareness, countries can prepare alternative ICTs to the primary ones in case of any failures, alternative electrical supplies could be of importance, as well as ICTs could be used for conferences via the telephone, mobile phones or the Internet (Stolzenburg 2007, p.23). In the response phase ICTs such as GPS (Global Positioning System), HAM radio, Telemedicine and mobile phones or satellite phones would enhance the response work (Stolzenburg 2007, p.23). Finally, in the reconstruction phase ICT such as satellite phones could improve the work. The possibilities to leapfrog dated tools, implement backup services and support communities with real-time data are also areas ICT could an important tool (Stolzenburg 2007, p.24).

As I have written earlier, hazards and disasters know no borders. Everything from a local community to a greater region can be hit by a disaster. Hence, the spatial approach is an important aspect of disaster management. Not only would a country have to relate to their own disasters and emergencies, but also they might have to relate to other countries as well as the international society. Cooperating on information for research and improving disaster management, as well as sharing experiences and receiving help from national, regional and international organisations are a part of disaster management (Stolzenburg 2007).

Fraser (2005) also mentions this aspect, arguing that with events such as disasters a problem would be overlapping jurisdictions. "A comprehensive plan must include mechanisms for dealing with local, regional and international agencies and media" (Fraser 2005, p.5). Rao et.al. (2007) point out how important cooperation and coordination between agencies involved is. It needs to be acknowledged that there is cooperation between, and within, nations and organisations, hence proper directives and policies on how best to cooperate is yet another vital aspect of disaster management. ICT can play an important role here through the use of communication tools to coordinate tasks and actions, such as radios, mobile phones, videoconferences or chat, and email (Rao et.al. 2007; Dorasamy et.al. 2011).

Effective communication is key within disaster management. Linking all the important stakeholders through communication would be vital, especially in the recovery phase, but also in all other phases. Yodmani and Hollister (2001) argue the importance of good communication tools for collecting information on supplies and resources, coordinating rescue and relief activities, motivating the public as well as motivating political and institutional responses. They also argue the importance of communication in vulnerable areas to make them more resilient and capable to handle hazards and disasters. The importance of correct and timely data, the ability to communicate them to all necessary stakeholders, in particular decisions makers at all levels, as well as being able to communicate the data efficiently, is important in the operational process and the creation of a common operational picture (Rao et.al. 2007). Here ICT such as GIS, sensor data and data analysing programs can play a vital part. Yap (2011) argues that the different agencies and partners involved would likely be using different ICTs with different units and standards. Hence, coordinating the equipment and its data, and creating operational standards is of great importance to the cooperation.

There is a need for:

> "A clearer role of public policies and regulatory frameworks; overcoming the uneven access to ICTs in developing regions; the lack of governance accountability and delivery; as well as the need to foster local appropriation and use of the information through adequate translation and understandable terminology" (Ospina & Heeks 2010, p.14)

Ospina and Heeks (2010), Fraser (2005) and Stolzenburg (2007) all argue the importance of policy in disaster management. For anything to even be done regarding disaster management, proper policies and regulations must be in place to assist in effective disaster management. Without the support of the government actions within the realm of disaster management would most likely be limited to emergency management disregarding the long-term effects and deep social and livelihood impacts of disasters. As discussed short-term emergency management receives much funding, taking from what would have gone to more long-term projects, due to its visible short-term results, as well as the lack of information and knowledge on the long-term effects of disasters.

By addressing the lack of data on long-term effects of disasters and increasing the research on it, countries can more effectively affect policy decision within national governments and regional and international organisations. Also, one should increase the awareness of governments and policy makers of the benefits of using ICT in disaster management, as it can be an important tool to enhance disaster related work (Ospina & Heeks 2010). Stolzenburg (2007, p.30) talks about four main policy areas; international agreements on standards, the robustness and reliability of ICT infrastructure, ICT interoperability and the incorporation of new technologies.

Regarding collaboration of standards, this would improve the use and effectiveness of ICTs by standardising building regulations for ICT infrastructure, standardising a common emergency language, integrating cell broadcasting across two-band systems, and agreeing on a single frequency which all response teams across agencies and organisations can communicate on (Stolzenburg 2007, p.31). Addressing the robustness and reliability of ICT infrastructure can be handled through building standards and developing and improving the current state of existing infrastructure (Stolzenburg 2007, p.30). The necessity of working ICT, and hence robust and reliable infrastructure, is crucial for communication.

When communication via different ICTs there can occur situations where the ICTs are not compatible with each other. This will cause challenges to disseminating information as well as communication and cooperation between agencies, organisations, and the general public. Stolzenburg argues that the responsibility for implementing interoperability standards lies with the national government. Examples of how to enhance interoperability is to enhance the interoperability of hardware and software, incorporate the use of RSS feeds and allocate radio frequencies to the different agencies (Stolzenburg 2007, p.31). The last policy area is the incorporation of new technologies. Ideally the ICTs used in a disaster situation should be the same as those used in the daily lives of people, the ICT should then have the capacity to function under extreme situations such as disaster. That way the users would be familiar with the ICT and more information would be comprehensible and reach a greater part of the population. Newer ICTs could be the answer, as they are faster, easier and there is an array of newer ICT to disperse information through. Examples of newer ICTs that could be used are WiFi and

Wi-Max technology, common alert protocol, third generation mobile systems, software-defined radio and digital television (Stolzenburg 2007, p.32-33).

Incorporating newer ICTs does not mean that it is the best tool for the situation. As Stolzenburg writes "effective disaster management is effective management of information" (2007, p.32). Also, as I have portrayed here, ICT is not necessarily the solution to all the problems. It is important to emphasise that ICTs are tools that can enhance disaster management, not solve the problem of disaster. For instance, in the case of hurricane Katrina, technology alone did not guarantee effective intra-agency cooperation and community coping capacities. For ICT to be as effective as possible it is vital that the context and history of the area where it is applies is incorporated into the organisation and policy of ICT use in disaster management, or else it will have little or no effect at all (Rao et.al. 2007). Also, underlying developmental issues cannot be solved either by ICTs. To address disaster management in the best possible way, one has to address developmental issues, policy issues, and environmental issues. ICT can be a tool incorporated into all these issues, but that is it, it can only be a tool.

More research is now taking into consideration the organisational and social aspects that affect the effectiveness of ICT. Experiences in Asia, Africa, Latin America and the Caribbean show how the use of mobile phones, the Internet and community radios are good ways of addressing coping capacities towards hazards, vulnerability and disasters (Ospina & Heeks 2010). However, there are existing challenges within vulnerable countries that affect the use of ICTs. There is often information that is inaccessible due to infrastructure, personal, local and national economy, as well as available human resources who have the right education for applying and understanding ICTs and information about hazards, disasters and vulnerability (Ospina & Heeks 2010). As Ospina and Heeks argue:

> "Without explicit consideration of the development challenges and resource limitations faced by developing countries, which ultimately determine the degree of vulnerability of any given context to climate change, the exploration of ICT potential runs the risk of being conducted in a vacuum, and of being disconnected from policy making processes and climate change strategies." (2010, p.20)

ICT can be important tools in many aspects of development, and the more holistic an approach and the integration are, the better the effects of the ICTs will be. Looking specifically at the disaster management cycle we can see how ICT can be integrated into the related work and activities. In the theory around the mitigation and preparedness phase it is obvious that vulnerability is one of the largest challenges to ICTs in disaster management. However, ICT can be important tools in enhancing the disaster management work directed at vulnerability. For communities to be able to mitigate and enhance their capacity and preparedness towards disasters, relevant information and knowledge is needed. This includes both local knowledge of the area, the community and the potential risk factors, as well as knowledge on how to mitigate the risks and cope with oncoming disasters. This knowledge needs to be accessible, and will enhance the voice of the most vulnerable within the decision making processes, as well as networking and knowledge dissemination, which would foster better practices and partnerships (Ospina & Heeks 2010, p.19).

Fraser (2005, p.3) argues that there are ten reasons to integrate ICT into the disaster management cycle. These ten reasons coincide with the points that have been presented in this paper. They are to link disaster experts with the public, to educate the general public about preparedness, track approaching hazards, alert authorities, warn endangered communities, assess damage, collect information, supplies and resources, coordinated the response, account for missing people, and finally motivate public, political, and institutional responses.

Disseminating information and knowledge to all stakeholders throughout the disaster management process can be difficult due to different ICTs, units and standards being used, as well as the many actors involved. Without any well-organised coordination this can result in confusion, chaos and information overload (Dorasamy et.al 2011). The use of ICT can be helpful tools in raising public awareness as well as raising the preparedness levels and coping capacities to efficiently address vulnerabilities, hazards and disasters. This includes making information and data accessible through web-based systems; readiness can be improved through the sharing of information on social networks such as Facebook, Twitter, YouTube and other similar sites (Dorasamy et.al. 2001, p.3). On the knowledge side, being able to collect and analyse data to be able to

learn from previous experiences and improve disaster management activities can be accomplished through knowledge management systems and decision supports systems through the use of ICTs such as expert systems and virtual reality (Dorasamy et.al. 2011, p.3).

Different ICTs can be applied and be helpful in the disaster management process. Radio and television are amongst the most traditional ICTs used as they are already an integral part of many communities, yet they are also cheap, reliable and do not require literacy. Radio is particularly useful, especially amongst the poorest populations (Yap 2011, p.14). Satellite radios communicate via satellites and hence can be more reliable during disaster events as it is not dependent on the local and national radio infrastructure, however it may be costly and trees, buildings and certain weather conditions could affect the service (Yap 2011, p.14)

Telephones, both fixed and mobile, are also very useful in the disaster management process. Information dissemination can happen through telephones, as well as other types of one-to-one communication and coordination. However, the drawbacks of using telephones lie in its infrastructure as many lines can be congested during a disaster, telephone lines can be destroyed and the low penetration of fixed telephone networks in poor communities. Yet, there is an increase of mobile telephony in such areas (Yap 2011, p.14).

The collection of data and analysis off weather and weather patterns through monitoring and modelling are available and enhanced through the use of ICT such as satellite remote sensing. Together with GIS and mobile phones it would be a very powerful combination within disaster management, yet it is not cheap and the use of satellites and satellite data often have to be accessed and used in cooperation with the owners of such data, which in most instances would be other nations and international agencies. However, it is important to also gather information and data on the ground to get the most comprehensive picture of the situation (Yap 2011. p.16-17).

Wireless technology and the use of the Internet and email are increasingly being used within disaster management activities. Yet there are not many developing countries

where there is any or wide spread penetration of such technology. Also, there is limitations to the information online, where in many instances the information available is in English and not necessarily relevant for the current situation or nation (Yap 2011, p. 17-18). There is however an emerging trend of standardisation of information and data, increased interoperability and data availability at lower costs with new technologies, greater and improved intra- and inter-agency coordination, global covenants, and more and improved strategic alliances (Yap 2011).

Barriers towards the use of ICT within disaster management in developing countries go beyond cost. Governments can neglect the importance of ICT and not implement ICT friendly policies or invest in efficient ICT infrastructure. In countries where there is high penetration of ICTs, access can be denied and restricted by governments, economic situations, illiteracy and cultural barriers such as gender, ethnicity, religion and caste (Yap 2011). The unwillingness of users to use available ICTs and believe in their usefulness is also a barrier. Yet, the contribution of ICTs to disaster management is so great that incorporating it into disaster management activities, working on education in this field in creating knowledge about disasters, hazards, vulnerability and the ICTs, standardizing the data, and improving cooperation and coordination should be a priority in vulnerable countries and within development practices.

As the literature presented in this chapter shows, public awareness is an important aspect of disaster management. People are the ones affected, their lives and livelihoods are severely impacted and sometimes destroyed by disasters. They are the ones who are vulnerable and susceptible to disasters. Raising public awareness by educating them on the impacts of hazards and disasters, by teaching them about risks and vulnerability and how to address them, by keeping them up-to-date with real-time data on up-coming and occurring events, as well as training them on how to prepare, react and cope with a disaster and the proper procedures and ICTs, is vital for enhancing their outcome after a disaster.

Involving the public is part of sustainable development and sustainable livelihoods (ISDR 2002; Ahrens & Rudolph 2006). Often very crucial decisions need to be made during disasters by the local community. Therefore at risk communities should be

involved in disaster management through assessing risk and vulnerabilities. The importance of them being aware of their own vulnerabilities and possible risks, as well as being able to understand and address disaster information that is being given them, is great (Yap 2011). Public awareness is vital not only for the well being of the general public, but also for those dealing with normal development activities such as infrastructure and production. If they have more knowledge and information about risks and vulnerabilities there is a greater chance of such information and knowledge being incorporated into their work, making it more sustainable and less risk prone.

In connection with raising public awareness there are Fraser (2005, p.7-8) argues that there are five important actions. Firstly, collecting and disseminating relevant and adequate information and knowledge to improve public awareness and inform the general public of their possibilities to actively reduce their vulnerability. Secondly, establishing effective educational programs aimed at the general public, as well as creating and improving higher educational programs on disaster management and climate issues. Thirdly, it is vital to institute regular and effective communication amongst all partners in public awareness raising and education. Fourthly, strengthening the relationship to media and increase their participation and contribution as they are a highly influential part of the everyday lives of a country and community. It would also be important here to take advantage of all the different ICTs used in media to reach out to the greatest number of people and ensure a greater chance of the correct information reaching the general public in time. Lastly, it would be important to improve organisational communications so that every aspect of informing the general public is as effective as possible, and in line with other aspects of disaster management.

ICT can be an important tool in raising public awareness. This is where my research fits in. In the next chapter I will look at how ICTs are used as tools in raising public awareness and what makes them effective. I will first look at how ODPEM collects and disperses information about hazards and risks, then I will continue to look at what ICTs are used and how, before looking specifically at the what makes those ICTs effective in ODPEMs work of raising public awareness. While looking at the effectiveness of those ICTs it is important to discuss how both the literature and those interviewed during the fieldwork defined "effective". After discussing that I will compare their views on

effective use of ICT as tools in raising public awareness with what is actually being done and how the general public receives it. Finally I will discuss the challenges and opportunities of ICT in raising public awareness.

Data analysis

Throughout the literature review I have looked at and discussed the theory surrounding ICT4D, the link between the development agenda and disaster management, and finally the importance of ICT in disaster management. There has been an incredible development within the field of information and communication technology (ICT) the last decades. Not only has it increased in number and quality, but also its penetration into poorer countries and communities. This has created euphoria around the potential use of newer ICTs within development practices. ICT can now enable development practices to reach a larger number of people at low costs, can enable more democratic form of communication and knowledge production, and can encourage self empowerment.

At the same time that this development has taken place, there has also been an increased number of disasters and number of people affected. Disasters create large destructions that not only affect the physical environment, but also the economic and social, making the impact of disaster far greater than the immediate pictures we get. A disaster is caused by the combination of hazards and vulnerabilities. Hazards can be part of the natural cycle, or it could be increased or caused by environmental degradation and climate change. Without vulnerability there would not be a disaster. Vulnerability is often a result of social, economical, political and environmental factors within countries and communities. Even though my focus in this paper is on natural disasters, they are not a natural phenomenon. Hazards are highly affected by human intervention with the environment, and human vulnerability creates disasters out of hazards. Due to this vulnerability disaster affect countries disproportionally, and the most affected are the poorest countries and communities. Over half the natural disaster related deaths occur in developing countries, even though they only are 11% of the total population exposed to disasters. Hence, this disproportional affect and immense impact disasters have on the poorest countries and communities, as well as the non-natural elements of disasters, call for greater integration of disaster management in development practices.

The combination of the potential importance of ICT in the development agenda and the importance of disaster management in the development agenda is important. By including ICT into disaster management, ICT tools would improve on the efficiency of information management to best achieve sustainable livelihoods and development. An important aspect of disaster management is public awareness. Not only is it important to make the public aware of hazards and the dangers of disasters, but also it is part of empowering the general public and achieving sustainable development. My research focuses on this aspect of disaster management, and it was important to present the theory in the literature review to have a firm handle on the importance of disaster management and the potential of ICT within the development agenda. With that in mind, the use of ICT for raising public awareness about hazards, disasters and vulnerabilities can be vital towards achieving sustainable development.

In this chapter I will now present and discuss my findings from the fieldwork I did in Kingston, Jamaica. The objective has been to look at the effectiveness of implementing ICT into disaster management and specifically in raising public awareness. Firstly I will look at how information about hazards are collected and dispersed, with the main focus on ODPEMs (Organisation for Disaster Preparedness and Emergency Management) work, as they are the leading organisation regarding disaster management, and their cooperation with other organisations and agencies. Then I will continue with looking at what ICTs are used and how. The third part will focus on the efficiency of the ICT tools used in raising public awareness. Here I will also discuss what the literature defines as efficient, as well as look at and discuss what the users of such tools in Kingston, Jamaica defines as efficient, before comparing these definitions with how the ICT tools are used for raising public awareness. Lastly I will discuss what challenges and opportunities are for the use of ICT in raising public awareness.

Jamaica is a good place to research the effectiveness of ICT as a tool in raising public awareness. It lies in the middle of the Caribbean, which is an array of different cultures, languages and politics, yet they all are exposed to similar risks, hazards and disasters. Jamaica is very vulnerable to natural disasters such as flooding, landslides, hurricanes and earthquakes. However, as an upper-middle income country they have good ICT infrastructure, reach and penetration. Access to radios and television are also good. This

background is a good starting point to look at ICTs effectiveness, as Jamaica is both vulnerable to hazards and disasters, as well as capable of implementing ICTs in disaster management. During my fieldwork I did eight main interviews with employees of ODPEM, the Red Cross and the Salvation Army. I also handed out questionnaires to 80 randomly selected people, of which 51 responded. Including the interviews and the questionnaires is an analysis of different literature and some first hand observances made while I was there. These are the basis for my findings and analysis throughout this chapter.

How does ODPEM collect and disperse information on hazards and risks?

The reason I focus on ODPEM in this research, is because of its unique position within disaster management in Jamaica. The National Disaster Act of 1993 gives the ODPEM mandate to advance disaster preparedness and emergency management measures in Jamaica that facilitate, coordinate, develop, and implement integrated management systems. As stated on the ODPEM website:

> "The ODPEM is the National Disaster Organization responsible for disaster management in Jamaica and has been charged with the responsibility for taking action to reduce the impact of disasters and emergencies on the Jamaican population and its economy. It plays a coordinating role in the execution of emergency response and relief operations in major disaster events" (ODPEM, 2008a)

The tasks of the ODPEM are to develop and implement policies focusing on enhancing national disaster management, encourage and support preparedness and mitigation activities in all parishes, provide early warning, emergency response, relief and recovery operations in the event of a disaster, to advocate and support risk reduction activities, raise public awareness about disaster management, conduct hazard identification and risk assessment, research social behaviour regarding mitigation and response, and establish and maintain cooperation and agreements with partner agencies and organisations, both nationally and internationally (ODPEM, 2008b). During my fieldwork I interviewed four employees of ODPEM, Senior Director Michelle Edwards, Information Systems Manager Ms Stewart, Emergency Telecommunications Manager Mr Corniff, and Parish Disaster Coordinator for Kingston and St. Andrew Terry Forester.

Does the general public know about ODPEM and what they do? From the data I collected through questionnaires 70,6% of those who answered new who ODPEM were. Most were aware of their functions during a disaster, and also to an extent their preparedness work, yet the training and workshops were little well known, as well as ODPEMs work on policies and strategies.

How do the ODPEM collet their data and information on hazards and risk? When collecting information ODPEM works a great deal with other agencies and organisations. They rarely collect any direct data themselves, but through the cooperation they have with partner agencies and other organisations involved with disasters and disaster management. The technical agencies that they work with are the Water Resource Authority, the Earthquake Unit, Jamaican Meteorological Service, Mines & Geology Jamaica and the National Hurricane Centre. Michelle Edwards said "a lot of the work that we have done is actually through these agencies". With the means each agency have, they collect specific data on hazards and risk areas. The Jamaican Meteorological Service, for instance, collects data on amongst other things hurricanes. The data and information on a hurricanes path, its strength, distance from Jamaica, its strength and impact zone, plus much more, is then gathered and sent to ODPEM.

ODPEM will also gather information from their parish offices, as well as other organisations such as Red Cross and the Salvation Army. During my fieldwork I interviewed the Director for Emergency Services of Red Cross Marcia Alexander, as well as three employees for the Salvation Army; the Disaster Preparedness Coordinator Selburn Oates, the Divisional Disaster Coordinator of the Eastern Territory of Jamaica Selburn Liang, and the Divisional Commander of the Eastern Territory of Jamaica Stanley Griffin. The different parish offices and other agencies will often gather information from the respective communities or people they have some responsibility for, writing reports that are then sent to ODPEM. Those reports will then include information on vulnerable areas and vulnerable people in the area, such as children, the elderly, the disabled, pregnant women, and so on. Different organisations and agencies will also gather in annual or biannual meetings in the National Disaster Committee or the Parish Disaster Committee, together with ODPEM and other Government ministries, where they share information and resources so that coordination goes more smoothly.

Organisations and agencies outside the ODPEM, such as Red Cross and the Salvation Army, will not only gather information from the communities to send to the ODPEM, but they will also be tracking and follow events as they go along from the media and various websites such as weather underground's and the national hurricane centre's own websites. Similarly, the Media collects its data and information from different agencies and organisation to disperse it to the general public through FM radio, TV or the Internet. ODPEM also cooperates with international partners through expertise exchange and lessons learned in other countries that may be applicable in Jamaica.

The data collection amongst communities and the general public involves creating community hazard maps and developing community disaster plans. The maps are created through cooperation with the communities based on their local knowledge and history as well as their experiences. The community disaster plans are also created through inclusion and cooperation. Data and information on the affects of hazards and disasters are collected after a disaster. ODPEM then uses a system called Initial Damage Assessment, which also includes a Damage and Loss Assessment, to indicate what has happened, what damages have occurred and who are affected, and what are the costs (both direct and indirect) related to these damages.

During a disaster related information and data is collected through the National Emergency Operations Centre (NEOC). Different stakeholders call in information about what is happening and what they need; these calls are then recorded and dispersed to relevant agencies and organisations. ODPEMs role in this situation is the coordination of relief and rescue work, where the information they collect is vital, and good coordination of this information to the right agencies or organisations, is important for the lives and livelihoods in the affected area.

How does ODPEM disperse information on hazards and risks? The ODPEM recognises that there are many different avenues to reach out to the general public, which is reflected in the different information avenues they use to disperse their information. One of these avenues is through the media. In cooperation with Jamaican Information Services (JIS), ODPEM disperses information to the general public through

advertisements, announcements, reports, and so on. The media also actively contacts ODPEM and other organisations and agencies for information on what is happening and what is being done during a disaster. The Salvation Army, amongst others, finds such reports and interviews with the media helpful for their work. They may not see a reaction in the short term, but in the long-term they experience increased donations.

ODPEM also disperse a lot of information on their website. Here you can find current news, general information on preparedness and recovery activities, as well as on the national disaster plan. During a disaster the website will be frequently updated with on-going situation reports and weather updates. They also post press releases, listings of shelters and links to services they provide such as equipment rental. Articles and research on disaster management is uploaded to the website as well. Furthermore the ODPEM has a volunteer section for people who would like to volunteer in their work with communities. They also have specific information targeted for businesses, as well as having a very own site for children. Other links to their partner agencies can be found on their website too.

When dispersing information a lot is also done face to face with the general public. ODPEM will carry out campaigns, fairs and expos, promoting preparedness towards different hazards the country face. During the year they have different "seasons of disaster" were they focus most of their attention on how to prepare for specific disasters. It is important for them to use the time they have between disasters to disperse such information to the general public so that when a disaster occurs they general public will know what to do. Often in such campaigns ODPEM use popular personalities to promote their message, as well as hanging up flyers and posters. Training and sensitisation sessions are an important part of dispersing information to the general public, and are also an important part of ODPEMs work. Without knowledgeable human resources in all of ODPEMs work, including the general population, the information that is given out will not have the same effect, as many more would not understand it. Additionally, ODPEM focus on talks with community groups, sessions in schools and town hall meetings.

During a disaster the NEOC would be one of the main sources for information. The national emergency message handling system will alert responding agencies of what is happening. Also, all information that comes into the NEOC will be dispersed to the right agencies and organisations. Through committee meetings with the different agencies and organisations involved in disaster management information is shared and important information from the ODPEM will be given in these meetings.

Organisations and agencies also disperse their own information. The Red Cross for instance would provide information about an on-going disaster on their disaster management information system where other branches, both nationally and internationally, can see what is happening and decide whether to get involved or not. The Water Resource Authority will be in charge of sending out early warning if there is a risk for flooding, and the Jamaica Meteorological Service will disperse information on hurricanes and tropical cyclones on their own websites. Other information avenues such as Twitter, Facebook, YouTube and blogs are also used by ODPEM and other agencies and organisations, to disperse information on hazards and risks.

ODPEM has a clearly vital role within disaster management in Jamaica. It focuses on all aspects of disaster management, which I have argued in the literature review is important for the well being of the Jamaican people as well as achieving sustainable livelihoods and development. Relief and recovery is still a big part of ODPEMs work as disasters often hit Jamaica, either they are floods, landslides or hurricanes. Here data collection and information dissemination plays a vital role to save live and livelihoods, and as ODPEM is the coordinating agency in such situations, their role is key. The effort that they put into collecting data and information after a disaster as well as the focus they have on the importance of preparation and awareness, point to the vital role of mitigation and vulnerability reduction in disaster management.

As the ODPEM has such a central part in disaster management, cooperation with different agencies and organisations is important. The role their partner agencies play in data collection is key for gathering the best information on hazards and risks. Having such information enables the ODPEM to develop better strategies to cope with and reduce the impact of disasters. As a coordinating agency, having a good relationship

with other agencies and organisations also lead to better cooperation. This cooperation enables greater data collection, both from technological as well as social agencies and organisations, leading to the best possible comprehension of the country and communities' situation. Also such cooperation enables information sharing and the sharing of resources, making coordination between the different agencies and organisations easier and more effective, especially during disaster situations.

Evident by the many different avenues of information sharing and dispersion, ODPEM values the importance of getting as much information out to as many as possible. Having specific sites and information focused on businesses and children, as well as acknowledging the importance of face-to-face sessions amongst the most vulnerable communities - to emphasis the importance of disaster management, enhance cooperation, as well as due to the lack of access to information through other avenues such as TV and the Internet – shows the value put on raising public awareness. Not only do ODPEM, and other agencies and organisations use many new and old ICTs to reach the general public, but they also fit their message and mode of communication to reach all the different groups who are affected by disasters.

What newer ICTs are used and how?

The ODPEM use a great amount of ICTs in their work. Equipment such as GPS, radios (high frequency, narrow-band and broadband), radar imagery, satellite terminals and v-sat, are all used in collecting specific data on hazards and risk. WiFi and wireless devices are also increasingly used to be able to communicate with different communities, as they are able to put a WiFi device into an impact zone within 23-24 hours, enhancing communication. ODPEMs partner agencies also use different ICT tools when gathering data. For instance the earthquake unit use seismic networks to collect data on earthquakes, and the Jamaican Meteorological Service uses weather stations to collect data on weather events and hurricanes. The cooperation they have with these agencies, and the equipment ODPEM use themselves provides them with a greater data collection to analyse and enhance disaster management on the island.

GIS was implemented in the early 2000s and has been an important analysing tool for the ODPEM. They have incorporated GIS into all the phases of disaster management: preparation, mitigation, relief and recovery. Due to the use of GIS within other agencies, and the close collaboration between ODPEM and its partner agencies, ODPEM are able to collect a lot of data from their partners to utilise in their own GIS system (Thomas & Gignac n.a.). Due to their specific tasks within disaster management they have also developed some of their own data regarding hazard inventory and a shelter database. The ODPEMS GIS is now a central hazard database, which is used for research, planning and mitigation programs, emergency mapping and damage assessment.

The national emergency messaging system that the ODPEM uses in the NEOC was especially developed for them to use in disaster situations. It is a messaging system that is more robust than other communication systems, so that even though they would fail, including the emergency systems, the national emergency messaging system would be running and communication should not be hindered. This messaging system cover the whole island and the NEOC will be able to communicate with all 14 parishes through local control systems during a disaster. In the NEOC all calls that come in would be recorded and then dispersed to the relevant agency or organisation. Their response, what action they take, would also be recorded so that ODPEM and the NEOC will have an overview of the situation, if anything is being done, and what those actions are.

Regarding general communication within and between agencies and organisations, mobile phones and email is mostly used. Reports from the different parishes and organisations, the meteorological release from Jamaican Meteorological Service, meeting minutes, and other important documents and information would in most instances be sent via email. When communicating with community groups however, for reasons such as access and connectivity, mobile phones are much more utilised, as well as they provide direct access to the specific people they wish to reach. Before Sandy, the Government in some instances even handed out payment cards for mobile phones to minimize economic issues, such as not enough credit on the mobile phone, when organisations and community groups needed to communicate with each other and the NEOC.

Through the ODPEMs cooperation with JIS, they are also able to use FM radios and TVs to disperse adverts, announcements and on-going situation reports to the general public. ODPEM also utilises the Internet when dispersing information. They have their own website with a lot of information on, so if anyone want to get more familiar with preparedness or disaster in general they can go online and find the necessary information there. ODPEM also has a specific website accommodated to children, as they are often online it is wise to be able to reach out to them to in an understandable way. Other forums they use are Facebook, Twitter, Blogs and YouTube. In most cases these forums are used to disperse information and raise awareness about disaster and disaster preparedness. However, Facebook and Twitter have the distinct capabilities of greater communication with the public. The ODPEM experiences good communication with the public in such forums and feel that they enhance direct communication with the general public as there are many active users on these sites.

It was stated in several interviews with ODPEM employees how the use of different ICTs is important to their work, especially to raise public awareness. Looking at the different ICT they use it is clear that this is an important factor. The use of the Internet shows their incorporation of newer ICTs and their want to reach out to as many as possible. The ODPEMs website for instance gets 4-5000 hits monthly, and during a disaster this number often doubles. Getting such a response for their website, and knowing that many more are online encourages them to continue to enhance and improve their website. Two of the interviewees stated that they are working on updating their website to make it more attractive for more people, by making it modern, increasing its user-friendliness, making it easier to manoeuvre and making it more useable on smartphones. What is beneficial with their website is that it is frequently updated, even more during a disaster event, with much relevant and timely information.

Facebook is another site used by the ODPEM to disperse information. On interviewee argued that this is a site that is frequently used by many people, and acknowledging that and addressing those users as well increases the range of their information. Facebook is also more tailored for direct interaction with the general public. The ODPEM gets good feedback from the general public on their Facebook page and are able not only to disperse information, but also collect data and information, as well as have a dialogue

with the public answering questions and spreading information quicker. An example of how useful the Facebook site has been was an instance where there an area was affected by toxic fumes, and there was a dialogue between the ODPEM and the public about what it might be, where it was, who were being affected, and so on. They also receive many more comments on Facebook than on their website, both positive and negative, which they appreciate, making it possible for them to look at and improve on what people might complain about.

They not only recognize different avenues of communication and information dissemination, but they also appreciate the different groups of the general public they want to reach, and tailor specific information and methods to share this information with them. This is evident by the children's website and the focus they have on businesses and the particular difficulties they face during disasters. The use of appropriate technology is part of ODPEMs priorities, and seeking out better technology, enhancing current technology and attracting human resources with adequate knowledge of the equipment being used is a part of this priority.

The message handling system within the NEOC is a good example of appropriate technology, as it is specifically tailored for the ODPEM and for emergency situations. It is a system that is created to work when all other communication systems fail during a disaster, which has been beneficial for many agencies and organisations that use this messaging system. ODPEM ensures connectivity when other options fail, and allowing organisations, agencies and other people to uphold communication and coordination of relief actions. By utilising different communication technologies it increases the chances to reach different people as well as if one system fails there are other avenues of communication.

The benefits of these new ICTs are found on all platforms and in all phases of disaster management. The ODPEM are getting a greater and more comprehensive database, as well as being able to get the necessary information and data quicker, which is important to enhance action and strategy plans. They are also able to operate in new areas due to more robust and portable ICTs. Interaction with the general public is enhanced with these new ICTs, as they are able to disseminate information faster as well as access

information from the public. Challenges are related to costs, limited human resources, Government regulations and the limited penetration of ICT in rural areas.

A lot of the disaster management related work carried out by Red Cross and the Salvation Army, the two other organisations that I talked to, deal with the most vulnerable communities were the use of the newest ICTs are not applicable. Still, radio, and radio communication is vital and is used a lot. Concerning communications with ODPEM, the Government and other agencies and organisations newer ICTs such as the mobile phone and the Internet (email and Skype) are frequently used by the organisations, as they are a source of quick and necessary information when in need, as well as reliable for other important information throughout the year. The importance of good communication, enhanced by newer ICTs, is important for the coordination of actions taken, so that there will not exist any duplications in the work done and resources across different organisations and agencies are taken full advantage of. Red Cross and the Salvation Army follow for instance hurricanes on TV or online as they see it as a source for on-time and reliable information, and different interviewees stated that they found ODPEMs own website very useful in their work.

What the those working for with disaster management within the Red Cross and the Salvation Army found beneficial about the use of newer ICTs is the increased access to information and more information is available and easier to find, making them more prepared and they are able to make quicker and more informed decisions. Also, it is easier to communicate with relevant organisations and agencies. Some of the interviewees also experienced that hurricane warnings, and other disaster warnings, are taken more seriously now than before, increasing the response and decreasing the impact on lives and livelihoods by disasters. The challenges they experience are much the same as ODPEM experiences, with limited financial and human resources and the accessibility of newer ICTs. However they also experienced bottlenecks in the communication due to lack of user-willingness, and the that they are very dependant on outside help.

Regarding the general public and how they relate to the use of newer ICT I look at the response in the questionnaires. Though ICTs such as TV, FM radio and newspapers are

the most used sources for information about disasters (88,2%, 82,4%and 51% respectively), newer ICTs such as the Internet and mobile phones are being used as well. Online information is almost accessed as much as the newspaper with 47,1% of the respondents going online. The benefits many see with newer ICTs is the greater reach they have within the country, that it is easier and quicker to access information that also in many cases is updated. Much of the information is also relevant leading to more informed people giving them adequate time to prepare and less fearful of what is going to happen. They also find it beneficial that there are different sources and avenues to get information, as well as these new ICTs seem attractive to the younger generation. The challenges they see are similar to the challenges stated by ODPEM and the other organisations I interviewed.

Is the use of newer ICT effective in raising public awareness within disaster preparedness in Kingston, Jamaica?

In this section I will be looking at newer ICT and if they are effective tools in raising public awareness. To be able to do that I need to take a closer look at what would define effective raising of public awareness. I will start at looking at what the literature perceives as effective, before I continue to look at the interviews and questionnaires to see what the interviewees focused on and valued with ICT regarding raising public awareness. I will do this by looking at how both the literature and the interviewees define effective disaster management, information management and the use of ICT within raising public awareness. Then I will compare their definitions of effective use of ICT in raising public awareness before comparing their definitions to what is being done and how the general public receives it.

The ODPEM is the leading organisation regarding disaster management in Jamaica, and their responsibility is to take action to reduce the impacts of hazards and disasters. They are responsible for accumulating data and information, in cooperation with partner agencies, which they analyse. This work results in strategy, policy and mitigation plans, as well as knowing how best to communicate this information to the general public and increase public awareness. They also coordinate emergency and relief operations during

a disaster. The ODPEMs mission statement is; "ODPEM is committed to leading the process of reducing the impact of disaster on Jamaica through Comprehensive Disaster Management" (ODPEM 2008). To achieve this they work towards developing and implementing policies and programmes regarding disaster management, encourage disaster preparedness and mitigation efforts over the whole island, provide early warning and emergency response to disasters, advocate risk reduction measures, provide training in all areas of disaster management, promote greater national awareness through public education and awareness, conduct hazard identification and risk assessments, conduct research on social behaviour in relation to disasters, and establishing and maintaining mutual assistance and cooperation agreements between partner agencies, private sector and international donor organisations (ODPEM 2008b).

I have looked at how they collect and disseminate information. Data collection has been done a great deal in cooperation with agencies and organisations, both technical and others. One of the ways they cooperate with them is through disaster committees, as well as during a disaster they have a NEOC where data and information comes in and they communicate it to the respective agencies or organisations that can help. They also actively involve and cooperate with communities through for instance town hall meetings. When disseminating data the cooperation with other agencies and organisations is as important as when collecting data. For instance, their cooperation with JIS ensures that the correct information comes out to the media and the general public through newspapers, FM radios and TVs in a timely fashion. The NEOC is also a centre for information dispersion during a disaster. Other ways the ODPEM disperses their information is through the Internet. They have their own website, as well as use Facebook, Twitter, YouTube, and blogs.

The ODPEM uses a large number of newer ICTs in their work, including ICTs of their technical partner agencies through their cooperation with them. The equipment that they use is GPS, radios, radar imagery, satellite terminals, v-sat, wireless devices, and so on. When collecting and analysing data on hazards, disasters and vulnerability, they use GIS. There all necessary data is accumulated so that they have an overview of the risk and preparedness situation of the country. At the NEOC they have also developed a secure communications system that does not fail during a disaster, to uphold

communication in emergency situations. The use of the Internet is also a big part of ODPEMs work for disseminating data and information as well as interacting with the general public. General communication with agencies, organisations and communities go through email and mobile phone, with community leaders it is a greater deal of mobile phone use as access to Internet and email is limited or non-existent.

Comparing how the ODPEM collects and disseminates data and information, as well as with what kind of ICT they incorporate, with the goals they want to work towards it is clear that what their work is in accordance with these goals. When developing policies and programs the accumulation of data and information, both in quantity and quality, is key to ensuring that these policies and programs are relevant and beneficial for the country. Through their dispersion of information to the general public, and to agencies and organisations, they encourage disaster preparedness and mitigation measures, as well as risk reduction measures. They also focus and inform the public on training and seminars that they have, or their partnering agencies have. In cooperation with their partner agencies they provide early warning and emergency response operations, as well as hazard identification, risk assessment and research on social behaviour regarding disasters. Raising public awareness is clearly a part of their goal seeing how much effort they put into dispersing information through as many communication channels as possible, and taking into consideration the different groups of the general public. Cooperation between agencies and organisation is clearly important in the disaster management work being done in Jamaica, hence maintaining such cooperation is important.

Within data collection and dissemination, as well as within the cooperation and coordination of the different agencies and organisation involved, ICT can have a vital role. There are clearly both benefits and challenges with using newer ICTs, as I have discussed, so the question is if the current use is effective in enhancing the disaster management work done in Jamaica, carried out by the ODPEM?

What makes the use of ICT in raising public awareness effective?

According to the literature

According to Webster's dictionary (2013) effective means "producing a result that is wanted" or "having an intended effect". I will now be looking at what the literature says regarding effective use of ICT when raising public awareness. By focusing on what researchers and others emphasise as good disaster management and how ICT enhances that we can get a picture of what they view as effective. Firstly I will look at what the literature says about effective disaster management and public awareness raising, then look the importance of information management and how it can be effective, before looking at how ICT can be effective in enhancing public awareness raising about disaster. The reason I choose to look at how effective disaster management and information management is defined, in addition to how effective ICT is in raising public awareness is defined, is because of how the all relate to another. For ICT to be effective in raising public awareness it needs to take into consideration what makes information management and disaster management effective.

The corner stones of effective disaster management lie within decreasing the risk of hazards and decreasing vulnerability. The literature (ISDR 2002; DFID 2005) talks about three main causes of hazards: natural cycles, environmental degradation and climate change. Natural cycles are difficult to affect so that the risk of hazard decreases, however environmental management and climate change are issues that can be addressed. Educating local communities on sustainable environmental management, and addressing and educating the general public, including public authorities, on issues related to climate change, such as pollution, will be part of effective disaster management.

Addressing vulnerability is a much larger issue. As mentioned in the literature review disaster affect countries disproportionally, affecting the most vulnerable countries the most. In other words, poor and developing countries which are susceptible to hazard have a greater likelihood of experiencing disasters due to these hazards. By focusing on the issues that concern vulnerability, effective disaster management can be achieved. The DFID (2005) mention six main causes of vulnerability; susceptibility to hazards, poverty, conditions of human settlements and infrastructure, public policy and administration, globalisation and development practices.

Regarding poverty, what are issues amongst the poorer communities and countries are that they suffer greater relative losses during a disaster. This is partially due to their dependence on the surrounding environment for their livelihoods and lack of capacity and knowledge on how to reduce risk and cope with disaster (DFID 2005). There are multitudes of ways to address the issues of poverty, which is clear through the MDGs. However, within disaster management ways of addressing the effects of disaster amongst the poorest communities is through incorporating disaster management into poverty reduction activities, making sure that disaster is taken into consideration during planning and execution of different activities and other actions (ISDR 2002; DFID 2005).

Due to poverty and lack of other options, many people in developing countries live in high-risk areas. In many places the risk has increased due to growth of human settlements, both rural and urban, especially urban, leading to pressure on scarce land, deforestation, lacking urban infrastructure, soil degradation leading to unstable slopes and hillsides, and so on (ISDR 2002). Again, including disaster management into other national policies, in this instance in city planning and infrastructure policies, and accomplishing sustainable development, would be part of effective disaster management.

It is clear that addressing issues regarding public policy and administration would be key for effective disaster management. In many vulnerable countries it is the lack of administrative, organisational, financial and political capacity to cope with disasters, that increases their vulnerability (Ahrens & Rudolph 2006). As in all the other issues looked at so far, there is a need for appropriate policies and regulations. For disaster management to be effective it is vital that public authorities and governments are aware of and convinced about the importance of such management. Lack of, or inadequate, data and information on vulnerability, hazards and disasters are a cause for the neglect by authorities, addressing this issue would be vital for effective disaster management (DFID 2005; Schipper & Pelling 2006; ISDR 2002; Yap 2011).

Globalisation, with its international policies and regulations are also important issues to view regarding effective disaster management. Inequality within international trade undermines rural livelihoods, and capitalism and the competition for foreign direct

investment are causing some developing countries to neglect labour rights and environmental standards to become a part of the global market (Schipper & Pelling 2006). O'Brien and Leichenko (in Schipper & Pelling 2006) argue that this also causes "double exposure" for vulnerable communities and countries, meaning that not only are they affected by hazards and disasters, but also the international market increasing their vulnerability even more. Addressing these issues would be important for effective disaster management.

Regarding development and development practices, also here are there many issues that need to be addressed to achieve effective disaster management and sustainable development. Issues such as shortage of skills, corruption, influence from powerful countries, rapid liberalisation of agricultural markets, running down of state-run social protection schemes, decline of informal safety net mechanisms, poor quality and maintenance of vital infrastructure and environmental degradation due to pollution, deforestation and destruction of protective mangroves. Even risk reduction efforts and humanitarian relief can affect a community's, or country's vulnerability through relocation schemes and funds being relocated from other development activities to relief efforts (DFID 2005; Schipper & Pelling 2006).

Looking at the different issues mentioned above there are clearly several areas that need to be addressed by disaster management in order for it to be effective. Risk reduction is a big part of it. Focusing on preparation and mitigation and incorporating disaster management into the human, social, economic and environmental dimensions would improve effectiveness. However, for that to happen there is a need for political commitment, financial planning, institutional reform, improved analytical and methodological capabilities, legal measures, education and public awareness (ISDR 2002). Holistic action is a clear necessity for effective disaster management, and an important way to achieve that is through fostering better understanding and knowledge of the causes of vulnerability, hazards and disasters.

Public awareness is one of the most important aspects of disaster management. Effective disaster management entails raising public awareness, which involves educating them about vulnerability, hazards and disasters. Thus they will have increased knowledge on

how to reduce risk, prepare for a disaster and understand the warnings and information that is given out. In all of the previously mentioned issues that determine vulnerability, public awareness will be an important part of dealing with them and decreasing vulnerability, as well as decreasing risk towards hazards. Even if you are a member of a government, or living in an extremely vulnerable area, being aware and knowing about the risks of hazards and disasters is key to understanding and acting on the information given out, only then will good preparation and mitigation practices be achieved, and lives and livelihoods lost decreased.

Communication, coordination and cooperation are a huge part of disaster management. Not without cooperation between agencies, organisations, the government, and the general public, and without being able to communicate with them and coordinate all relevant disaster activities, disaster management would not be possible. Communication, coordination and cooperation are needed in order to access, analyse and disperse vital information and knowledge to the right people at the right time. The effectiveness of disaster management also depends on the availability, accessibility and comprehensiveness of information related to the hazard.

Information management is clearly an important factor in raising public awareness. For this information management to be effective it means that the information must reach a defined addressee, be comprehensible, multi-sourced, relevant, on time, reliable and standardised (Stolzenburg 2007; Fraser 2005; Yap 2011; Dorasamy et.al. 2011). As the addressees will be different throughout the disaster phase, tailoring the information and the communication medium to the intended addressee is important so that the recipient understands the information that is sent. It is also necessary that the information will reach the respective addressees. Here good ICT infrastructure is vital. To reach the greatest amount of people, which is one of the main intentions of raising public awareness, using multiple sources is recommended. It will also decrease the possibility of information not reaching the general public due to any technical failures. Relevant information is vital if the public are to act on the information that is given out. If it do not find it relevant for their situation they will likely neglect it, and some might even disregard other information that comes from the same source. That the information is on time is vital, especially during the relief phase. Reliable data is also important within

raising public awareness, as there is a need to trust those who disperse the information. Standardised information will increase its understanding throughout the general public they will be getting the same information from different sources, making it more reliable.

How can ICT make raising public awareness more effective? Some of the benefits of ICT that are emphasised in the literature are their availability, reach, penetration, the amount of different technologies that exist, the quality of the technology and the increased accessibility to information (Kleine & Unwin 2009). For a long time the diffusion of ICT has been highly uneven. This is still an issue, however there is, as mentioned, a greater penetration now of ICTs, even in the poorer communities and countries, the mobile phone is a particularly evident picture of this development. This also increases the inclusion and the reach information, via such technologies, can have. This access to ICTs, and the availability of information due to it, can be a part of self-empowerment amongst vulnerable communities and countries (Kleine & Unwin 2009; Heeks 2009).

ICT therefore are important tools within both disaster management and information management and can make raising public awareness more effective (Stolzenburg 2007; Dorasamy et.al. 2011; Yap 2011; Fraser 2005; Rao et.al. 2007; Ospina & Heeks 2010). In regards to public awareness, relevant information is more readily available, the reach is greater creating a greater number of the population being aware of the risks of hazards and disasters, enhancing the preparedness amongst them, as well as their general security.

As stated, cooperation and national policies are important for effective disaster management. ICT can enhance cooperation with communication tools such as radios, mobile phones, videoconferences, chat, email and so on. Not only will it be effective within cooperation, but also within collection of data, coordination and motivation of both the public and politicians (Stolzenburg 2007; Fraser 2005; Rao et.al. 2007). Incorporation of the use of new ICTs into national polices is important to secure reliable ICTs during disasters, develop standardised and comprehensible data, as well as reach a greater amount of the general public. ICTs such as WiFi applications, common alert

protocol, third generation mobile systems, software-defined radio and digital television are tools that can be enhance effectiveness of disaster management and raising public awareness, if incorporated into national policies.

ICT can enhance the effectiveness of raising public awareness through providing real-time data, and enhance coordination and communication, which will lead to quicker reactions and actions to on-coming disasters (Dorasamy et.al. 2011). ICTs will make information about vulnerability, hazards and disasters more accessible, make it easier for the general public to reach out if they are in need of anything, to prepare, they will be able to track approaching hazards, and keep up-to-date about what is happening. Public awareness throughout all the phases of disaster management is important for it to be effective. As ICT is involved it would be important to not only focus on the information given out and giving out information via different ICTs, but also educating the general public in the use of such technologies (Yap 2011).

To sum up, the literature states that the goal of raising public awareness is to contribute to the decrease of susceptibility to hazards through risk reduction, and decrease vulnerability through increasing knowledge and understanding, preparedness, and coping capacities. To be able to achieve this focus on information management is important. Effective information management entails reaching the defined addressee, the information being comprehensible, the use of multiple sources of information, the information must be relevant, on time, reliable and standardised. For ICT concerning raising public awareness to be effective it has to enhance the information management.

The benefits discussed in the literature argues that ICT has the capabilities to reach a greater amount of the general public due to the penetration of newer ICTs, there are many different ICTs than can be accessed and used to both find and disperse information on, because of the greater access to information and teaching about vulnerability, hazards and disasters, this increased knowledge increases comprehensibility, many can also provide quick access to important and timely information. The government will also have a role to play in making newer ICT effective, through creating standardised data and securing that data given out is relevant and reliable. If ICT enhances the effectiveness of information management that will lead to

decreasing the susceptibility to hazards and decreasing vulnerability, one can claim that ICT is effective with raising public awareness.

According to organisations, agencies and the general public

Now I will turn to how "effective" is perceived by the interviewees and the general public, represented by those who answered the questionnaires. Effective disaster management, effective information management and effective use of ICT in raising public awareness are all connected. For ICT to be effective in raising public awareness it should address issues of both effective information management and disaster management. For instance, a particular ICT may be a great technology to disperse information to the general public, but if the information it disperses is not relevant to the situation or the people getting it, it will not be effective.

What do the interviewees perceive as effective disaster management, with regards to raising public awareness? Data collection is an important issue within disaster management; the more information and data that is collected, the greater the overview of the situation will be. Damage assessment done by the ODPEM and their parish coordinators and partner agencies after a disaster is one way of collecting data and information. They collect data and information on what has happened, what immediate needs are there, what needs to be done, as well as human and financial costs. The collection of this kind of data and information is important for learning from experience and improving disaster management plans, which also will improve what is done to raise public awareness and what information is given to the general public, making it more effective.

Cooperation is another important aspect of effective disaster management emphasized by the interviewed. ODPEM cooperates with communities, technical agencies and other organisations. This cooperation improves the work that is being done as it encourages sharing of information and resources, sharing of expertise, it increases the reach of information that is dispersed to the general public and makes the information that is dispersed through different agencies and organisations more cohesive. Good cooperation is necessary for the coordination of information and good coordination

between all agencies and organisations involved in disaster management and the general public.

Coordination is clearly another important part of effective disaster management. There are many involved in disaster management work; agencies, organisations, ministries, international donors, local authorities and the general publication. To avoid confusion, duplication of work, and to improve cooperation, communication, and data collection and dispersion, good coordination is vital. Good coordination leads to more effective communication and cooperation, making the work done regarding raising public awareness more effective as well.

Informing the general public and raising their awareness is, as mentioned, key in all stages of disaster management. Raising public awareness is also highly regarded amongst the interviewees and the general public as important. Dispersing general information on hazards and disaster would improve preparedness amongst the general public, limiting the loss of lives and livelihoods. Its effectiveness would rely on the information reaching a greater audience, and it should be tailored and relevant to different communities' and groups' needs, making the information comprehensible.

Cooperating with communities and community leaders is necessary. Not only does it increase the chances of more community member receiving important information on preparedness, but such cooperation also encourages inclusion of community members in disaster management work leading to increased empowerment amongst these members. Such cooperation will also focus on building disaster resilient communities, ensuring that communities are well informed and knowledgeable, and therefore better prepared for hazards and disasters.

It is not only through cooperation information is dispersed to the general public. ODPEM also arranges awareness weeks focusing on a specific hazard; how to reduce the risks associated with it and how to prepare and increase coping capabilities. They also provide different trainings for the general public regarding disaster preparedness. Training, education and general awareness amongst the general public is important for

effective disaster management by increasing their preparedness. As Michelle Edwards, Senior Director of ODPEM said:

> "Disaster management at the end of the day really should change behaviour towards people recognizing, having an appreciation for the hazards that are around, the environment, and what are the things they can do to help to prepare themselves and to be safe."

This leads us to effective information management. Information is important in disaster management, so what makes information management effective in the perspective of those interviewed, regarding raising public awareness? They view effective information management, in much the same way as how it was viewed in the literature. Issues of effectiveness that they emphasised were the speed of receiving and sending information, the use of multiple sources, reliable information and information infrastructures, relevant information and comprehensible information. They also valued good cooperation and interaction with the general public when collecting and dispersing information, which encourages good communication.

Information management is clearly important in raising the public awareness. Focusing on these measures of effectiveness when planning and implementing public awareness activities would be important in making them as effective as possible. For instance, providing training and sensitisation meetings, awareness weeks, having specific information tailored for businesses and children, show how ODPEM take these measures into consideration. They are providing different sources to get information, as well as addressing the different groups with information relevant to them and their situation.

Also among the interviewed ICT is mentioned as an important tool in raising public awareness. Relating to the measures of efficiency of information management ICTs are seen as obvious tools to enhance them. ICTs have a great reach and using them to disperse information would increase the amount of people that receive or have access to important disaster information. ICTs are quick, they are both quick to access information as well as send information. ICTs can also be part of enhancing reliability. Not only are they able to provide reliable information but also the technology itself can be very reliable, as the technology is getting more robust and portable. WiFi for instance

is not dependent on telephone lines and poles making such technology more resistant to hazards.

The increased access to information through ICT increases also the possibility to find relevant and comprehensible data. ICTs also provide multiple sources that can be used to disperse information. There are radios (FM, two-way, broadband, satellite), television, mobile phones, data analysing systems, message handling systems, measurement tools, and the Internet with even more forums online. Due to ICTs being so many, so different and have a great reach and penetration, there is a greater chance of reaching a defined addressee. ODPEM, and the other agencies and organisations, consider who they are trying to reach out to and tailor the information to those groups, the multitude of ICTs make it easier to reach more groups with relevant and comprehensible information.

There is definitely a trend towards increased use of the Internet, accessing from both computers as well as from smart phones. Social networks are especially popular and connecting and interacting with the public on these arenas can enhance effective public awareness raising. Reaching out on different arenas online can encourage those responsible for dispersing information to make information more suited for the specific audience using the different site, making information more relevant and comprehensible. Forums like Twitter, Facebook, blogs and home websites for different organisations and agencies, can make information reach a greater public, make information comprehensible and relevant, it makes access to information quicker as well as dispersing timely and up-to-date information.

Michelle Edwards from ODPEM states that "people are out there listening to you, people are actually using the technology". Using newer ICT and online forums is clearly ways to go to increase interaction with the general public, and in that way raise public awareness. Such interaction encourages cooperation, as well as the feedback from the general public can be part of improving the way information is dispersed.

Those interviewed also perceived newer ICTs as effective tools to disperse real-time information. Before, during and after a disaster information is key, and the more updated the information is the better the preparedness and response will be. FM Radio,

TV, mobile phones and the Internet all have this feature. The more data that is collected at real time lead to a greater national response on all levels, and data gathered afterwards will improve planning, mitigation and policy making. Having a greater overview of what is happening will also improve cooperation between all who are involved before, during and after a disaster. In general those interviewed perceived ICTs at enhancing communication across the country and between agencies and organisations, and the general public.

Both the literature and those who were interviewed emphasize many of the same measures of efficiency regarding disaster management, information management and the use of ICT in raising public awareness. The literature and those interviewed argued that for disaster management to be effective it had to address issues of hazard risk and vulnerability. They highlighted integration of disaster management into national policies and strategies, and research, education and public awareness as important measures to take to achieve effective disaster management.

The literature and those interviewed argued that communication, cooperation and coordination are key in addressing all the issues mentioned above. Information management is therefore essential in both disaster management and raising public awareness. Also here, they pointed out many of the similar measures of efficiency. The literature had very clear measurements; reach a defined addressee, comprehensible, multi-sourced, relevant, on time, reliable and standardised. Those interviewed listed all these measures as well, however they also emphasized interaction with the public. Interaction was mentioned by the organisations as well as pointed out in the questionnaires as an important factor in effective information management, as it increased awareness, knowledge, comprehension and relevancy.

So how do they define effectiveness of ICT as a tool in raising public awareness? Again the literature and the opinions of those interviewed coincided. ICT reaches a greater number of people and penetrates into many communities, it also increases the availability and accessibility of information and data to the general public. The technology consists of multiple sources, it is in a greater degree robust and portable, as well as support quick and timely communication. All these measures of effectiveness

encourage and enhance communication, cooperation and coordination regarding raising public awareness, and as mentioned these are key in achieving effective disaster management.

The effectiveness of ICT as tools to enhance public awareness

How effective is the use of newer ICT as tools in raising public awareness? After looking at how effectiveness is defined, both in the literature and by those interviewed (organisations and the general public), we now have some measures to relate to. As discussed, the availability, reach, penetration, multi-sourced characteristics, accessibility to information, speed, robustness and portability are all measures of what makes newer ICT effective. By also addressing the issues of effective information management, such as reaching the defined addressee, being comprehensible, multi-sourced, relevant, on time, reliable and standardised, newer ICT can be effective tools for raising public awareness. By comparing what is being done, how newer ICT is incorporated into activities of raising public awareness, and how the general public receives it, will give us an idea of the effectiveness of newer ICT in such work. I will now look at this comparison, and discuss the effectiveness of newer ICT in raising public awareness.

Data collection is, as mentioned, an important part of disaster management. Increased data and information contribute to a greater understanding of vulnerability, hazards and disasters, it contributes to a greater overview of the risk and vulnerability situation, which furthermore improves disaster practices, preparation and strategy planning. Increased data and information also encourages research and better education within the disaster field, which again can lead to greater awareness amongst the general public, as well as public authorities, increasing the chances of integrating disaster management into national plans and strategies.

Even though ICT used in collecting data and information is not directly connected to raising public awareness, its effectiveness is still relevant due to its indirect relationship. As mentioned, for newer ICT to be effective in raising public awareness, it must also relate to other aspects of disaster management such as data collection. When newer ICT is enhances the effectiveness of data collection, this in return will increase the relevance, reliability and amount of the information that is dispersed to the general public,

indirectly enhancing, and making the activities related to, raising public awareness more effective.

The ICT used by ODPEM to collect data and information is, amongst others, GIS, emergency message handling system, radios, satellite terminals, and WiFi systems. GIS is a Geographical Information System that the ODPEM uses to process their data and create a greater overview of the hazard and disaster situation of Jamaica. Amongst the assessments and applications they use to collect data that is processed in GIS are an Initial Damage Assessment, a situation overview application and a shelter management application. These ICTs create more reliable and relevant information, they gather a greater amount of data and information than previous ICTs, increasing knowledge, encouraging research and providing an enhanced overview of the hazard and vulnerability situation, resulting in improved cooperation and coordination.

In terms of communication the radio is a much-used ICT, both amongst the ODPEM, as well as other agencies and organisations. The ODPEM uses high frequency, narrowband and broadband radios in their work to be able to communicate with all their 14 local control systems, one for each parish, as well as with different communities that have been trained in using radios. Radios are also used to gather different disaster related information and are frequently used during a disaster. The ODPEM will cooperate with other agencies and organisations, such as the Red Cross in training members of different communities, as well as their own staff, in the use of radios during a disaster. Most likely a community group will have access to one radio that a couple of the members have been trained in using. This radio will then be one of the main lines of communication to the ODPEM, or other response agencies, during a disaster.

Regarding how effective the radio is in raising public awareness it can be argued that it is an important part of such activities. First of all, it is a robust and portable communication device. It is important in both collecting information as well as dispersing information. By involving the general public through training sessions, they not only increase their knowledge of how to use a radio, but they also are able to contact ODPEM and gain vital information when needed to disperse to their respective communities. This improves both the access to human resources through the training

sessions and public awareness amongst communities. Other measures of effectiveness that it relates to are reaching a defined addressee and being timely and relevant. Reaching a defined addressee in this case would be either its' own staff and branches, or specific community members that they have trained themselves. The trained community member will have been trained in, and able to, use, understand and disperse any information that they receive through the radio. Regarding timeliness, this would be specific to disasters as the radio will be constantly monitored and used to communicate and disperse information from the ODPEM as soon as they have any information or updated information to share. The information that they then share with the different communities will be relevant to those specific communities.

There are of course limitations to radio usage as well. For instance, radio communication with community members outside of disaster events can be difficult, as the radio is not constantly managed. It is usually placed in a official building, for example a police station, where they only access and use it during a disaster. This limits the timeliness and reachability of the radio in communities. There are also regulations governing amateur radio that hinders effective use of amateur radio. As Mr Corniff of ODPEM states "in specific the regulations governing amateur radio […] needs to be amended to reflect modern changes in information communication technologies". Yet, despite these limitations I would argue that the radio is an effective tool in enhancing public awareness. The type of radios mentioned here might not be effective in dispersing a lot of information to the general public throughout the year, they are vital during a disaster to contact the different communities and parishes and keep them updated with relevant information. As mentioned, for ICT to be effective tools in raising public awareness it has to address all phases of disaster management, in this instance it would be in relation to the relief and recovery phase. It will also, due to the information they gather during and after a disaster, be part of lessons learned and enhance and encourage further research, improving disaster management even more.

The mobile phone is the main ICT within communication amongst the general public in Jamaica, as "everyone" has one. According to research done by the ITU (2013b) approximately 96,4% of the Jamaican population has a mobile phone subscription. Not only is there almost complete coverage across the island, but also most likely will the

penetration be even greater, in the sense that someone will know someone else with a mobile phone, and can benefit from the information dispersed to a mobile phone. This coverage that the mobile phone has is reflected in the results gotten from the questionnaires, where all 51 responders said they owned a mobile phone.

The mobile phone is used as the main form of communication technology amongst organisations, agencies, ministries, and the general public. Between agencies, organisations, ministries and the ODPEM, mobile phones are used to disperse information and coordinate actions and activities. Calls are made to gather all relevant parties to an all agency meeting when necessary; ODPEM will call relevant parties about what actions are to be after a disaster; the NEOC will get in calls that they record ad disperse the necessary information to the relevant agency, often done through mobile phones if they are not present; other general information dispersion is also done through the mobile phone. When dispersing information to communities mobile phones are the most relevant ICT to use, especially amongst the most vulnerable as other ICTs are limited there with regards to financial situations and Internet access.

Regarding both collecting and dispersing information the mobile phone can enhance the efficiency of raising public awareness. Through the mobile phone the general reach of the information dispersed is great. Also, it is easier to reach a defined addressee. If there is a need to get a hold of a specific person, calling that person on his or her mobile phone will improve the chances of reaching him or her. Another aspect of the mobile phone that can be part of raising public awareness effectively is the speed of the information that is both collected and dispersed. Whenever something occurs calls can be made informing relevant communities, agencies, organisation or other about what has happened and what is needed. Due to the speed of information collection and dispersion done through mobile phones, agreements and decisions can be made quicker decreasing the time spent on preparation, planning and coordination.

Amongst the 51 responders of the questionnaires 16 actively used the mobile phone to get information on hazards and disasters, yet 21 have occasionally accessed or received such information through their mobile phones. Their comments and statements about t using the mobile phone to access disaster related information were generally positive.

They pointed out aspects mentioned by ODPEM, the Red Cross and the Salvation Army, such as speed, reach and accessibility. They also mentioned the benefits of being able to use the mobile phone to disperse information through calls, text messages and images, all increasing the comprehensibility of the information shared. Another aspect of efficiency they mentioned was that the information given through mobile phones is short and to the point, increasing their comprehensibility and relevance. This is reflected through the questionnaires, where 8 out of 21, or 38,1%, which had used the mobile phone to gather information, strongly agreed that the information was understandable, and a total of 76,2% generally agreed to this. 7 out of 21 responders, or 33,3%, strongly agreed that the information was relevant, and a total of 80,9% generally agreed. It is important for me to mention that these results I have gotten through my fieldwork will not be applicable for the greater public as my sample size is relatively small, however it can give an idea of what may be a general perception, yet further research is needed to confirm that.

There are limitations to the use of mobile phones within raising public awareness. Even though the reach and penetration of the mobile phone is great there will still always be someone who does not receive the information. This can be due to the costs related to owning and operating a mobile phone, as well as the general mobile phone related infrastructure. Issues mentioned by the respondents of the questionnaire were bad service and jammed systems during and right after a disaster; there were technical issues such as the need to have the battery charged to take full advantage of its benefits, as well as lack of, or limited, ICT knowledge, affecting how the mobile phone is used; and also the costs related to owning and operating a mobile phone.

An issue that most of the responders mentioned regarding disadvantages of the use of mobile phones was that the information given out was not always accurate. The information dispersed through the mobile phone could be inadequate or not as up-to-date as other sources of information, the could be inaccurate due to second or third hand information, and the information might not be clear. This disadvantage is clearly reflected in their response to how reliable the information given through mobile phones are, where 9 out of 21 responders, or 42,9%, nor agreed or disagreed. In general over half the responders did not agree.

The smartphone, which has access to the Internet and mobile applications, has many of the same advantages and disadvantages. Yet, the smartphone, with its additional features, provide many other forums to get information from including voice and text. However there are limitations there as well as they cost more, use more battery time, and not all sites online are suited to be viewed on a smartphone. Both the mobile phone and the smartphone are tools that can be effective regarding raising public awareness. They have a great reach and penetration; they increase the availability of disaster related information as well as the speed of finding and receiving such information; they are portable and easy to carry around making people easier to reach; and finally it increased cooperation and coordination. There are obviously limitations to its use, cost and the reliability of the information being dispersed, however these are issues that can be addressed and improved on.

Emails can be viewed as an asset to dispersing and collecting information. As with mobile phones, emails are mostly used for general communication, however, regarding disaster management the use of emails are limited to communication between agencies, organisations, ministries and international partners. Amongst the most vulnerable communities access to email is limited by the access to computers and the Internet. Organisations, agencies, ministries and international partners however make great use of this ICT. They use it to gather information, to send reports after a disaster, to communicate with international partners, and to share information from committee meetings and so on.

There are benefits of using email, for instance it is easier and quicker than sending letters, as well as it is possible to send large sized documents quickly without general infrastructure being a hindrance, as for example, blocked roads. Yet, as with every ICT there are clear limitations. One being the limited use of email in general throughout the country, and even within the relevant stakeholder there are limitations as to how many actively uses is often enough for it to be beneficial. Secondly, not everyone has access to email. Regarding its effectiveness within raising public awareness, it is more limited than the other ICTs I have looked at so far, as its reach and its use is limited. However, as with other ICTs used for collecting information, it improves and encourages cooperation

and coordination between organisations, agencies and ministries. Gaining more information through many different sources improves the quality of research and in turn improves the quality of strategies and plans and information being dispersed to the general public. So even though email is a limited tool to effectively enhance public awareness it does contribute to the sharing of information, data and knowledge enhancing research and in the end information, plans, strategies and activities directed at raising public awareness.

The Internet is highly used across the country. Almost half the country's population has a computer with access to the Internet. As well as those many who access the Internet at home, many more use the Internet due to access through mobile phones, Internet cafes and computers at work. According to the responders of the questionnaires there were many benefits with the use of the Internet to raise public awareness. First of all they emphasized the great amount of information that can be found online. Not only can a lot of information be found online, but also a wide range of information. Secondly, the Internet is quick and easy to access. You can access the Internet not only from a computer, but also through your mobile phone. Thirdly, online you can find information through a wide variety of forums, making the Internet multi-sourced. Depending on which forum is accessed, the information can also be comprehendible, reliable, relevant and up-to-date.

Fourthly, the information found online reaches many people. As mentioned the penetration is great, and people find ways to go online without needing a computer with Internet access at home. Also, what some people see and learn online can quickly be spread through word of mouth, and the information available online is dispersed even further. Fifthly, the Internet creates and encourages greater interaction between the agencies and organisations, and the general public. Many of the responders mentioned how the opportunity to talk to someone within disaster management work and ask questions, was very beneficial. Not only could they ask for specific information relevant to them, but also they got relevant answers back, as well as the response being quick. Lastly, both responders of the questionnaires and those interviewed mentioned the benefit of being able to track disaster, specifically hurricanes, by themselves through different websites. Being able to follow up on an event, as well as having access to a lot

of information about preparedness, has resulted in people trusting the information given out and being better prepared for an oncoming disaster.

Limitations to the Internet are both technical and regarding the information dispersed. The responders of the questionnaires mentioned misinterpretation as a limitation to the effectiveness of the Internet for raising public awareness. Lack of both ICT knowledge and disaster management knowledge can lead to such misinterpretation. Depending on what site you go to, there can also be inaccurate and unreliable information given out, and in some cases there are more opinions than facts shared. These are all situations that can lead to misinterpretation. Such misinterpretation can lead to unnecessary panic causing more problems than solutions. The penetration and access to Internet does not incorporate all. Even though the penetration is great, there will still be many left outside, which will hinder the reach of information spread over the Internet.

There are as mentioned also technical issues that can limit the effectiveness of the Internet. Such issues can be computer and connection failure. For the Red Cross, not only are they dependent on the connectivity working, but also if it should fail they have no one who can respond immediately and help them. They have a volunteer who helps them with their technical and connectivity issues, but if he is not available at the time they have no one. Human resources are therefore also an issue of limitation to the effectiveness of the Internet for raising public awareness.

There are many forums online which disperse information about vulnerability, hazards and disasters. They can be agencies and organisations home websites, Facebook, Twitter, blogs, forums and YouTube. Looking at the questionnaires, the respondents have had the opportunity to share their opinion of which forum have the most information, the best information, the most up-to-date information, the most reliable information, and the most understandable information. In general both online newspapers and agencies and organisations own website scored high, however regarding most information and up-to-date information, social media was also a favourite. As mentioned, ODPEM uses most of these forums to come across with their information to as many as possible.

ODPEMs website is one forum for dispersing information and raising public awareness with ICT. They put all the information that the public needs to be aware of on their website. This includes information of what they do; current weather information; training material; links to services provided such as training and volunteering; general hazard and disaster information such as how to prepare and recover from a disaster; current press releases; disaster maps; listing of shelters; situation reports; relevant article; information on how to contact those who are safe after a disaster; links to partners; and links to a blog, forum and children's site that they also have. The website is effective in raising public awareness as it is accessible, and reachable by many. Also, the website delivers relevant, on time, reliable and standardised information quickly. It is easy to access and easy to find. They clearly have a focus on reaching a greater amount of the general public by reaching out with a children's site, as well as using blogs, forums and other social media. The interviewed organisations supports this view as they find the website, easy, dependable and up-to-date, being very helpful in their work. Only 13 of the 51 responders of the questionnaires had visited ODPEMs website, yet those who had agreed or strongly agreed that the site was understandable, relevant, timely and reliable.

Disadvantages with their website, outside of the disadvantages of the Internet in general, is that there is a lot of information on there, making it a little difficult to manoeuvre, also, it is not as modern as other sites, which is making it less attractive to the general public. Another issue is that they do not get a lot of feedback on the website, causing interaction with the general public to be limited.

Facebook and Twitter is one way to increase such interaction, as both responders to the questionnaire and those interviewed emphasised. Many have commented on the increased popularity of Facebook. ODPEM sees the necessity to be there so that their information reaches many more. It is important to be were the people are. The way Facebook is constructed encourages interaction, which is taken advantage of by ODPEM and their followers on Facebook. Such interaction increases the relevance and reliability of the information given out, as well as enhancing communication and cooperation. As Ms Stewart argued;

"we get a lot of comments and so on that we probably wouldn't get back on the website, but through Facebook you find that people can talk to us daily. During the time we were having Sandy people were communicating with us through Facebook and so on, so I think that's effective in terms of how we're able to send the right message to them".

There was, for instance, an event regarding fumes that made people ill, on Facebook discussion broke out over where this was occurring, who were being affected, and what it could be. ODPEM had the opportunity to both gather information of an on-going event, as well as answering questions the public had. ODPEM also makes sure that the information that is put on Facebook is the same as what is on their website. This way they standardise their own information so that there is less confusion and greater understanding.

In general then, I would argue that the Internet, including the different forum that can be accessed online, is a relative important tool making public awareness activities more effective. Even though the Internet is not accessed by everybody it reaches many, making it worthwhile using to disperse information and raise public awareness. Due to all the different forums online they make the Internet multi-sourced and accessing information is easy. Yet, there are limitations to the relevance, reliability, accuracy, and timeliness of online information depending on which site is visited. For instance, as some of the responders to the questionnaire stated, on some sites there are more opinion than facts, and information spread through for instance Facebook may not be very reliable. Sites such as the ODPEMs website and online newspapers however, are viewed as reliable and relevant. With so many different forums, it is also more likely to reach the defined addressee. ODPEM uses several sites to reach out to the general public, all with their different advantages. Another advantage is that they tailor information specifically for the different sites so that they are as relevant as possible to the people who use those sites, as for instance the children's website.

ODPEM often uses the media to get important information out to the general public. They do this through their cooperation with JIS, Jamaican Information Service, who sends out the information to different FM radio and TV stations. Using the media to disperse information can be an efficient way of raising public awareness. Amongst the

51 responders to the questionnaires 82,4% got their main information about hazards and disasters from the FM radio, while 88,2% got their information from the television.

According to the responders of the questionnaires the benefits from dispersing information over the FM radio are; you get first hand information; regular warnings and updates; they give out information in advance about the oncoming hazard and how to best prepare for it; the information is short and to the point, as well as being consistent and relevant; the radio reaches many; it is portable, and many also have radio on their mobile phones; finally it is a good source for the illiterate.
The limitations mentioned were that through the FM radio one does not get any visualisation of what is happening; that one is not around the radio often; the stations only give out short information that sometimes lacks clarity; the announcements are not always comprehensible due to for instance that you do not clearly hear what they say; if you are not listening to the correct station at the correct time you can miss the information given there; and finally technical problems such as loosing power and lack of reception can hinder information being dispersed effectively. Yet, despite these limitations over half the responders agreed or strongly agreed that the information given out on radio was understandable and timely, and over half agreed that it was relevant, while 37,8% agreed that it was reliable.

Benefits of using the TV as an ICT to disperse information and raise public awareness is that there are better updates and warning than on the FM radio; they show advertisements and announcements in advance that tell you how to prepare; they give a better idea of what is going to happen so that people can be better prepared, as well as telling you what you can buy at the stores that will enhance your preparedness; the TV reaches many with good, concise and detailed information; you are constantly reminded of what is happening as the come with frequent updates as well as showing a map and tracking storms; the TV is also beneficial for those who are illiterate.

The limitations of TV have to do with technical issues such as lack of electricity; as with the FM radio, if you are not on the right channel you can miss the information that is being given out; the information given out is not always specific to where you live and it is not always comprehensible; the information given out and the pictures shown can

have the effect of creating panic. Many of the responders of the questionnaires emphasised this last point, making it clear that creating panic and fear is a realistic outcome of the coverage and information given out about disaster through the TV. Despite these limitations, the TV as a source of information was highly regarded amongst the responders of the questionnaires. Over half of them, 55,9 % strongly agreed that the information given out was understandable, 44,1% strongly agreed that it was relevant, 41,2 strongly agreed that it was reliable, and over half agreed or strongly agreed that it was timely.

From these results and responses to the use of FM radio and TV in raising public awareness I would argue that they are great ICT tools to use. Compared to any other newer ICT these two are the most widespread with the greatest reach. They are actively used in dispersing information about disasters and disaster preparedness, especially right before, during and after a disaster event. Also, the availability of these ICTs is great as most people own one or the other. As the main amount of information dispersed through these ICTs come from the ODPEM the information is often relevant, reliable and timely.

In general, the newer ICTs that are used by the ODPEM for dispersing and collecting information to raise public awareness can be tools that effectively enhance such activities. There are clearly some ICTs that are more beneficial than others, such as TV and FM radio, however at the same time there is great opportunities in the rest of the ICTs to take advantage of to be effectively enhance public awareness. One argument towards the effectiveness of such ICTs is that they are a wide variety of sources to disperse information on, reaching a greater amount of the population and making the information more available and accessible. They have a greater chance of reaching a defined addressee when they can be reached through multiple sources, and the use of so may different ICTs can increase the timeliness of the information given out. The use of theses different ICTs also encourages and enhances interaction, inclusion, communication, cooperation and coordination, all vital in disaster management.

The ODPEM also takes into consideration the ones left out by the lack or limitation of newer ICTs. Through cooperation they work with communities and the most vulnerable,

provide face-to-face training, education, and sensitisation sessions. Newer ICTs will not always be the better solution as they will have limitations connected to them as well as the public will have limitations connected to owning and using an ICT due to different issues such as financial situations, infrastructure and ICT knowledge.

What challenges do the ODPEM face with ICT and what opportunities can ICT provide regarding raising public awareness within disaster preparedness?

In this chapter I will now finish by summing up and discussing the challenges and the opportunities of using newer ICT in raising public awareness in Kingston, Jamaica. The limitations I have mentioned throughout the chapter are all challenges toward the effectiveness of newer ICTs. There are some overall general challenges to the use of newer ICTs as well as specific ones related to each of the above mentioned ICTs. I will here focus on the general challenges.

In general the challenges that face the ODPEM, as well as other relevant stakeholders within disaster management, are amongst others the lack of amongst others financial and human resources. Newer ICTs are not cheap, they are constantly updated and highly specialised. One of the ways to deal with this challenge is to cooperate even closer with the Government. As mentioned in the literature review, humanitarian relief often gets more focus and more funding than disaster management and development work (Schipper & Pelling 2006; DFID 2005; ISDR 2002). This is due to the short-term and tangible results of relief work. It attracts more donors and attention from public and international authorities than long-term solutions to minimize vulnerability and address hazards and disasters before they occur. Also right after a disaster a lot of funds have to be allocated from one section of the national budget to relief work, minimising even more the funds allocated to disaster management and development. The close cooperation that ODPEM has with the Government, and their role in creating policies related to disaster management can influence the funding that such work receives. However, the financial situation of the general population is more difficult to address.

Government regulations as well are challenges to the use of newer ICTs. For instance, as Mr Corniff of ODPEM mentions, there is a lack of regulations regarding allocation of

frequencies during a disasters, the regulations for amateur radio are out-dated, and the lack of Jamaican signature on the Tampere convention is a challenge. All these governmental hindrances affect communication, cooperation and coordination during and after an event, making ICTs such as radios, less effective than they could be. In general closer cooperation with the Government can address this challenge. The ODPEM already works very close with the Government, as they are a governmental organisations. They were appointed by the Government through the National Disaster Plan of 1993 to provide disaster management functions involving activities throughout the disaster management cycle. One of its tasks is to develop and implement policies and programs for the purpose of "achieving and maintaining an appropriate stat of national preparedness for natural disasters and other emergency events national disaster" (ODPEM 2008).

There is clearly some influence from ODPEM on national policies, especially the National Disaster Plan. Yet, in the disaster plan there are no specific sections dedicated to the use of ICT in disaster management work. It could be an idea, and a way to address some of the challenges if ICTs could be even more incorporated into disaster management policies, as well as disaster management policies being even more incorporated into national policies. Currently the National Disaster Plan is up for revision. Even though I do not know the full extent of the cooperation between ODPEM and the Government, there seems to be issues and regulations that have to be amended or considered by the Government to improve the benefits and lessen the challenges of ICT. The issues mentioned by Mr Corniff are examples of this.

There is a need for persons who know how to operate different ICTs, as well as can learn their skills away. Regarding GIS for instance, the ODPEM, in cooperation with CUSO, a Canadian Volunteer Agency, had a volunteer with them for two years who was knowledgeable in the use of GIS and had an understudy that he educated in the use of GIS (Thomas & Gignac n.a.). This was because the use of GIS up until them was not as beneficial as it could be, so by addressing the issue and cooperating with other organisations outside of Jamaica, such knowledge exchange was possible, and beneficial for today's use of GIS. Greater cooperation in general with international agencies and organisation can address the challenge of human resources. Both ODPEM and other

organisations are aware of this taking part of expertise exchange and lessons learnt in other countries. The Red Cross for instance is always in contact with the rest of the Red Cross family, sharing information and expertise. In their cooperation with ODPEM, Selburn Oates from the Salvation Army was sent to the Caribbean Disaster Conference in Montego Bay last year. With ODPEMs cooperation with CDEMA (Caribbean Disaster and Emergency Management Agency), CARICOM (Caribbean Community), and other countries and international agencies, it is clear that they have a focus on information and expertise exchange to enhance the work being done in Jamaica. By also focusing on enhancing ICT related higher education the challenge of lack of human resources can be addressed.

Lack of ICT skills and knowledge amongst the general public is also a challenge, limiting the use of ICTs and the understanding of the information given there, and hence its benefits. There is a lot of information to be found on the Internet, for instance, and deciphering what information is important, reliable and relevant can be difficult. If one is lacking the basic skills of ICTs such as mobile phones and the Internet, the basic use will be very limited, and accessing the full benefits of such ICTs will not be possible. The ODPEM carries out training and sensitisation sessions with communities and volunteers in the use of ICTs such as radio, GIS, emergency telecommunications, and so on. This is one way of overcoming these challenges, and with the increasing reach and use of mobile phones and the Internet, basic skills will increase. However, some training in the use of computers, mobile phones, and such will also be relevant to increase the effectiveness of these ICTs.

The accessibility to different ICTs is also a challenge. Not everyone are able to have or to use newer ICTS, this could be due to limited infrastructure where access to electricity is lacking, it could be due to the penetration of newer ICTs in rural areas, and it can also be due to the financial situation of the general public. However, the different ICTs might reach different people, making the total reach and penetration of all the newer ICTs together greater than it is separately. Still, information dispersed through newer ICTs will not reach everybody. By investing in improving the electrical infrastructure, one can address this issue somewhat. However this is not a situation with a simple solution. There are clearly developmental issues that create challenges to the use and benefit of

ICTs, such as the financial situation, infrastructure, vulnerability, education, employment, and so on. Therefore it is important that disaster management, including the benefits of ICT within disaster management, are even more integrated into national policies. As mentioned throughout this thesis, the effectiveness of disaster management, and indirectly the effectiveness of ICTs in disaster management, relies on disaster management being integrated into development practices and national policies.

TV and FM radio are clearly the most used sources for information on hazards and disasters as you can see and hear the information, the information given out is reliable and relevant in a great degree, and many have access to either one or the other. Yet the Internet with its access to a multitude of websites and the use of email, has a greater potential in providing the most, and the best information, as well as the mobile phone. The opportunities such ICTs bring to disaster management are many. As mentioned throughout this chapter there are many benefits to these ICTs, as they have a great reach, penetration, and provide multiple sources to disperse information through. They improve interaction, communication, cooperation and coordination, all vital in disaster management, and raising public awareness. Being able to address the challenges mentioned here would enhance and increase the benefits of these ICTs, taking full advantage of the opportunities they provide.

Conclusion

In this chapter I will present my key findings, relating to the use of ICT as tools for enhancing public awareness. The main objective of my research has been to find out how are ICTs effective tools in raising public awareness and what makes them effective. The reason I have had this focus is due to a combination of events that is taking place globally. First of all, there has been an increase in disasters across the world, with an increase in damages and loss of livelihoods and lives. The affects have been disproportionate affecting the most vulnerable countries the most, which in other words mean the poor and developing countries. Despite only 11% of people who are affected by disasters live in poor and developing countries, they count for over 53% of the total deaths (DFID 2005; Ahrens & Rudolph 2006).

Disasters are created by a combination of risk of hazards and vulnerability within a country or community. The countries and communities that are hardest hit have the least capabilities of coping with the disaster and who lack or have limited risk seduction strategies. As well as hitting the vulnerable the hardest disasters do not just have immediate effects that can be addressed through humanitarian relief, but also long-term effects that need to be incorporated into the development agenda. Disaster management is an important way of addressing these long-term effects, as well as vulnerability, by increasing coping capabilities and risk reduction measures. For disaster management and these issues to be dealt with appropriately and in an effective way that benefits the affected countries and communities, there is a need for it to be integrated into the development agenda.

The second global event that has affected my choice of research objective it the incredible development we are seeing within the field of ICT. This development includes a great increase in ICTs as well as different ICTs. The technology is getting cheaper, the reach and penetration greater, and the quality better (Kleine & Unwin 2009, p. 1047; ITU 2013). The development of ICTs and newer technologies are not only affecting wealthy countries, but also poorer and developing countries. The reach and penetration of ICTs, such as the mobile phone, in such countries has created euphoria about the

possibilities that ICT can have within the development agenda. There are many aspects of ICTs that can be beneficial to development activities and programs.

Within disaster management, information management is key for its success. This includes effective communication, cooperation and coordination of information, data and activities. Here ICT, *Information* and *Communication* technologies, can be important tools in enhancing such work. One of the most important aspects of disaster and information management is informing the general public and raising their awareness about disaster preparedness. Combining disaster management activities with the ICTs that are increasingly used amongst the general public in all countries can have a great effect on the decrease of loss of livelihoods and lives during and after a disaster.

The goal of disaster management is to address issues relating to hazard risks and vulnerability. Disaster management address risks of hazard, environmental degradation and climate change through collecting data and information, analysing, researching, and dispersing the information increasing awareness, knowledge, as well as enhancing empowerment. Here the focus is on education and awareness, both amongst those who work within disaster management and the general public. Regarding vulnerability there is a need to address issues of poverty, high-risk settlements, public authorities, globalisation and development. There are many underlying development issues regarding vulnerability, but as disaster affect these development issues as well, including them in disaster management is important. Through research, education and integration of these issues into national, as well as international, policies, disaster management can have a beneficial affect in reducing the loss of livelihoods and lives in disasters. Lack of knowledge about vulnerability, hazards and disasters are often an underlying factor to the increased vulnerability in different countries and communities. There is therefore a need for effective communication, cooperation and coordination between various stakeholders within communities, countries, regions and the international society within disaster management.

Disaster management consists of our phases, mitigation, preparation, relief and recovery. For the work within disaster management to be effective it relies on the availability, accessibility and comprehensiveness of information related to vulnerability,

hazards and disasters. These are similar to the measures of effective information management listed by Stolzenburg (2007), namely reaching a defined addressee, being comprehensible, using multiple sources, being relevant, on time, reliable and standardised. To achieve the greatest potential of disaster management to increase coping capabilities and enhance risk reduction efforts, its approach has to be people centred.

According Fraser (2005) there are five important actions to take towards raising public awareness. Theses are; collecting and disseminating relevant and adequate information and knowledge; establishing effective educational programs on disaster management and climate issues; institute regular and effective communication amongst all partners in public awareness raising and education; strengthening the relationship to media and increase their participation and contribution as they are highly influential; and improve organisational communications so that every aspect of informing the general public is as effective as possible. All in all, the overall goal of raising public awareness and disaster management is sustainable livelihoods and development.

ODPEM, which is the main organisation working within disaster management in Jamaica, tasks consist of developing and implementing policies focusing on enhancing national disaster management; encourage and support preparedness and mitigation activities in all parishes; raise public awareness about disaster management; conduct hazard identification and risk assessment; research social behaviour regarding mitigation and response; establish and maintain cooperation and agreements with partner agencies and organisations, both nationally and internationally. All these tasks address the issues of disaster management that have been mentioned in the literature as important. Regarding raising public awareness specifically we can see how ODPEMs work is compared to the important actions mentioned by Fraser (2005), as well as compare how ICTs are used with the measures of effective information management mentioned by Stolzenburg (2007).

The first action mentioned by Fraser (2005) was collecting and disseminating relevant and adequate information and knowledge. Here the use of ICT plays a vital role in ODPEMs work. ODPEM effectively addresses these issues in their work, and due to their

use of ICTs they are even more effectively addressed. The benefits of ICTs are their availability, their reach and penetration, that there are multiple different ICTs that can be employed, their accessibility, how they are quick, robust and portable. They obviously address many of the measurements of effective information management. ICTs that the ODPEM uses are amongst others GIS, radio, an emergency message handling system, mobile phones, email, the Internet with their home website and presence on Facebook, Twitter, YouTube, blogs and forums. Regarding collection of data and information they cooperate a great deal with other agencies and organisations taking advantage of the possibility to share technology resources and knowledge. The ICTs and this cooperation enhances the quantity and quality of the data and information collected contributing to a greater understanding of the situation of the country, as well as leading to enhanced information that is dispersed to the general public raising public awareness.

The second action mentioned by Fraser (2005) was establishing effective educational programs on disaster management and climate issues. This is not an issue that I looked very closely at during my research. However I was informed that ODPEM had training and sensitisation sessions with communities, they offered training in the use of different ICTs necessary during a disaster, as well as they encouraged people who worked in agencies and organisations that they cooperated with to attend different seminars. Realising that ICT not always is the best solution, they do a lot of face-to-face work with vulnerable communities as ICTs are limited and hence all ICTs will not be beneficial in those areas. The third action mentioned was to institute regular and effective communication amongst all partners in public awareness raising and education. As already mentioned, they cooperate closely with all agencies and organisations within disaster management. They also have regular national, and parish committee meetings with all these stakeholders involved. Not only do they discuss actions, policies and such, but they also exchange contact information to uphold effective communication with everyone. In general mobile phones and email are the most used ICTs for communication amongst the agencies and organisations.

The fourth action mentioned by Fraser (2005) was strengthening the relationship to media and increase their participation and contribution, as they are highly influential.

This is clearly addressed by the ODPEM through their work and cooperation with JIS in dispersing information through FM radio and TV. Also other agencies and organisation have a relationship with the media. FM radio and TV are clearly the most used ICT amongst the general public to find information about hazards and disaster, where they experience that they get relevant, reliable, understandable and up-to-date information about preparation and what is happening. The last action was to improve organisational communications so that every aspect of information the general public is as effective as possible. ICT is highly used throughout most of the work done by the ODPEM enhancing every aspect of their work as the ICTs address the measurements of effective information management and enhances public awareness.

ICT is not necessarily the solution or the best solution to the problems and issued disaster management is addressing. To address disaster management in the best possible way on has to address developmental issues, policy issues and environmental issues. ICT can be a tool incorporated into this to enhance the work being done, but it will never be the only solution. This is evident in the focus on face-to-face interaction that is still a huge part of ODPEMs, the Red Cross' and the Salvation Army's work.

How are ICTs used as tools in raising public awareness and what makes them effective? Within the work that ODPEM does they are clearly integrated into every aspect of their work. As to what makes them effective, they are a big part of every lives of the general public and taking advantage of that to reach out to the general public, as well as enhancing the data collection the ODPEM does, is a step towards them being effective tools. The effectiveness of ICT lies mostly in their availability, reach, penetration, their multiplicity, accessibility, how quick they are to use and access information, that they are robust and in many cases also portable. Throughout this thesis I have showed and discussed the effectiveness of ICTs as tools within raising public awareness, as well as how they enhance communication, cooperation and interaction with the general public addressing issues of inclusion and empowerment and enhance communication, cooperation and coordination amongst agencies and organisations addressing effective disaster management, information management and public awareness.

Due to the limitations of my sample size and amount of interviews done, there are possibilities to do further research from my research. The results I have arrived at are not relevant to the greater population of Kingston and Jamaica, however, increasing the sample size of the questionnaire is on way to continue the research and see if the results are applicable to the greater population or not. Also one can do more analysis of the questionnaires if there was a bigger sample size, making it possible to look for relationships and causes behind what people choose to use when looking for information on vulnerability, hazards and disasters. More interviews, including interviews with JIS, with government officials, with some of the technical partner agencies can increase the picture presented in this thesis, and look even closer at how ICTs are used and what makes them effective within raising public awareness.

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Appendices

Appendix 1: Interview guides

INTERVIEW GUIDE, ODPEM:

General Information
Name of interviewee: _____
Position: _____
Length of employment: _____
Did you have any similar employment before you started working with this organisation? __
      o   What? _____
Task and responsibilities: _____

Question	Probing questions
How do you collect data and information on hazards?	What kind of information and data is collected about natural hazards? Where do you get the information? Is there someone hired within the ODPEM who has a specific responsibility of collecting such information? • How does he/she collect that data? Do you cooperate with other organisations, agencies or government departments on collecting relevant information? • Who? • How do you cooperate with them? Do you consult with experts? (In-house?) • Who? • What kind of expertise do they provide? Do you receive information and data from abroad? Nationally? • From who? How do you follow up-coming events such as hurricanes and storms? • Who provides the information you receive?
What kind of ICTs do you use when collecting information and data on hazards?	What communication and information gathering tools do you use? What are the benefits of using these ICTs? What are the downsides?
Regarding disaster preparedness, what kind of information about hazards and disasters is given out to the general public?	Information about what is happening, what to do, how to prepare, other general information about hazards and disasters?
How is this information given out to the general public?	How can they receive necessary information about hazards? • What kind of avenues of information can they use? What kind of ICT do you use to send out information about hazards? • How are they used? How do you keep the general public updated on up-coming hazards, for instance storms and hurricanes, as they are approaching?
Could you tell me a little about your website and other online avenues that you use to disperse information to the general public?	Who is responsible for updating the main site? Is it frequently updated and used? Do you follow up on how any hits you have on the

What can you tell me about the website, why have you chosen to put up a website?	site? • Are there any time periods were you experience more hits than usual? When? Do you receive feedback and questions from the public on these sites? Do you use any social media? • How are they used? I have heard that it is possible to connect your mobile phone to ODPEMs website and receive important information that way, how does that work? • What information will be sent to mobile phones? • Has this been effective? • Are there many who subscribe to this service? I have read that you have established a website specifically designed for children, could you tell me a bit about that? • Why a site for children? • Has it been successful? Why have you chosen to use these online avenues? Do you review the effectiveness of these sites? • How? • What results did you arrive at?
In your mission statement it is written that you want to take pro-active and timely measures to prevent or reduce the impact of hazards through, amongst other things, the use of appropriate technology. What are the appropriate technologies?	What makes them appropriate? How are they used? Are you involved in any research on newer technologies and technological solutions? • What? • How do they work? • Are they an improvement? o Why?

Can you tell me about the public information, education and training you provide?	What are the programs?
	Who takes advantage of these programs?
	How do they receive information on these programs?
	In a pamphlet I have read it is stated that ODPEM uses mass media programs for public information, education and training, can you tell me about these programs?
	• How are they used?
	• Have you reviewed its effectiveness?
	    o How?
	    o Do they achieve what you set out to achieve?
	• What are the opportunities and challenges with using programs like this?

In your opinion has newer ICT been effective tools in improving the disaster preparedness work that you do?	Both regarding receiving information and data as well as reaching out to more people efficiently? How? Examples?
What challenges do you face regarding newer ICT in your work?	Can anything be improved?
Do you cooperate with any IT company?	How?
Is there anything else you would like to add regarding newer ICT and the ODPEMs disaster preparedness work?	

INTERVIEW GUIDE, Red Cross:

General Information
Name of interviewee: _____
Position: _____
Length of employment: _____
Did you have any similar employment before you started working with this organisation? __
      o What? _____
Task and responsibilities: _____

Question	Probing questions
What is the main mission of your department?	What do you do? What do you want to achieve? What goals do you have? Who is your target group?
What are the most common natural hazards here in Jamaica?	Which hazard(s) occur most often? How often do you experience disasters? • What hazards causes these disasters?

How do you collect data and information on these hazards?	What kind of information and data is collected?
	Where do you get the information?
	Is there someone hired within the ODPEM who has a specific responsibility of collecting such information?
	  • How does he/she collect that data?
	Do you cooperate with other organisations or government departments on collecting relevant information?
	  • Who?
	  • How do you cooperate with them?
	Do you consult with experts? (In-house?)
	  • Who?
	  • What kind of expertise do they provide?
	Do you receive information and data from abroad? Nationally?
	  • From who?
	How do you follow up-coming events such as hurricanes and storms?
	  • Who provides the information you receive?

What kind of ICTs do you use when collecting information and data on hazards?	What communication tools do you use? Do you use any measurement tools or tracking devices?
Regarding disaster preparedness, what kind of information about hazards and disasters is given out to the general public?	Information about what is happening, what to do, how to prepare, other general information about hazards and disasters?

How is this information given out to the general public?	How can they receive necessary information about hazards?
	  • What kind of avenues of information can they use?
	What kind of ICT do you use to send out information about hazards?
	  • How are they used?
	How do you keep the general public updated on up-coming hazards, for instance storms and hurricanes, as they are approaching?
	Do you cooperate with other organisations or government departments with giving out information about hazards?
	  • Who and how?

Websites	How is the website used?

	Do you use any other social media to reach out to the general public? • Which and how?
Do you have any public education or awareness programs or activities/workshops?	Can you tell me about these programs? Who participates? How do they receive information about them? Do you cooperate with other organisations or government departments on providing programs like these? • Who and how? Do you use any ICT during and after these programs to keep participants updated on what they have learned, news, etc.? Do you arrange any training on the use of different technologies used during and after disasters? • What kind and how?
What kind of change have you experienced with the use of newer ICTs such as mobile phones and the internet within disaster preparedness work while you have been working with the ODPEM?	What changes have you experienced regarding who you reach and how many? .. regarding the timeliness of the information given out? .. regarding the reliability of the information given out?
In your opinion has newer ICT been effective tools in improving the disaster preparedness work that you do?	Both regarding receiving information and data as well as reaching out to more people efficiently? How? Examples?
What challenges do you face regarding newer ICT in your work?	Can anything be improved?
Do you cooperate with any IT company?	How?
Is there anything else you would like to add regarding newer ICT and the ODPEMs disaster preparedness work?	

INTERVIEW GUIDE, Salvation Army:

General Information
Name of interviewee: Stanley Griffin_____
Position: _____
Length of employment: _____
Did you have any similar employment before you started working with this organisation? ___
     o What? _____

Question	Probing questions
What are the main tasks of your position?	What are your main tasks? What do you do? What do you want to achieve? What goals do you have? Who is your target group?
What are your responsibilities regarding disasters?	
What is the Salvation Army's specific function in Jamaica before, during or after a disaster?	
What are your main tasks before a hazard occurs?	Do you do any preparation? Training?
What kind of information and/or data on hazards is collected?	Where do you get the information? Do you cooperate with other organisations or

	government departments on collecting relevant information? • Who? • How do you cooperate with them?
What kind of ICTs do you use when collecting information and data on hazards?	What information and communication tools do you use?
Do you participate in giving out any information to the general public before a hazard occurs?	What information do you give out?
How is this information given out to the general public?	How can they receive necessary information about hazards? • What kind of avenues of information can they use? What kind of ICT do you use to send out information about hazards? • How are they used? How do you keep the general public updated on up-coming hazards, for instance storms and hurricanes, as they are approaching? Do you cooperate with other organisations or government departments with giving out information about hazards? • Who and how?
How do you work with the different corps/divisional coordinators before a hazard occurs?	What information is given out? How is that information given out? What challenges do you face when communicating with the different corps? • Why do you think that is a challenge?
Before hurricane Sandy hit Jamaica, what did you do to prepare for that event?	How did you follow the hurricane before it hit Jamaica? What were your tasks in preparation for the hurricane? Where you in touch with any agencies or organizations? • What kind of cooperation did you have with them? • How did you communicate with them? • What information did you receive? • What information did you give out? Where you in touch with any communities? • How did you prepare them for Sandy? • What information was given to them and how?
Can you tell me about your cooperation with ODPEM?	How do you communicate with them? What information do you receive from them? • Do you find that information useful?
Regarding the use of information and communication technologies, in your opinion what are the opportunities and challenges?	Why are they opportunities? Why are they challenges? Can anything be done to address these opportunities/challenges?
Do you use any internet sites to give out information?	What internet sites do you use? What information do you put on the website? Who are the main target groups of the websites? Why do you use the internet? • Do you find it useful? • What positive experiences do you have with the Internet? • What negative experiences do you have?
Do you participate in any courses or seminars?	What kind of courses?

	How where you informed of them? Who arranges them? What did you learn from these courses?
What are your main communication tools?	Which ICTs do you use the most when communicating with others? Why are they the most used? Are there any challenges connected to the use of these ICTs?
Is there anything else you would like to add?	

Questionnaire

Hello,

My name is Synnøve Anthun Ørsnes. I am currently a student at the University of Agder in Norway taking a Master in Development Management. I am here in Jamaica working on my thesis that focuses on disaster preparedness and the dissemination of information to the general public. This questionnaire is about how general information about hazards and disasters are disseminated to the general public before a disaster occurs.

I hope that you will have the time to take a few minutes to answer these questions honestly and truthfully. The questionnaire will be completely anonymous.

Thank you for your time!

Synnøve Anthun Ørsnes
Master in Development Management
University of Agder, Norway
_____

1. General information

1.1 Gender

  □ Male   □ Female

1.2 Age group

  □ 18-24   □ 45-54
  □ 25-34   □ 55-64
  □ 35-44   □ 65 or older

1.3 Education

  □ Primary
  □ Secondary
  □ Trade School
  □ University
  □ College
  □ Community College

1.4 What do you do for a living?

1.5 What is your weekly income?

_____

1.6 Do you have a cell phone?

☐ Yes   ☐ No

    1.6.1   <u>If yes</u>, do you have a smart phone?

      ☐ Yes ☐ No

1.7 Do you have Internet access at home?

☐ Yes   ☐ No

2. **Collecting information**

A natural hazard is a rare or extreme event that takes place in the natural environment. When these affect human life, property, and activity, in a severe manner, they become disasters.

In Jamaica the most common hazards are flooding and landslides. Also, storms and hurricanes have affected this country severely, as hurricane Sandy is a recent evidence of. Earthquakes are also a hazard in Jamaica, however very few disasters have come of them.

This section contains questions about how you collect general information about these natural hazards and disasters and how to prepare for them.

2.1 Where do you get general information about hazards and disasters before it occurs? (Check more than one box if applicable)

    ☐ Newspaper   ☐ Cell phone   ☐ Other (please specify): _____
    ☐ Radio   ☐ Internet
    ☐ TV   ☐ Friends and Family

Please answer the questions related to the information mediums that you checked in 2.1

In the following questions there are statements that you may agree or disagree with. Using the 1 - 7 scale below, indicate your agreement with each item by checking the box with the appropriate number. Please be open and honest in your response.

7 : Strongly agree
6 : Agree

5 : Slightly agree
4 : Neither agree nor disagree
3 : Slightly disagree
2 : Disagree
1 : Strongly disagree

2.2 **Newspaper**

2.2.1 The general information you get from newspapers about hazards and disasters before it occurs is:

	(Strongly Disagree) 1	2	3	4	5	6	7 (Strongly Agree)
Understandable	□	□	□	□	□	□	□
Relevant	□	□	□	□	□	□	□
Timely	□	□	□	□	□	□	□
Reliable	□	□	□	□	□	□	□

2.2.2 What are the advantages of getting general information via the newspaper about hazards and disasters before it occurs?

_____

_____

_____

_____

2.2.3 What are the disadvantages of getting general information via the newspaper about hazards and disasters before it occurs?

_____

_____

_____

_____

2.3 **Radio**

2.3.1 The general information you get from radios about hazards and disasters before it occurs is:

	(Strongly Disagree) 1	2	3	4	5	6	7 (Strongly Agree)
Understandable	□	□	□	□	□	□	□
Relevant	□	□	□	□	□	□	□
Timely	□	□	□	□	□	□	□
Reliable	□	□	□	□	□	□	□

2.3.2 What are the advantages of getting general information via the radio about hazards and disasters before it occurs?

_____

_____

_____

_____

2.3.3 What are the disadvantages of getting general information via the radio about hazards and disasters before it occurs?

_____

_____

_____

_____

2.4 **TV**

2.4.1 The general information you get from TV about hazards and disasters before it occurs is:

	(Strongly Disagree) 1	2	3	4	5	6	7 (Strongly Agree)
Understandable	☐	☐	☐	☐	☐	☐	☐
Relevant	☐	☐	☐	☐	☐	☐	☐
Timely	☐	☐	☐	☐	☐	☐	☐
Reliable	☐	☐	☐	☐	☐	☐	☐

2.4.2 What are the advantages of getting general information via the TV about hazards and disasters before it occurs?

_____

_____

_____

_____

2.4.3 What are the disadvantages of getting general information via the TV about hazards and disasters before it occurs?

_____

_____

_____

_____

2.5 **Cell Phone**

2.5.1 The general information you get from cell phones about hazards and disasters before it occurs is:

	(Strongly Disagree) 1	2	3	4	5	6	7 (Strongly Agree)
Understandable	□	□	□	□	□	□	□
Relevant	□	□	□	□	□	□	□
Timely	□	□	□	□	□	□	□
Reliable	□	□	□	□	□	□	□

2.5.2 What are the advantages of getting general information via the cell phone about hazards and disasters before it occurs?

_____

_____

_____

_____

2.5.3 What are the disadvantages of getting general information via the cell phone about hazards and disasters before it occurs,?

_____

_____

_____

_____

2.6 **Internet**

2.6.1 Where do you get the most information online about hazards and disasters before it occurs?

□ Online newspaper
□ Social Media (facebook, twitter, youtube, etc.)
□ Blogs
□ Agencies and organisations home website
□ Other (please specify); _____

2.6.2 Where do you get the best information online about hazards and disasters before it occurs?

□ On-line newspaper
□ Social Media (facebook, twitter, youtube, etc.)
□ Blogs
□ Agencies and organisations home website
□ Other (please specify); _____

2.6.3   Where do you get the most up to date information online about hazards
        and disasters before it occurs?

        □ Online newspaper
        □ Social Media (facebook, twitter, youtube, etc.)
        □ Blogs
        □ Agencies and organisations home website
        □ Other (please specify); _____

2.6.4   Where do you get the most reliable information online about hazards and
        disasters before it occurs?

        □ Online newspaper
        □ Social Media (facebook, twitter, youtube, etc.)
        □ Blogs
        □ Agencies and organisations home website
        □ Other (please specify); _____

2.6.5   Where do you get the most understandable information online about
        hazards and disasters before it occurs?

        □ Online newspaper
        □ Social Media (facebook, twitter, youtube, etc.)
        □ Blogs
        □ Agencies and organisations home website
        □ Other (please specify); _____

2.6.6   What are the advantages of getting general information via the Internet
        about hazards and disasters before it occurs?

        _____
        _____
        _____
        _____

2.6.7   What are the disadvantages of getting general information via the Internet
        about hazards and disasters before it occurs?

        _____
        _____
        _____
        _____

3. ODPEM

In this section there will be questions about ODPEM (The Office of Disaster Preparedness and Emergency Management) and the general information they give out on hazards and disasters before it occurs.

3.1   Are you familiar with ODPEM and their work in disaster management?

☐ Yes ☐ No

(If no continue to section 4)

3.1.1   If yes, what do you know about ODPEM and the work they do?

_____

_____

_____

_____

_____

3.1.2   Have you visited their website?

☐ Yes ☐ No

3.1.2.1 If yes, as in section 2 indicate your agreement with each item by checking the box with the appropriate number.

The general information you get from ODPEMs website about hazards and disasters before it occurs is:

	(Strongly Disagree) 1	2	3	4	5	6	(Strongly Agree) 7
Understandable	☐	☐	☐	☐	☐	☐	☐
Relevant	☐	☐	☐	☐	☐	☐	☐
Timely	☐	☐	☐	☐	☐	☐	☐
Reliable	☐	☐	☐	☐	☐	☐	☐

3.1.3   Do you follow ODPEM on Facebook or Twitter?

□ Yes □ No

3.1.3.1 <u>If yes</u>, as in section 2 indicate your agreement with each item by checking the box with the appropriate number.

The general information you get from ODPEMs social media pages about hazards and disasters before it occurs is:

	(Strongly Disagree) 1	2	3	4	5	6	(Strongly Agree) 7
Understandable	□	□	□	□	□	□	□
Relevant	□	□	□	□	□	□	□
Timely	□	□	□	□	□	□	□
Reliable	□	□	□	□	□	□	□

3.1.4 Have you attended any seminars or courses arranged by ODPEM?

□ Yes □ No

3.1.4.1 <u>If yes</u>, how did you become aware of the seminars and courses?

_____
_____
_____

4. Information and Communication Technology

4.1 In your opinion, what are the advantages of using newer information and communication technology to find and receive information about hazards and disasters?

_____

_____

_____

_____

4.2 In your opinion, what are the challenges of using newer information and communication technology to find and receive information about hazards and disasters?

_____

_____

_____

_____