Chapter Four

Research Design and Methodological Approach

4.1 Introduction

Theories of international cooperation have undergone a series of developments since the 1930s. With the changing of the world order, however, global governance has become a dominant interest in this field. In the risk-shared society, disaster management is another major preoccupation of global actors. The concept of disaster reduction has been widely promoted by the UN, and so it influences the individual global actor’s decision-making. Some factors which may influence cooperation are derived from theories of rational choice and social capital.

4.2 The Context of Global Disaster Reduction and the IOTWS

4.2.1 Promotion of Sustainable Development

Sustainable development can generally be viewed from three perspectives: the economy, environment and society. Environmental issues did not receive widespread attention until around the 1970s. The United Nations Conference on the Human Environment was convened in Stockholm in 1972 and the next major summit, the Earth Summit, was convened in Rio de Janeiro in 1992. The four decades of evolution of ideas about development can be divided into three phases: the Pre-Stockholm Phase, the Stockholm Phase and the Rio de Janeiro Phase (Soroos, 2005: 22-27):
(1) Pre-Stockholm Phase (Until 1968)

Environmental issues have been important to the international community for over a century. When the International Commissions for the Rhine and Danube Rivers were convened in the 19th century, the teamwork among countries where the Rhine and Danube Rivers flow focused on navigation, hydrology, flood control, and pollution. At the time when the United Nations first came into being, such issues as the economy, society and humans had received more attention in the League of Nations, and environmental issues were still not mentioned in the Chapter of the United Nations. Since then, intergovernmental organizations (IGOs) have been managing environmental issues under the loose coordination of the United Nations. For instance, the Food and Agriculture Organization has been concerned about production and environment issues, while the World Health Organization (WHO) has dealt with issues of water pollution.

In fact, until the 1960s, environment-related issues had been defined within the narrow range of “ecological problems”. Compared with the fruits achieved in the economic sphere through the Bretton Wood Conference—the World Bank, International Monetary Fund (IMF) and General Agreement on Tariffs and Trade (GATT)—in integrating the international economy, environmental issues have been regarded as distinctly secondary concerns.

(2) Stockholm Phase (1968-1987)

The fever which focused the public on the environmental issues began in the late 1960s, and was initiated by non-government organizations (NGOs). In addition, at the 23rd United Nations Conference convened in 1968, the Swedish ambassador first posed the issues of the greenhouse effect, organic hydrorgyrism, and jet noise to
arouse the attention of the participating nations. He further argued that the technology, know-how and funds budgeted for arms should be diverted to the solution of world-wide environmental problems. In 1972 when the UN Environment Conference was convened in Stockholm, Sweden, such issues as environmental power and the concept of an irreplaceable globe were posed in the hope that the pollution problems could be solved by means of international teamwork. Subsequently, the UN Environment Programme (UNEP) began to be carried out. More than 130 participating countries designated June 5 as “World Environment Day”, and the “Environmental Communications Center” was set up in Nairobi, Kenya to carry out a variety of environmental protection activities (Cf., Environmental Protection Administration (EPA) Website, visited on 4/10/2006; UN Environment Programme (UNEP) Website, visited in 4/10/2007). In the 1970s, the industrialized nations began increasingly to address environmental issues. Many nations set up environment-related authorities to focus on domestic environmental issues. The U.S. Environmental Protection Agency, for instance, was established in 1970. Afflicted by such priority issues as economic development and anti-poverty-related problems, the developing nations were not focused on environmental issues. On issues related to the international environment, UNEP was continuously active, but the responses of the UN system toward environmental issues were fragmented and inharmonious.

(3) Rio de Janeiro Phase (Since 1987)

Issues related to the environment surfaced and received prompt attention in the late 1980s, at the Global Summit held in Rio de Janeiro in 1992. The World Commission on Environment and Development (WECD), established in 1983, was chaired by Gro Harlem Brundland, the Premier or Norway. In 1987, the United Nations WECD combined environmental protection and the global economy into a
whole and submitted the “Our Common Future” report. Not until had the concept of “sustainable development” received widespread attention.

In 1992, the United Nations invited heads of 171 states to participate in the “Global Summit Meeting” held in Rio de Janeiro. The key issues brought to the event included the transformation of the global climate, the rapid extirpation of tropical rain forests and the reduction of biological diversity. Scientific cluster posed the term of “global change” to interpret depict that quite a few human activities in common have promptly changed the existent functions of global systems.[this sentence is incomprehensible] During the Rio de Janeiro event, “Agenda 21” was officially promulgated. Subsequently, the General Assembly of the United Nations set up the Commission on Sustainable Development (CSD) in early 1993 to coordinate hands-on action for sustainable development around the globe. Meanwhile, the Rio Declaration, also known as The Earth Charter, was written, appealing to all countries of the world to strive together for sustainable development. (National Commission on Sustainable Development, NCSD, of the Executive Yuan, the Cabinet, visited in 4/10/2007). The key point worth noticing is that subsequent efforts to promote the key issues after the close of the global summit were not as satisfactorily as anticipated. Governments did not bestow CSD with adequate authority, nor did they finance CSD with adequate resources.

Other than the Global Summit, several other global, worldwide conferences were held during the 1990s, also focusing on environmental issues. In 1993, for instance, the World Conference on Human Rights was convened in Vienna. The United Nations Conference on Population and Development was held in Cairo in 1994. And The World Summit on Sustainable Development (WSSD) was held in Johannesburg, South Africa, in 2002; it was attended by representatives from 191
countries. At these events, the issues of economic development in poverty-stricken nations were considered in concert with sustainable development issues. Some observers believed that the results of those conferences would appear with time.

4.2.2 World Conference on Disaster Reduction (WCDR)

The United Nations Disaster Relief Coordinator, or the Office of UNDRO, was established in 1972 for the purpose of coordinating action to assist nations which are plagued by natural and other disasters. In 1987, the 42nd General Assembly of the United Nations mentioned in Resolution No. 169 that “…over the past two decades, approximately three million people were killed, and a minimum of eight hundred million people were adversely affected by earthquakes, hurricanes, tsunamis, floods, landslides, volcanic eruptions, forest fires and such natural disasters which directly led to over US$23 billion in losses.” The resolution mentioned as well that “…The United Nations is obliged to boost international cooperation, research about global physical phenomena oriented natural disasters, and to develop the technology and know-how to minimize the hazards so incurred to coordinate for disaster rescue and prevention, e.g., forecast and pre-warning.” In the General Assembly of the United Nations, therefore, the 1990s (1990-1999) were designated the first “International Decade for Natural Disaster Reduction”. The efforts were intended to minimize natural disasters and the subsequently incurred losses in lives, society and the economy by means of international teamwork. In Resolution No. 236, adopted by the 44th General Assembly of the United Nations held in December, 1989, the natural-disaster minimization decade was declared, to begin on January 1, 1990. The second Wednesday of every October was declared International Natural-Disaster
Minimization Day. The “International Framework of Action for the International Decade for Natural Disaster Reduction” also was published.

The First World Conference on Natural Disaster Reduction was held in Yokohama, Japan, on May 23-27, 1994. The major issue discussed was an international strategy for 21st-century disaster reduction, and how to reduce the damage caused by natural disasters. The common understanding reached at that conference was published as the *Yokohama Strategy and Plan of Action for a Safer World, Guidelines for Natural Disaster Prevention, Preparedness and Mitigation and its Plan of Action*.

The concept of eternal ecology development has drawn more and more attention in the ten-year plan of international disaster reduction. In other words, natural disaster prevention is on the same level as social security, economic development and environmental protection. In the 1992 conference held in Brazil, disaster prevention and reduction were also included as major issues for discussion. Looking at developments in the last decade, the international community’s promise of disaster reduction action will undoubtedly be expanded. However, the standard of execution of such promises is still very low. This is the conclusion and a key point of the 2005 WCDR, Reflections on the Yokohama strategy, Hyogo declaration and Hyogo Framework for published in Reflections on the *Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters*.

The symposium consisted of three major parts: an intergovernmental segment, a thematic segment and a public forum. The major conclusions included: (1). In or before 2015, the risk-prone nations should set up target-oriented natural-disaster minimization programs. All countries should set aside a minimum of 10% of their anti-disaster budgets for natural-disaster minimization purposes; (2). Set up global
and regional risk “indices”; (3). Take social risk cognition and education as the
grounds to carry out autonomous disaster minimization cultures; (4). Enhance
bilateral and multilateral cooperation programs in regional and international bodies
and put into effect thoroughly information co-sharing mechanisms/regimes; (5).
Taking the Pacific Tsunami Pre-warning System as a model, conduct the preliminary
assessment within six months to complete an Indian Ocean pre-warning system; (6).
Establish cross-national disaster governance knowledge and enforcement capacity
(Jan, 1/15/2005). Mainland China held its first ministerial-level Asian Disaster
Minimization Conference in Beijing during September 27~29, 2005, which was
attended by members and representatives from 40 countries and 15 international
organizations.

Natural disaster reduction has become a core element of eternal??? ecology
development. Whether seen economically, socially, or environmentally, prevention,
preparedness, reaction to, recovery and technological development related to disasters
are all issues which have been brought to the fore.

4.2.3 Early Warning Systems for Disasters

To intensify the pre-warning capacity against tsunamis, typhoons, hurricanes and
such natural disasters, several organs of the United Nations have jointly set up the
Early International Pre-warning Agency. Among its mechanisms/regimes, the World
Meteorological Organization will take charge of pre-warnings for typhoons,
hurricanes and floods. The United Nations Educational, Scientific and Cultural
Organization (UNESCO) takes charge of warning of earthquakes and tsunamis for the
Pacific Region. and the World Food Programme (WFP) and the Food and Agriculture Organization of the UN (FAO) is in charge of monitoring drought in the world.

What is the Early Warning System (EWS)? The International Strategy for Disaster Reduction (ISDR) points out that complete and effective EWS are connected by four elements, which include prior knowledge of the risks faced by communities, technical monitoring and warning services, dissemination of understandable warnings to those at risk, and knowledge and preparedness. Should one of the four elements fail, the entire system fails. In other words, EWS cannot merely serve a prediction function. As early as 1989, the UN General Assembly passed a ten-year disaster damage reduction plan, establishing the EWS. Two international conferences on early warning systems for the reduction of natural disaster were held in Potsdam in 1998 and Bern in 2003. The conference held in 1998 confirmed that the EWS is one of the core elements of the 21st-century national/international disaster prevention strategy. In addition to that, the German representative proposed that the IEWP be established at the Bern conference. The action plan includes: tsunamis, desertification, debris flows, forest fires, floods, El Niño, typhoons, droughts, volcanos and earthquakes. Each kind of risk is under the control of a specialized operation center. For example, the Pacific Tsunami Warning System is operated by the Cross-government Ocean Committee of UNESCO. Its operations department is located at the PTWC of Hawaii.

The formative concepts of the EWS are warning signs, prediction models, and the idea that “warnings are never perfect”. Besides natural disaster warnings, vulnerability concerns are equally important for natural disaster warnings. The signs of vulnerability include: growing poverty, environmental degradation, and population crowded in risky locations, civil strife, and lack of knowledge and preparedness. The
major participants in the EWS include governments, community, business leaders, NGOs, scientists, the media, and the authorities concerned.

4.2.4 The Massive Indian Ocean Tsunami and the IOTWS

The Indian Ocean undersea earthquake occurred on December 26, 2004, when an earthquake with its epicenter off the west coast of Sumatra, Indonesia, triggered a series of devastating tsunamis that spread throughout the Indian Ocean, killing more than 200,000 people and affecting millions of coastal communities across South and Southeast Asia, including parts of Indonesia, Thailand, India and Sri Lanka. Figure 8 shows the epicenter and the countries which were most affected by the tsunami.

In the aftermath of the disaster, there is now an awareness of the need for a tsunami warning system for the Indian Ocean. The United Nations immediately started working on an Indian Ocean Tsunami Warning System and by 2005 had the initial steps in place. Some have even proposed creating a unified global tsunami warning system to include the Atlantic Ocean and the Caribbean. The Indian Ocean Tsunami Warning System is a warning system set up to provide warning to inhabitants of the nations bordering the Indian Ocean of any approaching tsunamis. It was agreed to in a United Nations conference held in January, 2005, in Kobe, Japan, as an initial step towards an international early warning program. The system first began to operate in late June, 2006, under the leadership of UNESCO. It consists of 25 seismographic stations relaying information to 26 national tsunami information centers, as well as three deep-ocean sensors. However, UNESCO has warned that further coordination between governments and methods of relaying information from the centers to the civilians at risk are required to make the system effective.
The operation of the End-to-End IOTWS contains three levels, which are regional, national, and local. This means that data from a buoy goes to a satellite and into the Global Telecommunications System (GTS) that links all 27 Indian Ocean countries. In addition, the system will address all stages of early warning, from initial hazard detection and warning to the final communication of the message to coastal communities at risk. In addition, the approach will be multi-hazard in that it will simultaneously address tsunami hazards and a number of other critical coastal hazards such as cyclones, sea swells, floods, and earthquakes (US-IOTWS program, visited on 05/25/2007). Four elements, which include spanning a risk knowledge monitoring and warning service, dissemination and communication, and a response capability, are considered to be critical for a successful warning system (ISDR/ PPEW, visited on 05/20/2007).
Figure 4.2 The operation of Indian Ocean Tsunami Warning System

4.3 Level and Unit of Analysis

4.3.1 Level of Analysis: Inter-Organizational Network

Essential cooperation is related to the interaction of actors. Since this study has defined various global actors in the literature review, inter-organizational relations represent the principle level of analysis in this study. Nohria (1992: 4) considers a network perspective on organizations and conceives of organizations as “networks of recurring relationships and organization” and environments as a “field of relationships that bind together the most significant elements of organizations”. From the discussion above, it can be seen that this study rejects the traditional view of international relations. Instead, an inter-organizational perspective is utilized to explore contemporary international relations under global governance. National states still have power to deal with either domestic or international issues, however, there are more and more organizations, especially international, regional, and non-governmental organizations, which are increasingly influential with respect to some international issues.

Benson (1975: 230) defines inter-organizational networks as having the following characteristics. (1). They consist of a number of distinguishable organizations, (2). that may be linked directly by multiple direct ties to each other, and/or (3). indirectly by a “clustering or centering of linkage around one or a few mediating or controlling organizations.” Network analysis is a well-defined methodology, with definitions of terms such as centrality, cohesiveness, prominence, equivalence, and range (Berkowitz, 1988; Brass and Burkhardt, 1992; Nohira, 1992). In this study, an inter-organizational network contains two parts, a micro level and a macro level. First, the micro level (which analyzes the individual level) will be concerned with issues such as how those various global actors made their decisions.
and what are their strategies for their involvement with IOTWS. Second, the macro level (which concerns the networks in inter-organizations) will also be analyzed in defining the relationships. How they interact with other organizations and how those factors influence the outcomes of this international cooperation will be explored.

4.3.2 Unit of Analysis: Organizations

Since the level of analysis is focused on inter-organizational networks, the unit of analysis in this study is individual organizations. Again, this is not like the traditional international relation’s argument which puts the national state at the center of analysis. This study assumes that the organizations have autonomy to form some interaction strategies of their own accord, even in the age of global governance. In the process of data collection, people in organizations are viewed as representatives of the organizations where they work or for which they have ever worked. Although individuals’ behavior influences organizational activities, individuals’ behavior is constrained by organizational missions and their culture, standard operating procedures, and the rewards and sanctions for compliance and non-compliance to organizational rules (DiMaggio and Powell, 1983; Meyer and Rowan, 1977; Scott, 1987).
4.4 Research Framework

Figure 4.3 depicts how the outcomes of international cooperation will be affected by various global actors, the endeavors of disaster reduction, an organization’s rational choice, and social capital. Each factor is composed of several different variables, and is measured through our questionnaire, which is described below.

![Research Framework Diagram]

1. Diverse global actors
2. Influence of interaction
3. Organizational autonomy

1. Awareness of risk society
2. Capacity

1. Trust
2. Credible commitment

1. Preferences
2. Institutional constraints
3. Information

1. Effectiveness
2. Quality
3. View Broaden
4. Interaction Increased
5. Equalization

Independent Variables

Dependent Variables

Figure 4.3 Research Framework

4.4.1 Dependent Variable

Dependent variable in this study measures the outcomes of the international cooperation of Indian Ocean Tsunami Warning System. The variable includes two sources. The first one is from the Ph.D. dissertation of Ann Marie Thomson (1998). In her study, five collaboration outcome variables are defined an developed as the
questions of questionnaire. The other source of the outcome of cooperation comes from the work of Snidal (1991) which discussed the pattern of international cooperation. Therefore, the major dependent variables of this study, the outcomes of international cooperation, are consisted of six sub-variables, which are effectiveness, quality, change of organizational viewpoint, increase of interaction, equalization of influence, and patterns of cooperation.

4.4.2 Independent Variables

4.4.2.1 Global Governance: Various Global Actors

International organizations, regional organizations, multinational corporations, and non-governmental organizations have played more and more important roles in the age of global governance. Not only has the governance structure changed, but also the relations are more complicated than before. I would like to understand how different global actors may affect the outcomes of international cooperation.

4.4.2.2 Disaster Reduction

While rational choice theory and social capital theory contribute to any explanation of cooperation, I will measure how the factor of disaster reduction affects the outcomes of international cooperation, especially because we are facing more and more threats from natural disasters worldwide. In this study, two variables are measured in disaster reduction. Awareness of risk to society measures to what extent the global actors are aware of the advent of a risk society. The variable of capacity measures how the respondents evaluate whether they and the organizations involved in IOTWS are capable of dealing with natural disasters.
4.4.2.3 Individual Rational Choice

Three variables that are related to individual rational choice are derived from the foregoing theoretical discussion. They are: preferences, institutional constraints, and information. This study will assess to what extent these three variables have been considered in decision-making.

4.4.2.4 Social Capital

Social capital emphasizes the relations, norms, and trust of actors. In this study, two variables are derived from the theory of social capital: credible commitment, and trust. In this study, I will measure the extent to which those three variables have been evaluated in the relations among organizations.
4.5 Statement of the Hypotheses

Five major hypotheses were developed and then tested in this study. (Please see the research framework outlined in Figure 4.3.)

Hypothesis 1: Global governance influences the outcomes of international cooperation.

This study defines two major features of global governance, diverse global actors and organizational networks. The global actors in the IOTWS include state agencies, IOs, NGOs and MNCs, and the influence of their interaction is an alternative approach to examining the global governance network structure. Two sub-hypothesis include:

H1.1 Different global actors have different influences on the outcome of international cooperation.

H1.2 Different global actors have different influence on other actors in this international cooperation.

Hypothesis 2: The promotion of cooperation for disaster reduction will improve the outcome of international cooperation in general.

The idea of disaster reduction has been promoted by the U.N. for more than two decades. In this study, two variables are defined to measure disaster reduction, which are the awareness that we live in a shared risk society and the capacity for coping with disasters. This hypothesis concerns the relationship between the promotion of disaster reduction and the outcome of international cooperation in the IOTWS. The sub-hypotheses include:
H2.1 The higher the degree of awareness of a shared risk society will improve the outcomes of international cooperation.

H2.2 The higher the capacity of the global various organizations have, the better the outcome of international cooperation.

**Hypothesis 3: The greater the extent of individual rational choice in decision-making, the poorer the outcome of international cooperation.**

Three factors are referred to in the component of individual rational choice. First, several global actors including states, international organizations and non-governmental organizations have been previously defined. Different preferences exist among these actors in the building of the IOTWS. Taking states as one example, the developed, developing, and under-developed countries will have different goals for development. Whereas under-developed states focus on the issue of balancing economic and environmental development because they often are also combating poverty, the developed countries may pay more attention to economic growth. International cooperation appears to be a tough task for these global actors; however, changing the preference structure may make enhance the possibility of cooperation.

Second, contemporary international relations in the context of global governance appear less anarchic than before. After the end of the Cold War in the early 1990s, new international regimes formed a new world order. Examples of this include the emergence of the World Trade Organization (WTO) and the European Union (UN). The United Nations also plays an important role in the construction of world institutions. Although some might doubt the concrete functions of the UN, scholars
still believe the U.N. has provided some principles for reaching global goals (Jolly, Emmerij, and Weiss, 2005). In the case of the IOTWS, the U.N., especially the International Strategy for Disaster Reduction (UN/ISDR) and the International Oceanography Commission of the United Nations Educational, Scientific, and Cultural Organization (IOC of UNESCO), has coordinated several significant conferences and meetings. For example, at the World Conference on Disaster Reduction (WCDR) which was held by ISDR in Japan in January, 2005, the *Hyogo Framework for Action 2005-2015* was adopted and plans were announced to build the IOTWS.

Third, possessing sufficient information is a critical point for successful communication and cooperation. The publication of ISDR (2004: 192), *Living with Risk: a Global Review of Disaster Reduction Initiatives*, has pointed out that,

“Effective disaster risk management depends on the information of all stakeholders. The exchange of information and easily accessible communication practices play key roles...information describes working conditions, provides reference material and allows access to resources...” In other words, if completed communication and coordination are the two primary elements of successful cooperation, then undistorted and prompt information is the key to successful communication and coordination.”

In order to maintain and disseminate accurate and prompt information among actors, many mechanisms and platforms are needed for building the IOTWS. There are several good examples. First, the tsunami information transmitted from satellite to nations and communities will determine whether the IOTWS is successful or has failed. Within the ISDR framework, Internet-based electronic conferences and
discussion forums have been held on several occasions (ISDR, 2004: 192). Additionally, the “Platform for the Promotion of Early Warning” ¹ serves the role of information provider and exchange. Not only sufficient information, but also the accessibility of information will influence cooperation. Some information may be inaccessible for institutional or technical reasons, e.g. some information may have a security purpose; thus, dissemination of information may not be considered a priority by some organizations (ISDR, 2004: 193). For a healthy cooperative environment, some of these restrictions have to be overcome. The sub-hypotheses include:

H3.1 The higher the degree of cognizing the divergence of preference, the less international cooperation will be achieved.

H3.2 The higher the degree of perception of institutional constraints, the less international cooperation will be achieved.

H3.3 More accurate and accessible information facilitates international cooperation.

**Hypothesis 4: The greater the social capital invested in organizational interaction, the more favorable the outcome of international cooperation.**

Two components of social capital were measured in this study. First, trust has become an important factor in collective action. In short, trust is the cognition of mutual benefits, benevolence, and reliability. Second, commitment reflecting a sense of identification with the organizational mission and credible commitment will make actors take action and practice for the mission.

H4.1 The greater the recognition of credible commitment among individual actors, the

¹ Please see: http://www.unisdr.org/ppew/
higher will be the degree of international cooperation.

H4.2 The higher the cognition of trust among individual actors, the greater will be the
degree of international cooperation.

**Hypothesis 5: The promotion of disaster reduction, individual rational choice, social capital, and the outcomes of international cooperation have mutual influences.**

According to our framework, hypothesis four concerns the relationship among
disaster reduction, rational choice, social capital and the outcomes of international
cooperation.

H5.1 The effectiveness of international cooperation is influenced by the factors of
disaster reduction, rational choice, and social capital.

H5.2 The quality of international cooperation is influenced by the factors of disaster
reduction, rational choice, and social capital.

H5.3 Broadening of an organization’s view toward international cooperation is
influenced by the factors of disaster reduction, rational choice, and social
capital.

H5.4 Increasing interaction for international cooperation is influenced by the factors
of disaster reduction, rational choice, and social capital.

H5.5 Equalization of international cooperation is influenced by the factors of disaster
reduction, rational choice, and social capital.
4.6 Research Design and Data Collection

4.6.1 Research Procedure

This study contains four steps. First, the literature related to disaster management and international cooperation was reviewed. Second, an analytical framework was established for this study. The framework contains four major perspectives, which include global governance, disaster reduction, rational choice, and social capital. Third, in-depth interviews and survey questionnaires were used to collect the data. And finally, some conclusions and recommendations were made after the processing and discussion of the data.
4.6.2 Stage 1: Case Selection

In December of 2004, 200,000 people were killed by a tsunami in the countries bordering the Indian Ocean; in the aftermath, millions more became homeless. In addition to the global disaster relief and recovery assistance, the conclusion of WCDR in 2005 also promised to build an Indian Ocean Tsunami Warning System. The study takes IOTWS as our major case for several reasons. First, this tsunami is the most serious natural disaster in recent history. Its death toll established a new peak for the last hundred years. Figure 4.5 displays the most deadly tsunamis since 1900.

![The most deadly Tsunamis (1900-2004)](image)

**Figure 4.5** The Most Deadly Tsunamis


Second, in this case, international actors including government agencies, international organizations and international NGOs of various countries have cooperatively participated in a network reflecting the characteristics of global governance. Finally, unlike the Pacific Ocean tsunami warning system, which already has forty years of smooth operation in its history, the IOTWS is just in the beginning stages of development and operation. In the future, more attention should be given to the factors which influence its success.
4.6.3 Stage 2: In-Depth Interviews

There are at least five particular purposes for which qualitative studies are especially suited. They include: 1. understanding the meaning; 2. understanding the particular context; 3. identifying unanticipated phenomena and influences; 4. understanding the process; and 5. developing causal explanations (Maxwell, 1996: 17-20). An interview is a process in which a researcher and participant engage in a conversation focused on questions related to a research study, and these questions usually ask participants for their thoughts, opinions, or experiences (de Marrais and Lapan, 2004: 54).

In order to address the research questions, interviews were conducted according to the research framework. Based on the conceptual framework of this study, these interviews explored the formation and operation of the IOTWS. Table 4.1 presents the list of interviewees.

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<td>P-2</td>
<td>Coordinator/ US Department of State, OES/OA Room 5805</td>
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<td>Professor, Graduate School of Public and International Affairs, Pittsburgh University, USA</td>
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<td>Recovery Expert, International Recovery Platform (IRP)</td>
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4.6.4 Questionnaire Design and Survey

Base on the research framework, the study explored international cooperation, especially the case of the IOTWS, through the lenses of individual rational choice and social capital. The outcomes of international cooperation are the dependent variables of this study. Independent variables include preference, opportunity cost, institutional constraints, information, and expected future interaction, which are all derived from the concept of rational choice. Social capital, including resource interdependence, credible commitment and trust, also helped us to construct the independent variables. Operational definitions are displayed in Appendix 2. Several steps were implemented to collect the data. Our subjects were attendees at international conferences and meetings organized by the UN/IOC; I used their list of participants and sent them questionnaires. The website of IOTWS (Indian Ocean Tsunami Warning System) of the United Nations was our source for the meetings held by UN/IOC since 2005 (Table 4.2).

Table 4.2 Meetings of UN/IOC Related to IOTWS

<table>
<thead>
<tr>
<th>Name of Meetings</th>
<th>Date</th>
<th>Place</th>
<th>Organizers</th>
</tr>
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<tr>
<td>Paris Coordination Meeting</td>
<td>March 3–8, 2005</td>
<td>UNESCO Headquarters, France</td>
<td>UNESCO/IOC</td>
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<td>Mauritius Coordination Meeting</td>
<td>April 14–16, 2005</td>
<td>Grand Baie, Mauritius</td>
<td>UNESCO/IOC</td>
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<tr>
<td>Perth Coordination Meeting (ICG/IOTWS-I)</td>
<td>August 3 to 5, 2005</td>
<td>Perth, Australia</td>
<td>UNESCO/IOC</td>
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<tr>
<td>Hyderabad Coordination Meeting (ICG/IOTWS-II)</td>
<td>December 14-16, 2005</td>
<td>Hyderabad, India</td>
<td>UNESCO/IOC</td>
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<tr>
<td>IOTWS ICG-III</td>
<td>July 31–August 2, 2006</td>
<td>Bali, Indonesia</td>
<td>UNESCO/IOC</td>
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<tr>
<td>ICG/IOTWS-IV</td>
<td>February 28 - March 2, 2007</td>
<td>Mombasa, Kenya</td>
<td>UNESCO/IOC</td>
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</tbody>
</table>
---|---|---|---
ICG/IOTWS Working Group 2  |  May 1-2, 2006  |  Melbourne, Australia  |  UNESCO/IOC
ICG/IOTWS Working Group 3  |  June 30th to July 1st 2006  |  Mt Lavinia, Sri Lanka  |  UNESCO/IOC

Note: There are 5 working groups at ICG/IOTWS:

- Group 1: Seismic Measurement, Data Collection and Exchange
- Group 2: Sea Level Data Collection and Exchange, including Deep Ocean Tsunami Detection Instruments
- Group 3: Risk Assessment
- Group 4: Modeling, Forecasting and Scenario Development
- Group 5: A System for Interoperable Advisory and Warning Centers


Figures 4.6 and 4.7 show the website of the Indian Ocean Tsunami Warning System, which contains the official documents related to the IOTWS of the UN/IOC and released to the public. We used this official website to collect the participant lists for the meetings held by the UN/IOC.

**Figure 4.6 Official website of IOTWS (I)**
4.6.5 Stage 4: Analytical Tools

To analyze the collecting data effectively and efficiently, some software was used in this study. For the quantitative data, SPSS 12.0 was applied to process the data. For the statistical analyses, such as frequency distributions, factor analysis, ANOVA, and linear regression, I utilized SPSS 12.0. NVivo 7.0 was used to analyze the qualitative data which were collected during our in-depth interviews.
4.7 Summary

This chapter has described the context of global disaster management and the background for the formation of the Indian Ocean Tsunami Warning System (IOTWS). Responding to the emergence of global governance, the strategy of this study has been to employ the inter-organizational network as the level of analysis, and the organization as the unit of analysis. The dependent variables and independent variables are defined in the third section. Fourteen hypotheses are stated for further testing. Finally, I have used both quantitative and qualitative methods to gather and analyze data for the case study which is our focus, the IOTWS.