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EARTHQUAKE PREPAREDNESS: WHAT THE UNITED STATES CAN LEARN FROM THE 2010 CHILEAN AND HAITIAN EARTHQUAKES

HEARING

BEFORE THE

AD HOC SUBCOMMITTEE ON STATE, LOCAL, AND PRIVATE SECTOR PREPAREDNESS AND INTEGRATION

OF THE

COMMITTEE ON HOMELAND SECURITY AND GOVERNMENTAL AFFAIRS UNITED STATES SENATE

ONE HUNDRED ELEVENTH CONGRESS

SECOND SESSION

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EARTHQUAKE PREPAREDNESS: WHAT THE UNITED STATES CAN LEARN FROM THE 2010 CHILEAN AND HAITIAN EARTHQUAKES

THURSDAY, SEPTEMBER 30, 2010

U.S. SENATE,
AD HOC SUBCOMMITTEE ON STATE, LOCAL, AND
PRIVATE SECTOR PREPAREDNESS AND INTEGRATION,
OF THE COMMITTEE ON HOMELAND SECURITY
AND GOVERNMENTAL AFFAIRS,
Washington, DC.

The Subcommittee met, pursuant to notice, at 9:30 a.m., in room SD–342, Dirksen Senate Office Building, Hon. Mark L. Pryor, Chairman of the Subcommittee, presiding.

Present: Senator Pryor.

OPENING STATEMENT OF SENATOR PRYOR

Senator PRYOR. I want to go ahead and call our hearing to order. I want to thank everyone for being here. I am sorry I was a few minutes late. I got caught out in the hallway, but want to welcome everyone to the Ad Hoc Subcommittee on State, Local, and Private Sector Preparedness and Integration. We are part of the Senate Committee on Homeland Security and Governmental Affairs.

We have a very distinguished set of panelists and witnesses today, to speak on an issue that is very important for our nation's earthquake preparedness.

I want to start the hearing with a quote, and it says, "The earthquakes cause the ground to rise and fall, bending the trees until their branches intertwined and open deep cracks in the ground. Deep seated landslides occurred along the steeper bluffs and hillsides; large areas of land were uplifted permanently; and still larger areas sank and were covered with water that erupted through fissures or craterlets. Huge waves on the Mississippi River overwhelmed many boats and washed others high onto the shore. High banks caved and collapsed into the river; sand bars and points of islands gave way; whole islands disappeared."

This sounds like something that might be out of the Book of Revelation, but it is not. It is something that the U.S. Geological Survey (USGS) has on their website, and it is a quote from the two series of New Madrid earthquake back in 1811 and 1812.

I think a lot of times people in my part of the country feel like earthquakes are something you see on the west coast or in other countries. But we have more fault zones than just the ones in California and the other States in the west. Earthquake preparedness

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is something that is very important and we should make sure that the Federal Emergency Management Agency (FEMA) and others are on top of. We want to have this hearing today to get a sense of how prepared the United States is to handle an earthquake.

The witnesses here today have traveled from all around the country, and in Mr. Lira's case, as far away as Chile, to address the ability of the United States to respond to and recover from a major earthquake. I appreciate all of you for being here, especially you, Mr. Lira, for coming such a great distance to help us.

I would like to also recognize the Chilean Ambassador who is here, Ambassador Arturo—is it Fermandois?

Ambassador FERMANDOIS. Fermandois.

Senator PRYOR. Thank you. Welcome to the Subcommittee. It is great to have you here.

We have called this diverse group of witnesses because they have taken part in the response to some of the more powerful and catastrophic earthquakes in recent history, the January 12th earthquake in Haiti and the February 27th earthquake in Chile. Both of these were similarly powerful earthquakes. However, the outcomes of the two countries' response efforts could not have been more disparate.

In Haiti, we saw the worst case scenario: A very poor country with very primitive building codes and minimal response capacity. Some 230,000 people died during this event, and another 300,000 were injured. Over a million people remain homeless. I want to note that we extended an invitation to the Haitian government to send a representative here to testify today, but they still have an all-hands-on-deck response going on after January's catastrophe.

A month later an 8.8 magnitude earthquake struck off the coast of Chile. Seismologists estimate that the earthquake was so powerful that it moved the earth's figure axis by 2.7 milliarcseconds.

Tsunami warnings were issued in 53 countries causing minor damage in San Diego, California, and in Japan. Despite the magnitude of this disaster, the death toll was only 521, most killed by the tsunami. These events hold extremely valuable lessons for U.S. Government officials working to develop plans for responding to a severe earthquake on American soil. Our goal is to make an American response look more like the results of Chile, rather than the results in Haiti.

As we near the 100th anniversary of the 1811 and 1812 New Madrid earthquakes, we are reminded how critical planning and preparation are to mitigating against loss of life and property. The effects of the New Madrid earthquakes were spread over a vast area. Physical damage was reported as far away as Charleston, South Carolina, and Washington, D.C. In Boston, Massachusetts, which is about 1,000 miles from the epicenter, church bells rang due to the seismic vibration.

Consider this: A modern major earthquake along the New Madrid fault, which covers seven States, Arkansas, Mississippi, Tennessee, Missouri, Kentucky, Illinois, and Indiana, could impact up to 44 million Americans who live in that region, including some 12 million Americans who live in the highest impact zones. FEMA estimates over $70 billion in infrastructure damage, while others predict a $500 billion response and recovery effort.

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The potential of loss of life, damage to public and private structures, and disruption of interstate commerce is staggering. With the recent international earthquakes, we can learn valuable lessons. Our witnesses who are here today will help this Subcommittee learn some of those lessons and document those for the Committee's work and the Senate. I hope the outcome of this hearing is that it will lead to a more effective response and more effective preparation to these tragic events when they do occur.

I will introduce each one of the four witnesses on this panel. We will give everyone 5 minutes for their opening statement and we will submit your written testimony for the record. Do not feel obligated to read every single word of your written testimony. You may paraphrase or skip sections, that is up to you. But try to speak under 5 minutes and then we will open the panel up for discussion and for questions.

Our first witness is Bill Carwile, Associate Administrator, at the Federal Emergency Management Agency. Our second witness is Dirk Dijkerman, Acting Assistant Administrator of the Bureau of Democracy, Conflict, and Humanitarian Assistance at the U.S. Agency for International Development. And our next witness is Carol Chan, who is the Director for the Office of U.S. Foreign Disaster Assistance at USAID. And then our last witness will be Mr. Lira.

So, Mr. Carwile, would you like to lead us off?

TESTIMONY OF WILLIAM L. CARWILE III,[1] ASSOCIATE ADMINISTRATOR FOR RESPONSE AND RECOVERY, FEDERAL EMERGENCY MANAGEMENT AGENCY, DEPARTMENT OF HOMELAND SECURITY

Mr. CARWILE. Good morning, Chairman Pryor. Thank you for inviting me to appear before you today on behalf of the Department of Homeland Security (DHS) and the Federal Emergency Management Agency. It is my privilege to discuss preparation for a whole community response to and recovery from a catastrophic earthquake. I am also prepared to discuss some of the lessons we learned from our support to the U.S. Agency for International Development (USAID) and the Office of U.S. Foreign Disaster Assistance (OFDA) during the Haitian earthquake response, as well as our reconnaissance work during the earthquake in Chile.

I am Bill Carwile, FEMA's Associate Administrator for Response and Recovery. I am a retired U.S. Army Colonel and former Defense Coordinating Officer (DCO) who also served as Federal Coordinating Officer (FCO), other senior emergency management positions, and I am well-aware of the immense response and recovery challenges that face survivors of a major incident like an earthquake.

Such an event will require an immediate, massive, and sustained support from the whole community. The whole community, that is the Federal, State, local governments, and our many private sector and volunteer agency partners, as well as the survivors themselves. The enormous destruction in a catastrophic disaster environment

[1] The prepared statement of Mr. Carwile appears in the appendix on page 25.

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requires us to focus on our number one priority: Saving and sustaining lives within the first 72 hours.

The whole community must be prepared to respond in ways beyond our normal paradigms. We must seek atypical solutions and adopt a planning process that incorporates such approaches.

Our planning assumptions for a catastrophic disaster are based on worst case scenarios derived from modeling and historical analysis. These are designed to challenge preparedness at all levels and enforce innovative, non-traditional solutions as part of the response strategy to such events.

National earthquake planning currently includes developing a Federal Interagency Operations Plan for earthquakes. This plan is a response and short-term recovery-oriented document. It ties national, regional, and state efforts together in a capstone document that addresses how the Federal interagency will prepare for and respond to a catastrophic earthquake anywhere.

This plan is closely linked to the development of the National Level Exercise (NLE) 2011, which has, as its scenario, an earthquake along the New Madrid fault seismic zone. The four FEMA regions and eight States that are in that zone are working in partnership with Federal, State, and local agencies to develop a coherent plan using our recently published Regional Planning Guide (RPG).

Scenario and damage information to inform planning efforts are provided by the U.S. Geological Survey and the academic community. Regional planning and the development of operational plans are completed or underway for several other geographic areas that have high earthquake hazards, including the San Francisco Bay area and Southern California.

Our Region VIII and the State of Utah are working together to develop a joint region/state catastrophic earthquake plan for the impact of an earthquake along the Wasatch fault. Region II will lead an 18-month planning effort to develop joint regional plans with Puerto Rico and the U.S. Virgin Islands to address a catastrophic earthquake and tsunami in the Caribbean.

FEMA Regions IX and X in the States of Washington, Oregon, California, Alaska, Idaho, and British Columbia, Canada, will work together to develop joint plans for an earthquake and tsunami addressing the earthquake and resulting tsunami occurring in the Cascadia Subduction Zone in the Pacific Northwest of the United States and Canada.

All of our future planning efforts will incorporate the lessons we learned from our deployment of the National Urban Search and Rescue (US&R) teams to Haiti. These lessons include being able to achieve flexibility in deploying these large teams, how to effectively employ the dogs to find survivors, and the need to use our teams as force multipliers by organizing like teams made up of survivors or others.

Our 28 Urban Search and Rescue task forces will need to be augmented in a major earthquake who are working with the Department of Defense (DOD) to train and use the National Guard as an organized force to serve as light urban search and rescue teams.

Effectively and rapidly responding to and recovering from the impact of a catastrophic earthquake is one of the greatest challenges

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faced by the whole community. At FEMA we recognize success depends on collective and collaborative efforts of all dimensions of our society.

I look forward to working with the Members of this Subcommittee and Members of Congress to address the requirements of a catastrophic earthquake or other large disaster. Sir, subject to your questions later, that concludes my briefing.

Senator PRYOR. Thank you. Mr. Dijkerman.

TESTIMONY OF DIRK W. DIJKERMAN,[1] ACTING ASSISTANT ADMINISTRATOR, BUREAU FOR DEMOCRACY, CONFLICT, AND HUMANITARIAN ASSISTANCE, U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT

Mr. DIJKERMAN. Can you hear me? Oh, great. Thank you, Chairman Pryor. We really appreciate the invitation to come to testify about earthquake preparedness and what the United States can potentially learn from some of our experiences. I appreciate that you will be putting the written testimony into the record.

As you commented, the earthquake in January in Haiti killed 230,000 people and displaced and disrupted the lives of another three million. Right after that, one of the good steps was that President Obama designated USAID Administrator Rajiv Shah as the United States Disaster Coordinator, and he committed the United States would provide a swift, aggressive, whole of U.S. Government response.

And in that effort, USAID coordinated the efforts of a number of U.S. Government agencies, including the Department of State, Health and Human Services (HHS); Homeland Security; and, of course, our colleagues here from FEMA.

I think you are probably aware that FEMA and USAID, particularly the Office of Foreign Disaster Assistance, have had a long relationship sharing lessons back and forth, and we can give you some of the historical lessons as well. But I will focus more on some of the more recent findings that we have had.

But anyway, back to Haiti, to date we have delivered over $1.14 billion. In the first 2 months of the Haiti earthquake, we sent and delivered about $250 million quite quickly, and I am going to come back to how we did that and why. But what is also significant here is in Haiti, we had our colleagues from Chile sending a search and rescue team, helping us out and coordinating with other search and rescue teams from around the world.

But about 2 months after the Haiti earthquake, as you mentioned, the earthquake in Chile struck. I think it ranks up there as one in a century-type earthquake, but there, as you noted, the impact was very much different. USAID has had a long relationship with the national office in Chile responsible for preparedness, and because of that, we were able to take our directions from the Chileans on what to do and they were able to guide us and the international community.

I think it is a very strong lesson on the impact of preparedness, not only in terms of the disaster response, but also working it through the system where they came up with more rigorous build-

[1] The prepared statement of Mr. Dijkerman appears in the appendix on page 39.

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ing codes, but then they also implemented it, which is, perhaps, even more important than just defining the improved codes. I will let my fellow panelists go into it in much more detail.

So, first, what are some of the lessons that we talk about? One, we have learned over and over again, and even in Haiti and in Pakistan, is that we can have a very small footprint, but still have a very huge and rapid impact by utilizing existing in-country relationships as force multipliers.

As I said earlier, we delivered about $254 million within 2 weeks and we did that by sending out what we call our Disaster Assistance Response Team (DART) that had about 34 members. But we had tapped into our existing relationships with many non-governmental organizations and United Nations agencies on the ground, who in turn had reached back to the rest of their organizations throughout the world to bring in what we needed.

This obviously, our number of 34 people for USAID, did not include the 500-plus members that were brought in from search and rescue and the 20,000 military folks that were also brought in. But focusing on the resources we delivered and focusing on the fact that we used these non-governmental organizations, it gives us a couple of advantages.

One, as I said, force multiplier, but two, because they are there, they immediately start helping us try to maximize the extent to which we can make sure the assistance is locally attuned to the cultural challenges and circumstances there. I know the United States is not as diverse a difference between, let us say, Haiti and the United States, but being culturally attuned is always a challenge.

Now, the other point is that we, as USAID, again different from FEMA, do not implement. We implement through people. But we do keep ourselves on the ground right next to everybody else, closely monitoring, making adjustments, and issuing new grants as we go. And that is part of how we stay on top of it, and, if you will, move a fair amount of resources.

This model that we use is very flexible. In Haiti, we had 34 people addressing, if you will, a caseload of up to three million people affected. Right now in Pakistan, which is being affected by a flood we have about 17 people on our DART addressing and trying to address the caseload of between 16 and 20 million people. Again, we are using the same structure and I think it has been fairly effective there to move almost $300 million in a fairly short period of time.

The second lesson I would want to mention is that we are learning that the single chain of command, which we normally use, is not good enough and we have to scale it up, and here, we are actually learning from some of what FEMA has done and we are trying to make the whole of U.S. Government response a bit more comprehensive and work more on where the resources are going to come from and how we can do this.

The last thing that I would point out is that we are focusing on a lesson about the technical teams that we send out. They have to be small, nimble, mobile. We need to get them up to and familiar with international standards, and a benefit like this will also help if they come in to help us in the United States.

So let me stop there and thank you very much for inviting us.

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Senator PRYOR. Thank you. Ms. Chan, you are not going to testify, as I understand it, but will be available for questions and we appreciate that.

Mr. Lira, we again thank you for being here. I do not want you to feel constrained by the 5-minute rule since you have a presentation and since you have traveled such a great distance to be here. Go ahead and give us your presentation.

TESTIMONY OF CHRISTOBAL LIRA,[1] DIRECTOR, COMMITTEE FOR EARTHQUAKE AND TSUNAMI EMERGENCY (MARCH–AUGUST, 2010), RECONSTRUCTION COMMITTEE (SINCE AUGUST, 2010), CHILEAN MINISTRY OF INTERIOR

Mr. LIRA. Good morning Mr. Chairman. It is an honor and a privilege for me as the Director of the Reconstruction Committee of Chile, to be here at the U.S. Senate for sharing with you the Chilean experience on how we faced the devastating February earthquake. Thank you for calling me to this hearing.

Committee of Chile, to be here at the U.S. Senate for sharing with you the Chilean experience on how we faced the devastating February earthquake. Thank you for calling me to this hearing.

In this opportunity I would also like to thank the U.S. Government, the U.S. Senate, and all the people in this country that helped Chile during those difficult times.

In my presentation, I would like to talk about three main topics, earthquake and tsunami impact, government reaction and organization, initiatives in place and learning captured. First of all, I will try to show you how big this emergency was and the consequence it had for our people and our economy.

As you can see, this was the fifth strongest earthquake registered until now. The total loss was 14.9 percent of the gross domestic product (GDP), a huge loss for our economy. Image can say a lot about what happened in our country. This image shows the island of Juan Fernandez before and after the tsunami. This image shows Talcahuano port in the south, one of the most important ports in the country. Here you can see our main highway in the city of Santiago and all the damage caused by the earthquake.

A bridge, 200 kilometers south of Santiago, before and after the earthquake. This is the town of Dichato before and after the tsunami. The picture shows the Alto Rio building in Concepcion after the earthquake. Here we can see the enormous impact of the earthquake and tsunami, in all, 521 fatal losses, 56 disappeared, 370,000 destroyed houses, 73 destroyed hospitals, 3,049 destroyed and damaged schools, 1,250,000 children out of school, 221 destroyed and damaged bridges, 900 towns. Here you have an open view of the damages by sector in the economy. As I say before, it was 14.9 percent of the country's GDP.

Now I am going to talk about the government reaction to this emergency and how it organized to respond and deliver the necessary solutions. The most important thing is that we started simultaneously to attend the emergency and also starting the reconstruction efforts.

[1] The prepared statement of Mr. Lira appears in the appendix on page 45.

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As you can see here, two committees were created, the first one to respond to the emergency and the second to start working in the reconstruction. The emergency committee recruited around 10 people from the private sector to work temporarily in this committee. These people continued to receive their wages from the companies where they used to work. This help from the private sector and an emergency law that made it easier to buy and deliver help was fundamental for the success of the emergency committee in a very short period.

We worked in coordination with the armed forces and the Office of Emergency of the Interior Ministry (ONEMI). Also, very coordinated with a new authority, especially the regional governments.

The armed forces were very important in two stages of the emergency, first, working to restore the public order that was missing after the earthquake, and second, changing their guns for tools to help to build emergency houses and remove debris from the street. That is the first stage and then they changed their guns to tools.

A fundamental aspect to have permanent knowledge of the situation and deliver fast and adequate solutions was that the government worked permanently in the field, distinguishing their people with colorful red jackets so the people recognized us and talked to us and cried with us.

Since the beginning of the government, we have worked together with McKinsey Company trying to have a good diagnosis of what worked well and what did not work during this emergency. I would like to share with you these learnings and how we are working to be better prepared when the next emergency comes.

We have the seismological and telecommunication infrastructure. Communications were down for more than 12 hours. Sensors took more than two hours to provide the information. So we are working on investments in real time monitoring process and robust telecommunication systems with multiple backups.

Issuing alarms process. Process to issue an alarm involved unclear communication protocols, multiple unnecessary decision points, and no use of mass communication channels. We are working on clear communication protocols, single responsibility for decision, and use of mass communication channels.

Emergency task force. We do not have a force dedicated to help in initial evaluation of damage, nor specialized in emergency procedures. So we are developing an army emergency task force specialized in emergency procedures.

Chain of command. No clear chain of command in place, too many direct reports organized by institution instead of functions, and leadership duplicity. We are working on no more than eight direct reports organized by function and single leadership.

The war room dynamics. Unrestricted access, everybody sitting around the same table randomly, and press with direct access to everything. We are working on restricted area access, decision makers in one table separated from support staff in separate tables grouped by functions.

Looting. Heavy looting began 18 hours after the earthquake. Procedures to deploy armed forces to ensure safety in the first hours of the emergency.

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But we also learned from the good things we had in place. You hear about the 600 people that died in Chile compared with Haiti. The first thing was the population knowledge. Chile's coastal population have a very good understanding of the need to evacuate in the event of any big earthquake. The second thing was the lack of fires. Chile's energy network shuts down automatically in the event of any major earthquake. It is difficult to be without light, but also without fire.

And the robust civil infrastructure. Chile construction norm and developers being responsible for more than 10 years provided a civil infrastructure that was able to protect Chilean citizens overall.

So also, I would like to give you some materials. You will have more information on the topics I have talked about before, a copy of the Sustainable Reconstruction Plan of Constitucion City, an example that we have there, so you can see how we have been developing a reconstruction plan since the beginning of the government. That plan takes about 1 year to develop and we do it in 4 months.

Information about the Onemi, the Chilean Emergency Office, and how they are working in the prevention, response, and recovery for future emergencies. I will also give you a presentation from the Minister of Finance where you can find more information about the costs that this emergency implied for our economy, and how the government is preparing to finance these costs. And the final daily report from the Emergency Committee where you can find details about the aid delivered in the area affected by the earthquake and tsunami.

I am pleased. Feel free to ask anything, other information. I would like to invite the Senators to visit us. It will be an honor to show you personally all the details in the field. Thank you very much, Senator Pryor.

Senator PRYOR. Thank you for your statement and your presentation.

Mr. Carwile, let me start with you, if I may. Just in general terms, if you were going to grade the Federal Government right now on our preparedness for a big earthquake, wherever it may occur in our country—how would you grade us on our preparedness?

Mr. CARWILE. Mr. Chairman, I would probably give us a B. I think we have made great progress in the last year and a half or so with regard to building on regional and state plans. Sir, we are kind of a bottoms-up constitutionally, so through Congress's grant programs that we administered on our preparedness side of the house, we have seen some significant increases in state and local capacities for a major event.

I think on my side of the house, on response recovery, we have done a lot more coherent planning with our regions and States. It occurred to me when I came back to government about 18 months ago that there has been sort of a centralization here in Washington of planning efforts, which was OK at the Federal level, but when you really have to implement them, it is down to a state and a regional level. So I think we are moving along very well.

I do believe that the National Level Exercise 2011, which will be on the year anniversary of the terrible New Madrid earthquake you

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described, sir, will give us an opportunity to grade that preparedness a lot better than we can right now.

Senator PRYOR. Good. And let me ask the follow-up. You mentioned State, local, and I will throw in private sector. How would you grade the State, local, and private sector on their preparedness?

Mr. CARWILE. Let me start with the private sector. We have been reaching out to the private sector, actually to some folks in your home State, Bentonville, and some other folks around the country. In many ways the private sector is ahead of the government. I know that some of the large corporations have incredibly robust continuity of operations plans for their business model. But we have entered into partnerships with them to a much greater degree than we ever.

Last Monday, for example, we had 60 members of both associations and corporations at FEMA headquarters to discuss not only what can the private sector do for us, where can we buy from them for survivors, but what can we, as a government, do to help them get back up and operational. So I think the private sector pieces are working well.

We had included them, as well as our volunteer agency partners, into several thunderbolt exercises. Those are exercises that Administrator Fugate started when he came to office. There is no notice. We brought in the private sector and the volunteer agencies to a much greater degree.

We have also established a seat, and we went through some issues with our legal folks, but we have a seat now at the National Response Coordination Center (NRCC) for a member of the private sector and is going to rotate. Right now Target has that seat, but they will represent folks in Bentonville and all the other private sector folks. So we have partnered with them much better.

On the volunteer agency side, we have a tremendous relationship with the National Volunteer Organization's Active in Disasters (VOAD). They cover not only the big—the American Red Cross, Salvation Army—but a lot of the smaller volunteer agencies that are so critical to helping our survivors during the time of disasters.

So that partnership between government and state and local level, as well as here at the Federal level is extremely strong. Some States have entered into relationships. Louisiana has. Texas has. I know Dave Maxwell in Arkansas has entered into—he has a very strong relationship with the private sector there. They were part of a rehearsal of a drill they had yesterday in North Little Rock. The private sector participated. It has to do with New Madrid planning. The feedback from that yesterday was great.

So I think we are in much better shape. That is why Administrator Fugate has been pushing the idea of whole community, not just the Federal Government or state and local governments, but also our partners in the private and the volunteer agency sectors, sir.

Senator PRYOR. Good. And you witnessed the terrible earthquake down in Chile and it seems to me that they did a lot of things right before the earthquake happened that paid huge dividends when it actually occurred.

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Mr. CARWILE. Yes. In looking at Senor Lira's slides, a lot of the things they were doing well are things that we are trying to do as far as a knowledge of the people, working with our private sector partners in the energy field.

But also on the right side of the slide, some of the things that we are trying to do, one of my colleagues in the rear said, some of the organizational construct, which we have adopted are the National Management System and the Command System, to alleviate some of the duplication of efforts. I think we do that pretty well now.

I happened to have been the Federal Coordinating Officer in Hurricane Katrina in Mississippi with Governor Barber, and there, with his team, the state team, we formed a unified coordination group and worked with the state and local partners down at about the county level to create division supervisors under geographic branches. So we were able to set the priorities based on Governor Barber's direction, of course, and have some unity of effort.

So I saw a lot of things that we have been working on in Senor Lira's slides.

Senator PRYOR. One of the things in Mr. Lira's statement that struck me is that the general population has a knowledge level, about what to do and what not to do in the event of an earthquake. How are we doing in that area?

Mr. CARWILE. I think we have some work to do, sir.

Senator PRYOR. My sense is, if you are living in California, it is more something you live with every day.

Mr. CARWILE. That is right. I was able to speak in Kobe, Japan a couple of years ago on the anniversary of the Kobe earthquake, and in Japan, they teach children in school—we used to do it in the Cold War—a duck and cover and all that. Children know, if they feel a shake, they go to high ground.

I think in California, where I have lived in the past, there is a lot more cognizance of that. I do not think we do as well in other parts of the country, and I know that Jim Wilkinson from Central United States Earthquake Consortium (CUSEC) is going to speak on the next panel, and Jim is doing a great job through the Earthquake Consortium of the Central United States to try to do that outreach work. I think he can probably answer that question, how we are addressing the central part of the country, a little bit better. But I think California is probably leading the way, sir.

Senator PRYOR. Mr. Lira, how does Chile let the general public know what to do in the event of an earthquake, how to prepare beforehand and how to handle things when the earthquake actually happens? How has your country done that?

Mr. LIRA. Well, we have some simulations that we do in the cities. I gave you some examples of that in the information that I sent you before. So there we work—the last one I remember in Iquique, the city, it was about 100,000 people moving in a simulation for an earthquake and tsunami.

So in that, you can see it in the news, in the television, so all the people know so that after an earthquake, it is very probable that you will have a tsunami. So at 3 a.m., the people run away to the mountains, to the hills behind the cities. That is why we have only about 600 people died.

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Senator PRYOR. Wow. Well, that education certainly has paid off.

Mr. Carwile, I know that we have a large scale earthquake exercise planned for 2011. What dates will that run in 2011?

Mr. CARWILE. That is in May, sir. I will get back on the exact dates.

Senator PRYOR. OK. And I think a lot of times we make sure that our first responders are involved and our hospitals know what to do. We plan scenarios such as what if this bridge goes out and all of that is good for local law enforcement. But will part of the large scale exercise include educating the public on what to do and will the public have more awareness about the exercise?

Mr. CARWILE. Absolutely, Mr. Chairman, and we are providing, through our Hazard Mitigation Grant Program (HMGP), some resources to the States to do that outreach, as well as working with those four consortium that are doing outreach all the time. But part of the exercise will be the education of folks through a strategic communications part of the exercise.

Senator PRYOR. Great. Mr. Lira, let me ask you follow-up question on that. It sounds like your preparation went well, but if you could go back and change one thing before the earthquake, and do one thing differently, what would that one thing be?

Mr. LIRA. Probably the war room. We have to—we are working on that war room again. We need less people working there because if you have 40 people inside a war room, of course, it is very difficult to make decisions.

Senator PRYOR. Right.

Mr. LIRA. That is why one of the things that I would like to define very clear for a future earthquake is how has to be this war room, what people must be there, how you organize the other people, the function people in a separate room. That is something that we have to work and pay strong—and also, the first impression.

We need a team, a task force that goes with a helicopter and immediately goes through all the affected area and so we can know what is happening, real, because at 5 a.m., the television was saying, "No, we do not have any risk of tsunami," when the tsunami was there. That is why nobody knows in that night. So we need that task force that works only looking, what is happening. That is both things that I think we have to work on for the future.

Senator PRYOR. Great. Well, that is helpful. Did you jot that down, Mr. Carwile? I saw you writing notes. That is good. I am glad.

Mr. Dijkerman, Ms. Chan, I have not forgotten about you all, so let me ask a couple of questions. I know that, Mr. Dijkerman, you work around the world and try to be there for other countries when we provide assistance abroad. I know that you work in a lot of poor areas around the globe. We have some poor areas in this country as well.

What is your impression about areas in our country, whether they be inner cities or rural areas or just places like Indian reservations, etc? Do you think that they will be hit disproportionately hard because of the poverty or do you think that is much of an issue in this country?

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Mr. DIJKERMAN. Well, one of the advantages of having spent a lot of time overseas is, I think, I almost know that better sometimes than the United States.

Senator PRYOR. Right.

Mr. DIJKERMAN. So please recognize that limitation. But one of the differences that we find, if people have lower incomes, is that they have lower other resources and opportunities to cushion themselves for unforeseen circumstances, whether it be floods or earthquakes or droughts or you name it. And so, because their cushion is much smaller, the impact is much more devastating. So that is a reality that we look at.

And one of the things from that we focus on, not only in focusing on saving lives, but we focus, first and foremost, on the very elemental aspects of saving lives: Getting water, getting essential medicine there, particularly for women and children, because some of those groups are the first to start suffering.

And then when we talk about shelter, our immediate response efforts are very, very basic. Tents, things like that, or for water, water bladders. So we try to accommodate the fact that we have to respond all over the world with very basic commodities that can immediately start saving lives. As Bill mentioned, it is very important to start saving lives in the first 72 hours.

Senator PRYOR. As you work with other countries, do you try to go in before disasters happen and help them prepare? Is that part of your mission?

Mr. DIJKERMAN. Absolutely. That is an investment that we have tried to carve out from our first responsibility of being 9–1–1. But we have, at times, been able to spend up to 20 percent of our budget, when we have been fortunate enough to not have too many disasters, to try to divert towards what we call conflict prevention and mitigation.

So, for example, in Latin America, we have trained over 30,000 first responders and government officials with us, not only that we are training them, but that we work together so that when something happens, there is already an established familiarity between the groups. So in the case of Chile, the people we sent down there already knew some of the officers in the operation and we knew what they were capable of and we could just stand on the sideline and wait for directions.

In other places, we do not have that depth of capacity and we have to make some investments in potentially shoring that up. But the investments that we have made just makes it simply a lot easier for when something happens.

I recall, about a year ago, when we had the earthquake in Guatemala, it hit, the Guatemalans activated their service, we went there. They say, "Hey, come on in." We were inside the hard wall in the war room and they were just working away and we said, "Are you ready, do you need something?" They said, "No, I think we have it." We said, "Great."

But that familiarity in processes and procedures just makes the response time less. So had there been a need for us, I think we could have responded much more quickly.

Senator PRYOR. That is great. And you or your team spent a lot of time in Haiti as well?

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Mr. DIJKERMAN. Yes.

Senator PRYOR. I guess that would be an example of where you see how poverty works as a big disadvantage to an area and you get into things like building codes, etc, that they just did not have; whereas, in Chile, they have had a long history of enforcing seismic building codes.

One thing that I am a little bit concerned about and you may not be able to comment on this is that building codes differ so much from area to area in the United States.

My experience is that if you have an economically depressed area, they may not pay as much attention to something like a building code in order to try to get a business to locate there, as compared to some places doing better economically and that have the luxury of thinking about things like seismic building codes. Do you have any impressions on the disparities within the United States or is that just not your area?

Mr. DIJKERMAN. That is beyond my area of expertise, but I will say the point I emphasized earlier, which is the one that really matters, is what Chile demonstrated is not only putting the building codes in place, but for me what is much more important is implementing them.

What we often find in the first instances in working with other countries is it is easy to put the plan together or it is easy to identify what needs to be done. But the much more difficult task is to do the education of the population, the enforcement of the building codes. And even with doing that, there are still going to be gaps and limitations. But the key focus that we try to get at is execution of what you have decided to try to do. That is almost more important and maybe that is some of the issues that might be present here. I will let my colleague from FEMA talk.

Senator PRYOR. Did you have something to say about that?

Mr. CARWILE. I would say that the mitigation efforts in building codes and standards of both adopting and implementing, as Dirk talked about, Mr. Chairman, are critical. We work very closely through the National—we are part of the National Earthquake Reduction Program (NERP) as well as the international body that establishes codes, but it is a State by State, in some States it is by county, and you are right.

In the poorer counties—I happened to be working in a southern State in a large disaster and we started talking about codes and standards and there were not any. But if you look at the difference between—we just had a major earthquake in Christchurch, New Zealand, in which no lives were lost, but they adopted very stringent building codes and standards. I think that probably contributed to saving a whole lot of lives. But it is a very important issue in terms of earthquakes. I cannot think of anything more in preparing for the population is incredibly important, our ability to respond with the government and private sectors as far as these building codes are what really are going to save lives on the front end.

Senator PRYOR. Right. And, Ms. Chan, I am not going to let you off the hook here. I do want to ask you one question to see if you can enlighten us on this. My understanding is, at last count, there were nearly a million people displaced in Haiti. My understanding

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is a lot of them are living in tent cities or some sort of makeshift housing. Does USAID continue to have a presence in Haiti? And at this point, given the scale of the disaster, what is our mission there right now?

Ms. CHAN. Yes. USAID has a very strong presence there, not only with our team on the ground, our Disaster Assistance Response Team, but working very closely with the USAID mission and with the State Department. It is a whole government effort working towards trying to build back livelihoods. There is a focus on, again, trying to do reconstruction and getting people out of the displacement camps.

The Department of State is working very closely also with President Preval. So, I think, in essence, the overall vision is to help people build back their lives at this point.

Senator PRYOR. Good. I want to thank all of our witnesses on the first panel. You all have been great. What we will do is leave the record open for a couple of weeks. There are some Senators who are not here today that have expressed an interest in various aspects of earthquake preparedness. You may want to expect to get a few questions from the Subcommittee over the next few days, and we would love to get responses back. We will also put your presentations in the record. Your comments have been very helpful. I will go ahead and introduce our second panel. Thank you very much.

Mr. CARWILE. Thank you very much.

Ms. CHAN. Thank you.

Mr. LIRA. Mr. Chairman.

Senator PRYOR. Yes, sir.

Mr. LIRA. Only to say, again, thank you very much for calling me to this hearing, and also, thank you again for all the Americans that help us, especially some institutions like the Army, the Air Force, FEMA that is here, and USAID, the American Red Cross that was there, and all the Americans that helped us——

Mr. LIRA [continuing]. Like the government designator. Thank you very much.

Senator PRYOR. Well, thank you. You guys have always been a good neighbor as well and we appreciate you being here because you are helping us now by letting us see the results of your planning and your operations in Chile and learn lessons from you. So thank you very much for being here.

Mr. LIRA. Thank you.

Senator PRYOR. All right. I will go ahead and bring the second panel up and our staff will swap out the name tags and set up the microphones.

I will go ahead and introduce our second panel.

Our first witness will be Jim Wilkerson. He is the Executive Director of the Central United States Earthquake Consortium.

Our next witness is Ellis Stanley, Vice President and Director of Western Emergency Management Services at Dewberry and Dewberry brings a lot to the table. We look forward to hearing from you, Mr. Stanley.

And then our last witness today will be Dr. Reginald DesRoches, Professor and Associate Chair of the School of Civil and Environmental Engineering at the Georgia Institute of Technology. Thank

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you all for being here. I appreciate your time, preparation, and effort to get here today.

Mr. Wilkinson, we will lead off with you.

TESTIMONY OF JAMES M. WILKINSON,[1] EXECUTIVE DIRECTOR, CENTRAL UNITED STATES EARTHQUAKE CONSORTIUM

Mr. WILKINSON. Thank you, sir. First let me express my sincere thanks for the invitation to come and join you today and share my thoughts on the earthquake hazard and the risk in central United States

Earthquake hazard in the central United States has a couple unique issues that elevate this hazard to a point that is considered to be catastrophic if the right variables were to align themselves. First, that the geology allows for a very large area of influence. The seismic waves from earthquakes carry for great distances before they dissipate. This is well-documented, both historically and for current seismicity.

Rather than being constrained by one felt area, the effects are commonly reported over a 10-, 15-, even 20-State area. Damage from an April 18th 4.8 event of 2008 was recorded in three States, thankfully not at a level to be significant. Had this been a magnitude 5 or greater, the outcome would have been most likely very different.

The other unique issues with earthquakes in the central United States is the sequencing of large events like those of 1811 and 1812, meaning that rather than a single main shock followed by some number of aftershocks, we experience several main shocks spread over a period of time, each with their own series of aftershocks. This has been documented to have occurred in 1811, 1450, 900 A.D., as well as 2350 B.C., also supporting the fact that the events of 1811 and 1812 were not a one-time event.

These unique aspects, coupled with the fact that the United States has not built with earthquakes in mind until most recently, and the fact that we have a large percentage of old and aging infrastructure has created a situation that would be truly catastrophic. But it does not stop there.

There are cascading effects with the impact either from the shaking or liquefaction or both that would also have additional secondary losses to oil and gas pipelines that run through the central United States; electrical grid, which also happens to service a large portion of the north and eastern United States, including the District of Columbia; as well as impact to commerce, loss of highways, bridges, river systems, agricultural farming, and ports.

I have described but a small sampling of the issues that make the seismic hazard associated in central United States a significant issue. With a hazard that presents such a daunting picture, it is easy to see how addressing it would present significant challenges. This is not your garden variety hazard. The complexity for dealing with a hazard affecting multiple States, Federal regions, make this an area that requires a strong collaborative approach from all levels of government as well as the private sector and citizens alike.

[1] The prepared statement of Mr. Wilkinson appears in the appendix on page 73.

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While there is nothing we can do about the hazard, there is good news. The risk can be addressed, the steps can be taken to reduce that level of exposure, but there has to be a willingness to work towards that goal. A strong public awareness and educational effort is key, in combination with an aggressive mitigation program.

This does not mean we have to turn away from the development of strong response and recovery plans. On the contrary, we need to be working towards a balanced approach that supports all program areas working together to make our communities safer and more responsive to future seismic events.

In addition to day to day program efforts of the National Earthquake Hazard Reduction Program (NEHRP), CUSEC has been working in partnership with FEMA and a host of others for the past 4 years on a focused effort to revise and, in many cases, develop new earthquake response plans at the local, State, regional, and national levels. We will test these plans in April of next year in a multi-state, multi-regional national level exercise in order to identify any gaps which have been identified and improve on those.

The exercise is one of many planned bicentennial events in observance of the 1811/1812 earthquakes. Other significant events will include the Great U.S. Shakeout, which is an earthquake drill, and various planned earthquake program training and other outreach activities.

In closing, addressing earthquake risk in the central United States is not a function of one organization or governmental agency. The issue requires a comprehensive approach involving citizens, community leaders, Non-govermental organization (NGOs), as well as the private sector and many others working with state and national levels of government. Unless we improve on our abilities to work together, putting aside our programmatic and organizational differences, we will be faced with sporadic and marginal improvements and ultimately, communities less prepared to address a major earthquake.

As Executive Director of the Central United States Earthquake Consortium, it has been my special honor for me to have the opportunity to share with you my thoughts concerning the earthquake threat in central United States

Senator PRYOR. Thank you. Mr. Stanley.

TESTIMONY OF ELLIS M. STANLEY, SR.,[1] VICE PRESIDENT, DEWBERRY; DIRECTOR OF WESTERN EMERGENCY MANAGEMENT AND HOMELAND SECURITY SERVICES

Mr. STANLEY. Chairman Pryor, thank you so much for having us here to speak to you before this Subcommittee on Earthquake Preparedness-What the United States Can Learn from the Chilean and Haitian Earthquakes.

How a government responds after a disaster usually captures the headlines. But most often it is the role that government plays in preparing for these types of events that can be the single biggest factor in minimizing not only the event's initial toll, but also the recovery time necessary to bring a community back to a healthy functional State.

[1] The prepared statement of Mr. Stanley appears in the appendix on page 81.

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In this regard, an examination of how the government of Chile responded during the immediate aftermath of the earthquake and related tsunamis is appropriate. I will also address how Southern California differs from a lot of these incidents in their preparedness.

Our findings reinforced the importance of our pre-disaster relationships with all of our governmental, non-governmental, and community partners, including the private sector. Properly done, these relationships require an organizational commitment as well as a significant investment of time and personnel. The number and complexity of these relationships will vary based on local nuances. But as a general rule, it is vital to ensure active participation in disaster policy and planning and response and recovery activities at all levels.

It was no surprise to learn that the areas of Chile that made the most effective use of resources were the very areas where some level of interaction had been ongoing before the earthquake. In the interest of time, I will just give some of the overall findings and ask that the rest be submitted for the record.

The previous panel talked about the people's knowledge. We dub that culture of resilience. What we saw in Chile was people had resilience that they did not even know they had. For example, there were fewer lives lost in the tsunami area simply because they had been taught that if the earthquake shakes enough to knock you off your feet, move to higher ground. They did not have to wait for the government or anyone to give them signals.

We also learned that they have a compulsory military, and even though they do not see that as emergency planning, it was planning that helped them to be resilient. Volunteers in Chile tend to be very resilient. They are able to work effectively with little or no direction from the national headquarters. This has been part of the reason that they were able to do so well.

Some of the recommendations for improvement that we took away is that emergency plans need to be flexible and include alternative options in case primary plans are unable to be executed. That sounds simple, but so often we do not do the backup to the backup to the backup. All volunteer leadership at all levels need to know the emergency plan. Exercises need to be done on a regular basis with everybody participating.

Involve local officials in regional planning as well. Perform a realistic assessment of life-essential systems such as water or emergency medicine and supplies. Personnel should be trained in the probability of core services not being available and exercise that.

Personnel conducting comprehensive exercises including joint government, private sector, NGO, emergency responder, and community exercises before an incident is paramount to surviving and thriving. Individual resilience and effective networking with local partners are vital to the continued success of the community after a disaster. Education, education, education about what happens during the event is important.

Emergency and earthquake professionals should work with representatives of print and broadcast media before a disaster to determine how best to serve. We are doing this in Southern California with the Great ShakeOut in which 6.8-plus million people

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are involved. Emergency plans need to be redundant. I have said that twice because it needs to be redundant. We need to keep doing that.

Recognize that competing personal and professional demands will be made on an organization. And organizations need to plan for non-structural damage and potential evacuation. We need to recognize vulnerabilities in our communication systems and we have been talking about that since September 11, 2001. We need to explore mechanisms to encourage building owners to adhere to rigorous building codes.

We need to collect all possible data for each disaster when it happens. It took the 33 Long Beach earthquake to design schools to a higher standard. It took the 71 San Fernando earthquake to design hospitals to a higher standard. What will it take to design tall, high occupancy buildings to a higher standard? Those are some of the things that we need to look at.

We need to look at what are acceptable collapse rates for new buildings and who determines what that will be. And we also need to get the public involved in helping to make these decisions. Thank you very much.

Senator PRYOR. Thank you. Dr. DesRoches.

TESTIMONY OF REGINALD DESROCHES, PH.D,[1] PROFESSOR AND ASSOCIATE CHAIR, GEORGIA INSTITUTE OF TECHNOLOGY, SCHOOL OF CIVIL AND ENVIRONMENTAL ENGINEERING

Mr. DESROCHES. Thank you, Mr. Chairman. Thanks for the opportunity to come here today to testify about earthquake preparedness in the United States My testimony will highlight the risks associated with a potential catastrophic earthquake event in the United States and address the opportunities to improve infrastructure resilience.

My perspective is that of one who has studied earthquakes, first as a student in California during both the 89 and 94 earthquakes, and subsequently as a professor at Georgia Tech where I focus on the earthquakes in the central and southeastern United States More recently, I have worked extensively in Haiti since the January 12, 2010 earthquake, having led a team of 28 engineers, scientists, and planners to study the effects and survey building damage in Port-au-Prince. I might add that I was born in Haiti and lost family during the earthquake event and I am committed to seeing Haiti be more resilient and moving forward.

The Haiti earthquake is likely the most catastrophic natural disaster in modern times, particularly when viewed on a per capita basis. The magnitude 7 earthquake resulted in over 250,000 deaths, 300,000 injured, over a million displaced, 250,000 homes destroyed, and critical infrastructure particularly damaged. In contrast, the much larger 8.8 Chile earthquake resulted in less than 600 deaths and much fewer injured.

There are numerous reasons for the differences in the outcomes. However, there is no doubt the advanced level of seismic design and preparedness in Chile compared to Haiti is a primary contrib-

[1] The prepared statement of Mr. DesRoches appears in the appendix on page 87.

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uting factor to the significant differences observed between the two earthquakes.

Chile has a long history of large and frequent earthquakes. Because of this history of large and frequent earthquakes, Chile has been diligent in ensuring its buildings and other infrastructure are designed according to updated seismic design codes. On the contrary, Haiti had not experienced a major earthquake in over 200 years, and therefore, was not prepared for the earthquake that struck on January 12.

There are several regions in the United States that have a history of large, but infrequent earthquakes, and therefore are not prepared in terms of appropriate building designs and earthquake details. We have heard many people today talk about the New Madrid Seismic Zone (NMSZ). In addition to that, the Charleston region, Charleston, South Carolina, is also a region of large, but infrequent earthquakes. On August 31st, 1886, a large earthquake hit the Charleston region with an estimated magnitude of 7.0 that was felt along the entire East Coast.

The primary risk of catastrophic earthquakes in the United States is likely failure and damage of the built infrastructure. Today the New Madrid Seismic Zone region is highly populated and densely covered with homes, commercial buildings, critical infrastructure such as bridges, pipelines, power, telecommunication systems, dams, and levees.

Damage to these critical infrastructure systems would have a disastrous consequence on the regional, national, and global economies. It is expected that many of the bridges in the region, including some crossing the Mississippi, would collapse and be unuseable for weeks or longer. In addition, there would be severe interruptions to oil and gas services due to severely damaged pipelines.

Such a strong earthquake would rock the entire eastern half of the country and prove devastating to a broad section of the country. A recent study by the Mid-America Earthquake Center last year estimates that nearly three-quarters of a million buildings would be damaged, 3,000 bridges would potentially collapse, 400,000 breaks and leaks to local pipelines, and $300 billion in damage, direct damage, and $600 billion in indirect losses would occur. Similar numbers came out of a study on the Charleston earthquake.

The recent studies on the possibilities of catastrophic failures in the case of a large earthquake in the central and southeastern United States demonstrates the scope of the problem and reinforces the need to implement measures to reduce seismic risk. We know that there are hundreds of thousands of buildings and key critical infrastructure systems that remain at risk of a large earthquake. We cannot prevent the build-up of tectonic stress along fault lines, nor can we pinpoint the exact moment when a disastrous earthquake will strike.

With the leadership of the NEHRP agencies, significant progress has been made in our understanding of the earthquake hazards in the various parts of the United States as well as the vulnerabilities associated with different types of structural systems. New design codes and guidelines have incorporated lessons learned from recent

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earthquakes, as well as new knowledge developed from researchers and practicing engineers in cooperation with NEHRP agencies.

The transfer of scientific research successes from the NEHRP efforts in building and design codes is one important step towards preparedness in the United States. Still more needs to be done. Small investments now can yield significant savings later. The California Department of Transportation is a good example of the return on investments from retrofitted bridges. Following the 1971 San Fernando earthquake, California Department of Transportation (CALTRANS) initiated a retrofit program for bridges that was deemed vulnerable from earthquakes. These same bridges, when subjected to the 1994 and 89 earthquakes, performed extremely well with little to no damage.

My main message to this panel is that it is critical that we continue to apply science and engineering knowledge to develop innovative technologies and designs to increase our earthquake preparedness. We also need to continue to enhance building codes and establish priorities for mitigation strategies that limit damage to buildings and critical infrastructure. Prioritized mitigation strategies can assist in identifying infrastructure systems that are most at risk of damage and/or failure so that we can begin developing ways to fortify them against future earthquakes. Thank you.

Senator PRYOR. Thank you. By the way, my understanding is they have been trying to earthquake-proof one of the bridges over the Mississippi River at Memphis. Is it the I–40 bridge? I cannot remember which one.

Mr. DESROCHES. Yes, sir.

Senator PRYOR. That is great. I am glad that they are doing that.

Mr. Wilkinson, let me start with you. I am guessing that your primary focus for your group is the New Madrid fault area. Is that fair to say?

Mr. WILKINSON. Primarily. It is earthquakes anywhere in the central United States, the Wabash, the East Tennessee, but New Madrid is the primary focus.

Senator PRYOR. And in your testimony, you gave some dates in which New Madrid quakes have been documented. What are those dates again?

Mr. WILKINSON. The dates are 1450, 900 A.D., and 2350 B.C. Those were based off paleoseismic investigations of these large sand blow, sand areas you see throughout the Boot Hill in northern Arkansas.

Senator PRYOR. Does that mean that is the only time that they have happened?

Mr. WILKINSON. That scale. There are many other earthquakes of smaller magnitude, but equivalent to the 1811 and 1812, that is the documented ones.

Senator PRYOR. Is there a projection or a general scientific consensus on when to expect the next one?

Mr. WILKINSON. I am going out on a bit of a limb because I am not a geologist, but about every 500 years they seem to be having these larger seismic events, like 1811 and 1812. We are at the 200th period from New Madrid, 1811, so we are getting within the window that the numbers are going up.

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Senator PRYOR. I think we have something that the other witnesses talked about as well. It is a magnitude versus frequency concern, and that is, if you are in a area where there are a lot of earthquakes, you are more sensitized to it. The building codes are probably better and there are better systems in place to handle an earthquake. But if you are in another area that may not have nearly as many earthquakes but has more severe quakes, you really may be asking for trouble.

Mr. Wilkinson, you mentioned the National Level Exercise in your opening statement. I assume that you are participating in that already since there has been a lot of prep work happening. How is that going and do you think that will help our preparedness?

Mr. WILKINSON. Absolutely. Ironically, we were here last week, the eight States that make up CUSEC. Our Federal partners were here working on what they call a mid-planning conference for that exercise. So we are well underway in reaching an agreement on the objectives we are going to test.

One of the unique things that we have coupled with that exercise is a lead-up activity. It was referenced both in Ellis' and mine presentation about the Great ShakeOut. We have been working very closely with California to develop a ShakeOut for the central United States That is an earthquake drill that will take place on April 28 among our eight States.

Not to put any competition in it, but Missouri and your folks to your north are a little ahead of us in registering for that. But our goal is a million participants. We really want to get people to understand that there are steps they can take to protect themselves. So we have added that as part of the exercise to bring greater awareness.

Senator PRYOR. Good. And you heard Dr. DesRoches' statement about the scenario of a New Madrid quake in terms of the number of bridges that might collapse and damage the oil and gas lines, etc. Did you want to add anything to the scenario that he painted?

Mr. WILKINSON. Well, we worked very closely with the Mid-America Earthquake Center (MAEC) in development of that scenario, with our state geologists and U.S. Geological Survey, to develop what we consider to be a credible scenario. Our plans are actually built around that scenario so that again we have justification to fall back on why we did this and the expenditures we made.

But he is right. We have a very old infrastructure. The modeling shows that. It shows the vulnerabilities of that. Retrofitting or fixing existing infrastructure is very costly, but building it right on the front-end, having proper building codes in place, significantly reduces that cost, and that is really what we push, to increase the building codes themselves.

Senator PRYOR. This is really for any of you. If, say, New Madrid has a major quake, what is the estimated loss of life? Is there an estimate on what you can expect? Anybody want to take a stab at that?

Mr. WILKINSON. Well, let me pull out my cheat sheet here. Based on the estimations from the Mid-America Earthquake Center, we are looking at about, for the eight-State area, of 82,000 injuries with about 3,500 to 4,000 fatalities. That is from a magnitude 7.7

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event. Now, the more probable event-we talk a lot about 1811, 1812, but the more probable event is a magnitude 6, 6.5, which is very likely in our lifetime, and it would have a multi-state impact as well.

Senator PRYOR. OK. But I assume that would be quite a bit smaller impact.

Mr. WILKINSON. Smaller in intensity, but not as far as damage. Again, looking at the age in infrastructure and the geology of the area.

Senator PRYOR. And there is something about the soil there that liquefies and makes damages more likely? Do I understand that right?

Mr. WILKINSON. Yes, sir. It increases the potential for amplification of the seismic waves, so infrastructure, bridges, pipelines, towers, whatever is on there, has the greater capacity to lose the ability to stand. So that is the greatest concern we have which is pretty much the entire Delta region.

Senator PRYOR. Mr. Stanley, do you have a sense of how our Federal Government is doing in terms of working with state and local and private sector folks about earthquake preparedness nationwide?

Mr. STANLEY. Yes. I think the Federal Government is working quite well. As I indicated, it is a partnership. It is a partnership on the vertical axis with the local, State, and Federal partners. It is a partnership on the horizontal axis with the private sector, the NGOs, and the community individuals themselves. So we are able to do some things relative to strong mitigation plans, looking at what the potential might be.

A noted seismologist and friend indicates that it is not the earthquakes that kill people, it is the buildings and stuff in your house that fall on you that injure you. So you have the opportunity to harden your space. And when you are looking at designing exercises, when you are looking at doing non-structural education, non-structural retrofits to get people to tie down things like water heaters, you are enhancing your level of preparedness in your community.

We have long had a strong relationship with government, post-September 11, 2001 especially, when we look at Urban Area Security Initiative (UASI) funds. Earthquakes and hurricanes, for example, is one of the things that communities can use those funds to make sure that we keep those natural hazards in front of the community.

Senator PRYOR. Mr. DesRoches, do you want to comment on that?

Mr. DESROCHES. Yes, I can.

Senator PRYOR. How is the Federal Government doing and State, local, and private sectors?

Mr. DESROCHES. I can particularly comment on some of the Federal work in terms of some of the efforts NEHRP has made in terms of understanding what is the vulnerability of the earthquakes and the systems that work. I think the challenge we have is getting some of the States and some of the infrastructure owners to make decisions on something that probably will not happen in their lifetime, and that is something I have struggled with as an

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educator, is trying to get them to understand that it likely will not happen in their lifetime, but if it does, it is quite catastrophic.

Senator PRYOR. I have a question for you, Dr. DesRoches, about using new technology, even things like Google Earth, to help you identify vulnerabilities and potential problems. Do you want to comment on that?

Mr. DESROCHES. Sure. We have come a long way as far as understanding the vulnerability, both on the hazard side as well as the infrastructure stock that we have. I think Jim mentioned a little bit about the aging infrastructure in the central United States

We can catalog. We have tools now where we can actually do very sophisticated risk assessment where we can look on a regional level, whether it is a city level or state level, even multi-state level, and propagate an earthquake and really get a sense of where the collapses will be, which roads are most critical in terms of the ones that would be damaged, and which ones we need to really prioritize.

And so, one of the messages I have today is we cannot go about retrofitting all structures that are vulnerable in the eastern United States. It would be too expensive. It would take too long. But we do have the tools available that will tell us which ones are the most priority, which ones will actually save the most lives, which ones will result in the least disruption following an earthquake. And I think those are the tools that need to be put in the hands of those that can use them and that is what we need for moving forward.

Senator PRYOR. Good. I just want to say again, thank all of you all for being here. I have some more questions, I am sure my colleagues will have questions, so we are going to leave the record open for a few days.

I really hope that this 2011 exercise really does bring more public awareness and education about what the public should do in the event of an earthquake and make sure that we are connecting all the dots at all the various governmental levels as well.

Like I said, we will leave the record open for 2 weeks and you may get some questions from the Subcommittee. We would appreciate quick responses on those. With that, I will adjourn the hearing. Thank you.

[Whereupon, at 11:56 a.m., the hearing was adjourned.]

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APPENDIX

Written Statement of

WILLIAM L. CARWILE III

Associate Administrator for Response and Recovery
Federal Emergency Management Agency
Department of Homeland Security

"Earthquake Preparedness—What the United States can Learn from the 2010 Chilean and Haitian Earthquakes"

Before the

Senate Committee on Homeland Security and Governmental Affairs
Subcommittee on State, Local, and
Private Sector Preparedness and Integration
U. S. Senate
Washington, DC

September 30, 2010

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I. Introduction

Good morning Chairman Pryor, Ranking Member Ensign, and distinguished Members of the Subcommittee. Thank you for inviting me to appear before you today on behalf of the Department of Homeland Security (DHS) and the Federal Emergency Management Agency (FEMA). It is my privilege to discuss preparation for a whole community response to and recovery from a catastrophic earthquake in the United States. We appreciate your leadership and commitment to working together as a nation to build, sustain, and improve our capability to prepare for, protect against, respond to, recover from, and mitigate all hazards.

I am Bill Carwile, FEMA's Associate Administrator for Response and Recovery. As a retired U.S. Army Colonel and Defense Coordinating Officer who has also served as a Federal Coordinating Officer and in other senior emergency management positions, I am well aware of the immense response and recovery challenges that face survivors of a major incident like an earthquake. I recognize that such an event requires immediate, massive, and sustained support from not only the whole community and federal, state and local governments, but also from our many private sector and volunteer agency partners. The enormous scale and complexity of a catastrophic disaster environment requires us to focus on our number one priority - saving and sustaining lives - during the first 72 hours.

In my testimony today, I will discuss how we are using the New Madrid Seismic Zone (NMSZ) Catastrophic Planning Project as a model for how we work with our partners at every level of government, the private sector, voluntary organizations, non-governmental organizations, academia, and members of the critical infrastructure sectors. Collaborating with our partners, we are identifying high-risk areas, developing loss estimates, assessing response capabilities and any accompanying shortfalls, and augmenting our comprehensive planning strategies with our Regions and state partners to enhance capabilities. I will also discuss how FEMA is integrating preparedness efforts into response and recovery planning by working from the grassroots level up to carry out all aspects of planning for a catastrophic earthquake event of the scope and size of the NMSZ. I will discuss our involvement in the Chile and Haiti earthquakes, as well as our domestic efforts.

II. Catastrophic Earthquake Preparedness in the U.S.

A. Planning for a Catastrophic Event

Whole Community Approach to Catastrophic Preparedness

An incident of catastrophic proportions has the potential to imperil millions of people, devastate multiple communities, and have far-reaching economic and social effects. Time is of supreme importance, and the imperative to take immediate action begins in the communities where people live and work, where businesses and industries operate, and where local governments and government institutions reside. The national emergency management, public health, security, law enforcement, critical infrastructure, and medical communities – as well as government at the federal, state, local and tribal level as well as the private sector make up the "whole community"

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– we all must be prepared to respond in ways that extend beyond the normal paradigms in which we each traditionally operate. The whole community approach to catastrophic preparedness addresses the fundamental pillars of the entire emergency management spectrum: prevention, protection, response, mitigation and recovery.

One of FEMA Administrator Fugate's top priorities is a focus on developing and implementing a catastrophic preparedness, response and recovery strategy designed to quickly stabilize communities and support their timely recovery and return to municipal self-sufficiency.

We at FEMA are only one part of the emergency management team – we build on and supplement the strengths of local communities and citizens and integrating the public. The faith-based communities, fraternal and trade associations, and the broader marketplace are all important to this process and are included in the planning efforts as well. We recognize that only through close cooperation and collaboration with all partners can we begin to close gaps and meet key objectives.

To begin this change in national preparedness practices and doctrine, we are enlisting the active participation of the whole community to heighten awareness, plan, train, and organize as a practiced team. We have identified the highest priority tasks necessary to save and sustain lives and stabilize a catastrophic incident during the crucial first 72 hours, and have begun to work across all segments of society to identify how we can collectively achieve these outcomes. While the initial 72 hours after an incident are the most critical in saving and sustaining life, our approach spans not only response operations following a disaster, but also recovery, prevention, protection, and mitigation activities that occur before, during and after a catastrophic event. Changing outcomes will require public engagement and public action, which means fully embracing "two way exchanges" between our public safety and emergency services institutions and the communities they serve. The whole community approach to catastrophic preparedness is embodied in our mission: "Working together as a nation to prepare for, protect against, respond to, recover from, and mitigate all hazards."

FEMA Reorganization – Focus on Catastrophic Planning

On Oct. 1, 2009, the Response, Recovery and Logistics Management Directorates were combined under the new Office of Response and Recovery to better align the organizational structure with FEMA's mission and core competencies. This reorganization has enhanced FEMA's ability to perform its mission of coordinating and providing an immediate federal disaster response and recovery capability with state partners in anticipation of, or immediately following, a major disaster. Under the new Office of Response and Recovery, we have a dedicated Planning Division focused on national, regional and chemical, biological, radiological, nuclear and explosive (CBRNE) catastrophic planning efforts. The Planning Division is responsible for developing and coordinating joint state/FEMA Regional catastrophic incident plans, leading the development and alignment of national-level interagency efforts, and coordinating with FEMA's National Preparedness Directorate on Regional grant planning initiatives to align all catastrophic planning efforts.

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Reenergizing the Emergency Support Functions Leaders Group (ESFLG)

FEMA has also expanded its coordination with other federal agencies to ensure the smooth and responsive coordination of federal support when it is needed. A key component of the National Response Framework (NRF) is the Catastrophic Incident Annex (NRF-CIA), which establishes the context and overarching strategy for implementing and coordinating an accelerated, proactive national response to a catastrophic incident. Recognizing that federal and/or national resources are required to augment state, tribal, and local response efforts, the NRF-CIA establishes protocols to pre-identify and rapidly deploy key essential resources (e.g., medical teams, search and rescue teams, transportable shelters, medical and equipment caches, etc.) that will be urgently needed – and even required – to save lives and contain incidents.

Under the NRF, federal departments and agencies are grouped by capabilities and types of expertise into 15 Emergency Support Functions (ESFs) to provide the planning, support, resources, program implementation, and emergency services needed during a disaster. The ESFs serve as the primary operational-level mechanisms supporting state efforts, coordinated by FEMA in providing disaster assistance in functional areas such as transportation, communications, public works and engineering, firefighting, mass care, housing, human services, public health and medical services, search and rescue, agriculture, and energy. The signatories to the NRF provide substantial disaster response assistance in their areas of expertise, as well as provide operational support when assigned missions to support the disaster response.

FEMA coordinates ESF emergency management resources and collaborates with the ESFs through the Emergency Support Function Leadership Group (ESFLG). FEMA has recently reenergized coordination within the interagency through the ESFLG, and is in the final stages of revising its charter to more clearly identify and share leadership responsibilities in coordinating interagency activities related to the ongoing management of the NRF. FEMA is also working to provide national interagency planning oversight and approval authority, and elevate issues not resolved at the ESFLG level to the National Security Staff Domestic Resiliency Group. The ESFLG members have begun to work more closely together by conducting monthly meetings and work groups as required. Routine coordination with the Regional Interagency Steering Committees in each FEMA Region has also been increased to gain a better regional and state perspective and to identify grass roots issues for resolution.

All Hazards Catastrophic Planning

FEMA is coordinating and facilitating the development of detailed, horizontally and vertically-integrated state and regional catastrophic response plans for earthquakes, hurricanes, improvised nuclear device attacks and other threats. Our planning assumptions for catastrophic disasters are based on worst-case scenarios and are designed to challenge preparedness at all levels, forcing innovative, non-traditional solutions as part of the response strategy to such events. To more effectively carry out operational planning, our Response Directorate has aligned existing federal response planning initiatives into a more holistic and coordinated planning approach that will incorporate activities such as catastrophic planning, evacuation and transportation planning and emergency communications planning.

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National earthquake planning currently includes developing a Federal Interagency Operations Plan for Earthquakes. This plan is response and short-term recovery-oriented, and will address federal capabilities supporting response efforts to a catastrophic earthquake occurring anywhere in the United States and its territories. The FEMA Regions are also partnering directly with their states for joint state/federal planning efforts with the focus on specific fault zones within those Regions. The overarching Federal Interagency Operations Plan ties all of these efforts together in a capstone document to address the means by which the federal interagency will prepare for and respond to a catastrophic earthquake anywhere. This plan is closely linked to the development of the National Level Exercise (NLE) 2011.

Regional planning and the development of operational plans is underway for several different geographic areas with earthquake hazards: the Southern California Catastrophic Earthquake Plan; the Joint Region/State Catastrophic Plans for NMSZ for Regions IV, V, VI, and VII; the Wasatch Fault Earthquake Plan for Utah; the Caribbean Earthquake and Tsunami Plans for Puerto Rico and the U.S. Virgin Islands; and the Cascadia Subduction Zone Plan for the Pacific Northwest. All of these plans are being developed by our Regions – with support from FEMA Headquarters – and in partnership with federal, state, and local agencies through the five phases of the planning process, as outlined in our recently published Regional Planning Guide. Specifically:

- The San Francisco Bay Area Earthquake Readiness Response Concept of Operations Plan (approved 2008) is based on the threat posed by a recurrence of the Mw 7.7 to 7.9 earthquake that occurred in 1906 on the San Andreas Fault, under current population and land use conditions. The CONPLAN focuses on the Bay Area's ten counties. The Southern California Catastrophic Earthquake Response Plan (final plan due in January 2011) represents the second incident specific plan developed under the California Catastrophic Incident Base Plan. This project is a collaborative planning effort between local governments, private and non-profit groups, state and federal agencies, and will produce a unified scenario-based response operations plan for Southern California. The Project Team selected the US Geological Survey's "The Great Southern California Shake Out Scenario" as the earthquake scenario for the plan. The same scenario was also used during the Golden Guardian Exercise of 2008. The Response Plan focuses on eight counties in Southern California.

- NMSZ Regional/State plans: FEMA Regions IV, V, VI, VII, FEMA headquarters and the states of Alabama, Mississippi, Tennessee, Kentucky, Indiana, Illinois, Missouri, and Arkansas and the Central United States Earthquake Consortium (CUSEC) are working together to develop joint Region-State catastrophic earthquake plans addressing an earthquake occurring along the New Madrid Seismic Zone in the central United States. The plans are currently in the writing and plan approval phase and are nearing completion.

- Wasatch Fault Earthquake Plan: FEMA Region VIII, FEMA headquarters and the state of Utah are working together to develop a joint catastrophic earthquake plan, which is currently in the research and analysis phase. The focus of the plan addresses the impact of an earthquake along the Wasatch Fault. The information and analysis brief is scheduled

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to be presented to FEMA headquarters in March 2012 and the final plan is scheduled to be delivered in June 2012.

- FEMA Region II, Puerto Rico, and the U.S. Virgin Island Catastrophic Earthquake and Tsunami Plan: this is a joint commonwealth and regional effort to address the impact of an earthquake striking on or near the islands. Region II is leading this project. The plan is currently in the plan preparation phase, to be developed over 18 months starting in October 2010. Implementation is scheduled for 2012.

- Cascadia Subduction Zone Plan: FEMA Regions IX, X, FEMA headquarters and the states of Washington, Oregon, California, Alaska, Idaho and British Columbia, Canada, will work together to develop joint catastrophic earthquake and tsunami plans addressing an earthquake and resulting tsunami occurring in the Cascadia Subduction Zone in the Pacific Northwest. The plan is currently in the preparation phase, with planning scheduled to begin in FY2011 and the estimated completion in 2012.

We are also coordinating catastrophic response planning efforts with the Department of Defense (DOD). During a meta-catastrophic event like an NMSZ earthquake, the FEMA-sponsored 28 Urban Search and Rescue Task Forces will need to be augmented by DOD personnel as a force multiplier. We are working with them to develop plans for training and exercises to ensure that DOD support is available when requested.

New Madrid Seismic Zone (NMSZ)

One of the best examples of our robust planning efforts is in national, regional, and state framework for a potential catastrophic earthquake impacting the eight states in the NMSZ, which integrates plans at all levels of government and provides the basis for a fundamental re-tooling of all-hazards catastrophic incident guidance. The experience from this planning effort is being applied to other key planning activities.

The NMSZ is a fault system in the Central U.S. that includes FEMA Regions IV, V, VI and VII and eight of the states that make up those regions: Alabama, Mississippi, Tennessee, Kentucky, Illinois, Indiana, Arkansas and Missouri. The geological characteristics in this zone increase the potential for an earthquake to cause greater damage, in amount and size, than other earthquake-prone areas in the U.S. Historically, the series of earthquakes in the NMSZ with the greatest magnitude took place between 1811-1812. During this time, the NMSZ was struck by four major quakes within three months, ranging from approximately 7.0 to 8.0 in magnitude on the Richter Scale. Due to the cyclical nature of these earthquakes and possible resulting catastrophic effects, FEMA is working on an NMSZ planning project with regional, state, local and tribal-level government and non-governmental entities.

If an earthquake were to occur, the impact to infrastructure and the ability to provide supplies and relief to survivors, would be immense. FEMA, along with CUSEC, the Mid-America Earthquake Center (MAEC), and the United States Geological Survey (USGS), has completed modeling the potential impacts of an earthquake in the NMSZ, which consists of three fault segments: the northeast segment, the reelfoot thrust or central segment, and the southwest segment.

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Each segment is assumed to generate a deterministic magnitude 7.7 (M_w7.7) earthquake caused by a rupture over the entire length of the segment.

The results of the October 2009 MAEC Report Number 09-03, titled "Impact of New Madrid Seismic Zone Earthquakes on the Central USA," indicate that Tennessee, Arkansas, and Missouri could be the most severely impacted. Illinois and Kentucky could also be impacted to a lesser extent. A rough estimate of the damage estimate would include the following: nearly 715,000 buildings could be damaged in the eight-state study region. Approximately 42,000 search and rescue personnel working in 1,500 teams may be required to respond to an earthquake. Damage to critical infrastructure (essential facilities, transportation and utility lifelines) could be substantial in the 140 impacted counties, including 3,500 damaged bridges and nearly 425,000 breaks and leaks to both local and interstate pipelines. Approximately 2.6 million households could be without power. Nearly 86,000 injuries and fatalities could result – and nearly 130 hospitals may be damaged, most located in the impacted counties. There could be extensive damage and substantial travel delays in both Memphis, Tennessee, and St. Louis, Missouri, hampering search and rescue activities as well as evacuation. Roughly 15 major bridges could be rendered unusable. Three days after the earthquake, 7.2 million people could be displaced, with 2 million seeking temporary shelter. Direct economic losses for the eight states could total nearly $300 billion, while indirect losses at least twice that amount.

The NMSZ Catastrophic Planning Project is designed to create an integrated response across the impacted FEMA Regions and states and identify planning solutions which maximize existing capabilities. Specifically, this planning project is being accomplished through the development of joint Region/State Operational Plans, which address operational issues resulting from an NMSZ earthquake through Courses of Action supported by both FEMA and the states. The project emphasizes collaboration from all levels of government, non-government organizations, tribal and private sector stakeholders. The Courses of Action are intended to address the catastrophic nature of the incident and apply creative thinking to solutions that meet the scenario-driven resource requirements.

The catastrophic response plan development process uses a grass roots approach. In coordination with the planners, those who would have a role in an actual operational response participate in the planning process through integrated working groups, which involve local, State, Regional and Federal representatives, the private sector, non-profit organizations, non-governmental organizations, and other stakeholders. This will ensure that all available resources are considered. The joint Region/State Operational Plans focus on developing objectives to address major threats caused by the event in each state. Objective-based vertical and horizontal planning such as this ensures cooperation across the entire community and increases operational efficiency in meeting the requirements generated by a catastrophic event.

Additional partners in the NMSZ Catastrophic Planning Project include the U.S. Department of Health and Human Services, DOD, U.S. Army Corps of Engineers, American Red Cross, and more than 200 local governments. While the joint Region/State Operational Plans identify objectives, the overall goal is to establish a unified response approach that integrates emergency management at all levels of government, private sector, and critical infrastructure communities into a single, coordinated response.

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FEMA and the General Services Administration (GSA), as co-leads for Logistics Management and Resource Source Support (ESF #7) are developing a New Madrid Earthquake-specific resource support concept plan. To test our capabilities, FEMA and DOD's U.S. Northern Command (USNORTHCOM) will co-host a Defense Support of Civil Authorities (DSCA) exercise in February 2011 to test the specified and implied logistics tasks for the first 72 hours following a catastrophic earthquake in the NMSZ incident.

The NMSZ Catastrophic Planning Project in its entirety will ultimately produce a number of highly beneficial products including all hazards concept of operations plans for Regions IV, V, VI and VII, and Joint Region/State NMSZ Operational Plans. The Joint Region/State NMSZ Operations Plan for Arkansas has been published in final draft and will be exercised in NLE 2011.

NLE 2011

The National Level Exercise 2011 (NLE 11) is a congressionally mandated series of building block exercise activities designed to educate and prepare participants for a catastrophic earthquake incident in the NMSZ. NLE 11 will test and evaluate the federal government's ability to implement catastrophic incident response and recovery plans in support of state, local, tribal, nongovernmental and private sector NMSZ earthquake response and recovery activities, as well as for individuals, families, and communities. The year 2011 is the bicentennial anniversary of the 1811 New Madrid earthquake, for which the NMSZ is named. NLE 2011 will be the first NLE to simulate a natural hazard and will provide the framework for the eight impacted states and four FEMA Regions to test and evaluate regional earthquake response and recovery plans. The NLE 11 capstone functional exercise (NLE 11 FE) will occur May 16 – 20, 2011, with targeted exercise play focusing on interaction between state emergency operations centers, FEMA Regional Response Coordination Centers, FEMA's National Response Coordination Center, and federal departments' and agencies' national and regional emergency operations centers. NLE 11 will also examine how these entities interact with and support the broader homeland security enterprise. We have set NLE 11 as a proof of concept for our whole community catastrophic planning construct.

As part of NLE 11, the states will test their response capabilities in the following exercise objectives: communications, critical resource logistics and distribution, mass care, medical surge, citizen evacuation and shelter-in-place, emergency public information and warning, emergency operations center management, and long term recovery. The Rehearsal of Concepts (ROC) Drill was conducted on September 28-30 in North Little Rock, Arkansas, and served as an excellent opportunity for all state and federal stakeholders to come together to rehearse and discuss Concept of Operations to the FEMA Region 6/Arkansas Earthquake Operations Plan. The ROC Drill used the NLE 2011 planning scenario to rehearse the plan.

Evacuee Support Planning

Evacuations are a state or local responsibility – the role of FEMA is to provide support and resources to ensure the safety and well-being of those evacuated. For that reason, FEMA has been developing guidance, gathering resources, and providing planning support to states for

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potential evacuations. An example of the tools being developed is the Evacuee Support Planning Guide – FEMA P-760 – as well as reimbursement policies for states to host evacuees and tools such as the National Mass Evacuation Tracking System (NMETS).

As part of the planning process, and at the request of the states, FEMA has been:

- Assisting states in identifying potential host states for evacuees.
- Providing technical assistance for the implementation of the NMETS. This system is both manual and computer-based, and is designed to assist states in tracking the movement of transportation-assisted evacuees, their household pets, luggage and medical equipment during evacuations.
- Coordinating with state government-assisted transportation providers to provide manifests.
- Supporting evacuees throughout the evacuation process, both in reception areas as well as host states.
- Coordinating with household pet service providers to ensure that adequate sheltering and services are available during the evacuation.
- Activating and deploying the National Emergency Family Registry and Locator System and activating and deploying the National Emergency Child Locator Center to facilitate the reunification of displaced families and unaccompanied minors affected by an evacuation.
- Coordinating with partner agencies to plan for and provide mass care support to evacuees as they return home and enter permanent housing.
- Addressing the requirements of the whole community, including children, older individuals, people with disabilities, and individuals with limited English proficiency, as well as the groups and organizations that support these groups.
- Activating, at the request of States, the Disaster Case Management program through our Inter-Agency Agreement with the Department of Health and Human Services' Administration for Children and Families, to connect impacted community members to human services resources that can promote families' self-sufficiency and recovery from the disaster.

B. Mass Sheltering and Housing Assistance

Mass Sheltering

We are currently engaged in a wide variety of planning activities with state, local and tribal governments, as well as voluntary organizations and faith-and community-based partners to ensure national readiness for the mass care and emergency assistance missions following a catastrophic incident. FEMA has jointly developed numerous catastrophic planning products

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with its many partners in order to enhance the nation's overall capability. Some of these products include the following:

- The Multi-agency Feeding Plan Template
- The Multi-agency Feeding Task Force Guidance
- Guidance on Planning for the Integration of Functional Needs Support Services in General Population Shelters.
- Inter-agency planning resources such as pre-scripted mission assignments that support:
    - mobilizing technical assistance teams to evaluate the special needs of communities post-disaster, focusing on people with disabilities, children, and older individuals;
    - deploying pharmaceuticals and durable medical equipment through the Emergency Prescription Assistance and Medical Equipment Replacement Program; and
    - deploying federal personnel from various agencies to support sheltering, feeding, emergency assistance, planning, and reporting activities.
- Blanket Purchase Agreements to ensure the immediate acquisition of food, commodities, equipment, and emergency supplies from national vendors.
- Established contracts to support the acquisition and distribution of durable medical equipment to be provided in congregated environments where individuals may require bariatric beds, wheel chairs and other specialized equipment that would allow them to sustain their independence in shelters.

FEMA also has a Transitional Sheltering Protocol that may be implemented when large numbers of evacuees are being housed in congregate shelters and will not be able to return to their homes for an extended period of time. In addition to the sheltering protocol, FEMA can reimburse the cost of evacuee return transportation when the federal government coordinates the out-of-state evacuation of state residents at the state's request.

III. Mitigation

National Earthquake Hazards Reduction Program (NEHRP)

Established by Congress in 1977, the National Earthquake Hazards Reduction Program (NEHRP) works to reduce risks to life and property resulting from earthquakes. Focusing on research, building codes and standards, technical guidance, and education, NEHRP is a

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collaborative effort among FEMA, the National Institute of Standards and Technology, the National Science Foundation and the U.S. Geological Survey. The NEHRP agencies work together to reduce the nation's vulnerability to earthquakes, researching the causes and effects of earthquakes and producing technical guidance to develop earthquake resistant design and construction standards, and techniques to educate the public about earthquake hazards and mitigation. FEMA manages initiatives that reduce the risk of loss of life and damage to buildings and other structures as a result of earthquakes, including the following activities: (1) translating research into technical guidance publications and best practices on seismic safety, building design and construction, building codes and standards, and reducing economic losses; (2) assisting state and local governments in building capabilities for determining potential damage and reducing the effects of earthquakes before they occur; and (3) working with national codes and standards organizations to develop and improve seismic building standards.

One particular tool that was developed by the Federal Insurance and Mitigation Administration, supported by the FEMA NEHRP program, is the Hazards U.S. Multi-Hazard Earthquake Model also known as HAZUS. This tool is widely used by emergency managers and planners in high-seismic areas throughout the U.S. to assess their risk from earthquakes and to determine the potential losses that would result from earthquakes of various intensities to which each region is susceptible. The HAZUS-MH Earthquake model was used extensively to develop the scenarios for both the NMSZ Catastrophic Planning efforts as well as being used as part of the upcoming NLE 2011 exercise in May 2011.

Regional Earthquake Consortia (EQ Consortia)

One of the methods that FEMA uses to fulfill its NEHRP obligations is the utilization of earthquake consortia. Each year, FEMA enters into cooperative agreements for the purposes of developing, disseminating and promoting knowledge, tools, and practices for earthquake risk reduction. FEMA's four earthquake consortia partners in this endeavor are: the Central U.S. Earthquake Consortium (CUSEC); Northeast States Emergency Consortium; Western States Seismic Policy Council; and Cascadia Region Earthquake Workgroup. Our partners work to improve the understanding of earthquake processes and impacts, developing cost-effective measures to reduce earthquake impacts on individuals, buildings and infrastructure, as well as improving the earthquake resilience of communities nationwide.

The purpose of these agreements is to provide guidance and assistance to states and local communities by: developing seismic policies and sharing information to promote programs to reduce earthquake-related losses; providing forums for information exchange to develop, adopt, and promote policy recommendations; conducting outreach to local governments and the business community; maintaining and strengthening partnerships with other earthquake consortia; helping deliver professional training to local communities; educating citizens about the risks they face; developing public awareness and education tools and resources; and encouraging public and private partnerships that benefit local communities.

For example, the FY10 work plan submitted by CUSEC proposes raising the level of public awareness and education regarding the central U.S. earthquake hazard. In addition, CUSEC plans to promote the adoption of building codes, mitigation programs, tools and techniques designed to

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reduce the vulnerability of the central U.S earthquake hazard. Further, CUSEC intends to foster multi-state coordination of mitigation programs while promoting the application of research and lessons learned to improve the level of mitigation and preparedness for earthquakes.

IV. Lessons Learned from 2010 Chilean and Haitian Earthquakes

Chile

The U.S. Agency for International Development (USAID) is the lead for international disaster response, and was requested by the Government of Chile to provide disaster assistance. Although FEMA's involvement was not requested in this operational response, FEMA did send a representative from the Mitigation Directorate to Chile as part of a scientific "reconnaissance team" deployed by the Earthquake Engineering Research Institute (EERI). EERI runs the Learning from Earthquakes program for the U.S. National Science Foundation. The Learning from Earthquakes program sends out multi-disciplinary reconnaissance teams to catastrophic earthquakes around the world to bring back major observations and scientific lessons learned for U.S. and global earthquake research and practice.

The large, multi-disciplinary EERI team included representatives from several federal agencies due to the significance of the event. They formed into small teams to conduct daily reconnaissance. This was a unique opportunity to document the impact of a large earthquake on buildings and infrastructure similar to our own in terms of the building code and how it is enforced. There is much we can learn from this event, and this information will be invaluable in directing FEMA's future earthquake mitigation guidance. A preliminary reconnaissance report was issued in July in the EERI Newsletter, with a complete report due in early 2012.

Haiti

On January 12, 2010, at 4:53 p.m. EST, a 7.0 magnitude earthquake occurred in the Atlantic Ocean approximately 15 miles southwest of Port-au-Prince, Haiti. The nation suffered massive damage in Port-au-Prince and in numerous other towns and cities. According to the Government of Haiti, the earthquake collapsed 100,000 structures and damaged another 200,000 across Haiti, resulting in over 220,000 deaths, 300,000 injuries, and 1.1 million displaced people.

The U.S. government, along with other nations, international organizations, and nongovernmental organizations, rushed to provide critical life-saving and other assistance to Haiti. President Barack Obama affirmed USAID as the lead for disaster response and directed the USAID to lead the coordination of the U.S. government assistance to Haiti. USAID worked with other federal agencies to organize and deliver assistance to the victims of the earthquake. Under the terms of an interagency agreement that USAID negotiated with FEMA, and at USAID's request, DHS deployed over 1,000 personnel from various components to support U.S. assistance in Haiti over the course of the relief response (including replacements).

On January 14, 2010, FEMA activated the NRCC to Level II operations, which included ESFs 6 (Mass Care, Emergency Assistance, Housing, and Human Services) and 9 (Search and Rescue) as well as logistics, operations, planning, and external affairs sections. FEMA Administrator

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Fugate worked closely with DHS Secretary Janet Napolitano and USAID Administrator Rajiv Shah to ensure that FEMA provided prompt and effective support to response operations. In Haiti, the disaster response was coordinated under USAID's Disaster Assistance Response Team (DART). The interagency agreement addressed reimbursement and other funding issues. FEMA deployed liaisons to other agencies' operations centers to help coordinate the multi-agency relief effort. FEMA activated eight National Urban Search and Rescue (US&R) task forces to prepare for deployment to Haiti to join the two task forces deployed by USAID. FEMA activated and deployed the US&R Red IST to DOD's Homestead Air Reserve Base (HARB) in Homestead, Florida. Four additional task forces were deployed, bringing a total of six American US&R task forces consisting of 511 personnel to Haiti. FEMA deployed Assistant Administrator Damon Penn to lead a DHS Integrated Response Team, along with personnel from the Incident Management Assistance Team (IMAT) West and the USCG Deployable Operations Group to support command and control. A six-person FEMA US&R Red IST Advance Element deployed to Haiti from HARB to provide support and assist with the demobilization of the four FEMA US&R task forces. FEMA also deployed Mobile Emergency Response Support (MERS) personnel and equipment to provide tactical communications for the United States Embassy, USAID, and US&R task forces in Haiti.

On January 16, FEMA's Logistics Management Directorate established an Incident Support Base (ISB) at HARB. The ISB served as the main staging area for emergency supplies, equipment, and personnel en route to Port-au-Prince. FEMA partnered with DOD's Transportation Command to transport 220 containers of supplies to Haiti and the Dominican Republic to support disaster relief efforts. By February 10, FEMA, in coordination with DOD, delivered more than 1.42 million meals; 24,365 blankets; 767,164 liters of water; 7,645 cots; and 94,709 comfort kits to Haiti. Overall, through its support to USAID, FEMA delivered critical life-saving and life-sustaining resources to help the victims of the Haiti earthquake.

While FEMA's role in the Haiti earthquake was limited, we did learn several lessons that bear mention, including the following:

- Lives can sometimes be saved in rescues made after the initial72 hours. However this is case-specific and should be determined by experts on the ground who are assessing the situation.

- In certain circumstances, dogs proved more effective than mechanical detection devices in the identification of buildings with survivors.

- We are reexamining the type and size of aircraft used to deploy teams in the U.S. as part of the urban search and rescue bottom-up review. For example, it might be more efficient to deploy teams in greater numbers of smaller aircraft, such as C-130s, than deploying fewer, larger aircraft such as C-17s.

- The Haiti earthquake response was greatly aided by the support of international teams. We continually work to develop and/or examine protocols for bringing teams in from other countries to augment response efforts in the United States, particularly into locations that may be logistically difficult to reach.

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V. The Way Ahead

Private Sector Collaboration

The private sector is a key partner in our catastrophic planning efforts. Various companies and organizations have worked with FEMA at the state and Region level to collaborate and help develop catastrophic plans. Key corporate and academic experts have provided essential resources and input, and have established relationships to facilitate response and recovery.

At the national level we are working with the private sector on a host of issues that will benefit our catastrophic earthquake planning. We have invited associations to nominate corporate candidates to serve three-month rotations within our National Response Coordination Center (NRCC). We have included representatives in our no-notice "thunderbolt" response and recovery exercises, and we have shared ideas and lessons learned on a wide array of technology initiatives, including mobile applications, shared data feeds, and alert warnings through smart phones and other devices. Finally, we have dedicated one of our primary working groups – chaired by a member of the private sector – in support of National Level Exercise 2001 (NLE 11) to engaging the private sector. This working group has already begun planning at the state, region and national levels alongside DHS and FEMA planners. As we move forward with all aspects of planning for a catastrophic earthquake event, the private sector is collaborating with us every step of the way, and our progress is better for it.

VI. Conclusion

As I noted at the outset, Mr. Chairman, FEMA is not the entire team. We are only part of the team – one that includes all Americans. Effectively and rapidly responding to and recovering from the impact of a catastrophic earthquake is one of the greatest challenges faced by all levels of government. At FEMA, we recognize that our success depends on the collective and collaborative efforts of the whole community, and we will continue to cultivate this approach to provide stronger and more agile disaster response and recovery capabilities.

I look forward to working with you, distinguished Members of this Subcommittee, and other Members of Congress to communicate this message to the American people as we collaboratively work to become a more resilient nation.

I am prepared to answer any questions the Subcommittee may have.

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Statement of
Dirk W. Dijkerman
Acting Assistant Administrator
Bureau for Democracy, Conflict, and Humanitarian Assistance
U.S. Agency for International Development

Before the
Committee on Homeland Security and Governmental Affairs
Subcommittee on State, Local, and Private Sector Preparedness and Integration
United States Senate

September 30, 2010

Chairman Pryor, Ranking Member Ensign, and members of the committee, I appreciate your inviting me to testify today on earthquake preparedness. I will address the U.S. Agency for International Development's (USAID) efforts to respond to the earthquakes in Haiti and Chile earlier this year, reflect briefly on our assistance in the aftermath of Hurricane Katrina, and also discuss the structures in place in the host countries that aided or hindered our response.

Haiti Overview

On January 12, 2010, at 1653 hours local time, a magnitude 7.0 earthquake struck southern Haiti. According to the U.S. Geological Survey (USGS), the earthquake's epicenter was located 10 miles southwest of the capital Port-au-Prince, West Department. The earthquake killed an estimated 230,000 people and affected approximately 3 million others, according to the Government of Haiti.

In the immediate aftermath of the earthquake in Haiti, President Obama designated USAID Administrator Rajiv Shah as the Unified Disaster Coordinator and assured there would be a swift, aggressive and coordinated U.S. Government relief effort. In less than 24 hours, USAID's Disaster Assistance Response Team (DART) was on the ground and working to coordinate the U.S. response effort.

Factors including the vast scale of destruction and Haiti's close proximity to the United States led to an unprecedented whole-of-government response from the United States. As the U.S. Government agency responsible for international disaster assistance, USAID coordinated the efforts of many federal government agencies including the Departments of State, Defense, Homeland Security, and Health and Human Services. We worked collaboratively with the Government of Haiti and other donor governments, the United Nations, international organizations, non-governmental organizations (NGOs), the private sector, and with thousands of generous and concerned individuals.

During the months following the earthquake, humanitarian efforts met the immediate needs of earthquake-affected populations, through search and rescue and the provision of safe drinking water, food, household items, emergency shelter assistance, and health care. USAID continues to work closely with other U.S. Government agencies, the Government of Haiti, international

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organizations, the United Nations, and nearly 35 NGOs to coordinate ongoing efforts and to facilitate the transition from emergency relief activities to recovery operations, while preparing to respond to the potential for further deterioration in humanitarian conditions during the rainy and hurricane seasons.

The devastation of the earthquake in Haiti was great. The Haitian government systems that might have otherwise been in place to help manage a response were destroyed in the earthquake. Most of the municipal buildings in Port-au-Prince were severely damaged. The country was left without electricity or phone service, and the airport and ports in Port-au-Prince were non-functional. Everyone working in Haiti – including international aid organizations – lost staff, buildings, supplies and vehicles in the quake. This includes the United Nations, which lost more than 80 staff including the UN Special Representative and his deputy.

And even before the earthquake struck Haiti, the country faced countless problems. It is the poorest country in the Western Hemisphere with 80 percent of the population living under the poverty line and 54 percent in abject poverty. Most Haitians rely on remittances as their source of income, and many do not have reliable access to potable water.

Because of the catastrophic nature of the quake, the urban setting and the fact that the Haitian government and relief agencies in Haiti were themselves debilitated, the relief coordination system under the United Nations took additional time to assemble. However, once the U.N. cluster system – the post-disaster mechanism that provides strategic field-level coordination and prioritization in specific sectors such as health, shelter and food – was fully operational, the relief community was able to better coordinate efforts and more efficiently get aid to those in need.

To date, the U.S. Government has provided nearly $1.14 billion to assist the people of Haiti in the aftermath of the earthquake. Within two weeks of the earthquake, USAID had provided an unprecedented $254 million for search and rescue efforts and rapid distribution of food and other much-needed humanitarian assistance. At the height of our emergency response efforts, USAID had 545 Disaster Assistance Response Team, or DART, members in Haiti, including 511 urban search and rescue (USAR) personnel. This is in addition to the approximately 20,000 military and civilian personnel – such as our colleagues from the Federal Emergency Management Agency (FEMA) – that were deployed by the U.S. Government to aid in the relief effort.

The DART was composed of experienced international emergency humanitarian aid experts with technical knowledge in areas such as shelter, health, logistics, water and sanitation and hygiene. The DART was deployed by USAID as a self-sufficient body with enough food and water for ten days to ensure full support to field operations and not hamper the operations of the U.S. Embassy. The DART was fully equipped with computer and telecommunications equipment, such as satellite phones, portable satellite broadband terminals, secure wireless routers, and handheld radios and repeaters. The DART provided a satellite phone and communications technician to assist the staff of Haiti's President and Prime Minister immediately after the earthquake when local capabilities had been destroyed.

The search and rescue teams ended their operations on January 23rd and the DART stood down on April 28th, but humanitarian operations continue as unmet emergency needs are identified and the operation transitions to recovery and reconstruction.

Chile Overview

Less than two months after the earthquake in Haiti, at 0334 hours local time on February 27, a magnitude 8.8 earthquake struck near the coast of Maule Region in south-central Chile. According to the U.S. Geological Survey, the earthquake's epicenter was located offshore, 70 miles northeast of Concepción and approximately 200 miles southwest of Santiago, Chile's capital. The initial earthquake was followed by nearly 100 aftershocks measuring magnitude 5.0 or greater and a tsunami.

The United States immediately offered humanitarian assistance to Chile. Unlike many countries, Chile has the governmental capabilities and resources to respond in the aftermath of a disaster. Because of its long history with earthquakes and the resulting preparedness measures—including establishing rigorous building codes—the damage caused by the temblor was not as dire as one might expect in the aftermath of one of the largest earthquakes in a century. In fact, there were less than 500 deaths, with 79 people reported missing.

With strong government and institutional capabilities, Chile did not request or need a vast amount of international assistance, and the Chilean government appealed to the international community for aid only after its initial assessments. The United States was asked to provide specific assistance that included the provision of satellite phones for use by the Government of Chile until communications networks were reestablished, support for the International Federation of Red Cross and Red Crescent Societies emergency appeal, funding to support the deployment of a U.S. Department of Defense Expeditionary Medical Support unit to affected areas, and the provision and transport of mobile water treatment units and rolls of plastic sheeting from the USAID warehouse in Miami, Florida.

The Government of Chile's National Office of Emergencies and Information, known by the acronym ONEMI, was coordinating the relief effort. Chilean officials met with United Nations agencies and donors, including USAID, to establish a clear plan for international assistance. USAID has worked with ONEMI for years on disaster mitigation and preparedness programs, and this pre-established relationship allowed USAID to quickly meet the Government of Chile's immediate relief needs and their longer-term disaster response plan. In addition, USAID has sponsored training for and provided equipment to Chilean search and rescue personnel over the years, which meant that local first responders were better equipped to respond in the aftermath of the February 2010 quake. The Chilean USAR team was also deployed to Haiti, where they worked alongside the U.S. teams to rescue those trapped in the rubble of Port-au-Prince.

In total, the U.S. Government provided approximately $9.3 million in the aftermath of the Chilean earthquake. At the height of the response, the USAID DART for Chile comprised 16 disaster response experts, including a communications expert and a logistician to facilitate the rapid deployment of relief items. As in the case of any international DART deployment, the team arrived self-sufficient and equipped with computers and telecommunications equipment. As a

result of a highly functional government with much experience in disaster preparedness, mitigation and response, the DART was able to stand down on March 23rd after less than one month of activation.

Hurricane Katrina

As the agency responsible for international disaster assistance, USAID does not normally engage in domestic disasters. Given the severity of the situation after Hurricane Katrina made landfall, however, USAID was called upon to assist FEMA in responding to the disaster. In support of FEMA's National Response Plan, which was in place at the time, USAID's Office of U.S. Foreign Disaster assistance helped coordinate offers of international assistance from over 80 countries.

To support FEMA's relief operations, USAID deployed a DART and stood up a Washington, DC-based Response Management Team. We had personnel serving as liaison officers at locations including the Department of Defense's Northern Command, FEMA headquarters, and the State Department Task Force. We also had field personnel in New Orleans, Baton Rouge, and Shreveport, Louisiana; Little Rock, Arkansas; and Mississippi, Alabama, and Georgia. The United Nations seconded personnel to USAID as well.

USAID field personnel worked to monitor and establish systems for receipt and delivery of relief supplies from international donors. USAID teams helped better identify immediate needs based on accurate stock reports of commodities supplied by the international community. This helped establish an effective supply "pull" system. Items received from the international community included, non-perishable food, generators, school supplies, shelter materials, emergency personnel, telecommunications equipment, and assorted relief commodities.

Prevention and Preparedness

It is important to note that USAID's Office of U.S. Foreign Disaster Assistance is not just focused on responding to disasters. In addition to disaster response activities, USAID is increasingly investing in programs designed to prepare for and mitigate both natural disasters and complex emergencies.

Recognizing vulnerabilities in the Latin America and Caribbean (LAC) region, USAID supports programs including risk identification, prioritization, and reduction, as well as post-disaster recovery and short-term rehabilitation projects. In the LAC region, USAID promotes local and national self-sufficiency in disaster preparedness and management. Our programs build upon and strengthen the capacity of established national and regional disaster management institutions, many of which already have the ability to meet most emergency needs after an event.

USAID has been working to strengthen USAR capacities in Haiti since the November 2008 collapse of a primary school in Port-au-Prince that resulted in the deaths of 100 people, mostly children. In the aftermath of the school collapse, USAID deployed the Fairfax County USAR team to assist Haitian firefighters and other rescue workers. In 2009, USAID deployed an assessment team composed of USAID disaster response professionals and USAR specialists

from Fairfax County to Haiti for 10 days to help develop a USAR program support strategy. The team met with local authorities and technical specialists, as well as visiting fire services in five cities. With that visit, the Government of Haiti agreed to create a working group to develop a national USAR strategy and policy directions.

After the January 2010 earthquake, the USAID provided urban search and rescue training to twenty-five volunteer first responders in Haiti. USAR experts from Fairfax County, Virginia, and Los Angeles County, California, trained the all-volunteer first responders from fire departments throughout the West Department.

The USAID-sponsored training helped build the skills needed to locate and extricate trapped victims, focusing on the proper use of the search and rescue equipment donated by the USAR teams from Los Angeles and Fairfax counties to the Haitian Volunteer Firefighters Association in February 2010. The equipment, worth an estimated $500,000, was used by the USAR teams deployed by USAID to help rescue 47 Haitians trapped under rubble after the major earthquake in Haiti on January 12.

In addition to building partnerships with national emergency response agencies, USAID frequently implements activities in conjunction with regional or technical organizations, such as the U.S. Geological Survey, the Pan American Health Organization (PAHO), and other offices within USAID.

For example, USAID has provided $12.6 million to PAHO since 1998 in support of efforts to promote improved disaster preparedness and response in the health sector in Latin America. With USAID funding, PAHO has worked to increase preparedness capacity in the health sector through advocacy and technical support to update or improve health policy and legislation, in addition to continuous training of partner organization staff and Ministry of Health personnel. PAHO also works with local and national government counterparts to ensure that heath facilities throughout the region have the capacity to operate during and immediately after disasters.

Relevant Lessons Learned

As the emergency phase begins to transition to early recovery and reconstruction, USAID conducts after action reviews to identify best practices and lessons learned from the disaster response. Many times, there are internal USAID after actions as well as interagency after action reviews conducted. USAID is currently leading an interagency Haiti response lessons learned process that began just four months after the earthquake, even as the response was still ongoing. USAID continues to identify lessons learned and is moving forward to quickly address issues to improve international disaster response.

In the context of the whole-of-government response to major disasters abroad, the engagement of multiple chains of command within the U.S. Government response points to the need for an international disaster response framework to better manage catastrophic events. This framework would help establish clear protocols as well as budgetary provisions for expanding response capacity when needed.

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All teams deployed to an international disaster by the U.S. Government should arrive on the scene self-sufficient. The teams should have passports, adequate medical treatment prior to departure, and enough food and water to sustain a ten-day deployment. If the team is an urban search and rescue team, it should be classified by the United Nations International Search and Rescue Advisory Group prior to deployment in an international response.

The United States responses in Haiti and Chile made it clear that there is a need for better data management, validation and sharing across agencies. Robust data and information will better determine specific resource needs, allowing the field to 'pull' additional resources rather than having resources 'pushed' based upon assumptions made in Washington.

The American people and businesses are very generous, and they want to help in the wake of a disaster. One of the issues we always confront during an international disaster is that of proper donations management and vetting of offers of in-kind assistance. The U.S. Government's position is and should remain that the most needed and efficient way of helping those impacted by disaster is to donate money to a reputable organization working in the affected area. When private sector in-kind donations are made, they should be fully coordinated and facilitated through non-governmental organizations already working on the ground.

As for the main lesson learned from USAID's involvement in the aftermath of Hurricane Katrina, we worked with FEMA and our interagency colleagues including the Department of State to assure there is a system in place to expeditiously vet offers of foreign government assistance in the aftermath of a domestic disaster. This International Assistance System includes a concept of operations to accept, allocate, disburse and track internationally donated in-kind relief supplies.

Conclusion

Good governance cannot prevent a catastrophic disaster, but it can help prepare for and respond to one. Although the Chilean quake was some 500 times greater than the January 2010 Haitian quake, Chile's urban centers of Concepcion and Santiago experienced severe shaking that was much less than the violent shaking experienced in Port-au-Prince. More intense shaking in more densely populated areas with weak building codes and enforcement coupled with limited preparedness and response capabilities helped contribute to Haitians facing significantly higher risk than Chileans.

Thank you for the opportunity to share with the committee the agency's experiences with responding to international disasters. I hope our experiences can help U.S. earthquake preparedness efforts.

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CRISISTÓBAL LIRA
Director
Committee for Earthquake and Tsunami Emergency (March-August 2010)
Reconstruction Committee (since August, 2010)
Chilean Ministry of Interior

Before the Ad Hoc Subcommittee on State, Local, and Private Sector Preparedness and Integration
September 30, 2010

(Power Point Presentation will be given and submitted into the record)

Good morning, first of all I would like to thank the invitation to come here, it's an honor to share the experiences of a catastrophe as big and complex as the one our country lived. In this opportunity I would also like to thank the United States Government and all the people in this country that helped Chile during this difficult times.

In this presentation I will talk about 3 main topics:
1) Earthquake and Tsunami Impact
2) Government reaction and organization
3) Initiatives in place and learning captured

First of all I will try to show how big this emergency was, and all the consequences it had for our people and our economy.

As you can see, this was the fifth strongest earthquake registered until now. The total loss was 14.9% of the Gross Domestic Product, a huge loss for our economy.

Images can say a lot about what happened in our country. This image shows the island of Juan Fernandez before and after the tsunami.

This image shows Talcahuano port in the south, one of the most important ports in our country.

Here we can see our main highway in the city of Santiago, and all the damages caused by the earthquake.

A bridge 200 kilometers south of Santiago before and after the earthquake.

This is the town of Dichato before and after the earthquake and tsunami. This picture shows the "Alto Río" building in Concepción after the earthquake.

During the emergency period we worked in each one of these areas, delivering temporary solutions to the people affected.

Here we can see an open view of the damages caused by the earthquake in the different sectors of the economy.

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As we saw before, this losses represent 14,9% of the country's GDP.

Now I'm going to talk about the government reaction to this emergency and how it organized to respond and deliver the necessary solutions.

The most important thing is that we started simultaneously to attend the emergency and also starting the reconstruction efforts.

As you can see here, two committees were created, the first one to respond to the emergency, and the second to start working in the reconstruction.

The emergency Committee recruited around 10 people from the private sector to work temporarily in this committee. These people continued to receive their wages from the companies were they used to work. This help from the private sector and an emergency law that made it easier to buy and deliver help, were fundamental to the success of the emergency Committee in a very short period. We worked in coordination with the armed forces and Onemi (National emergency office).

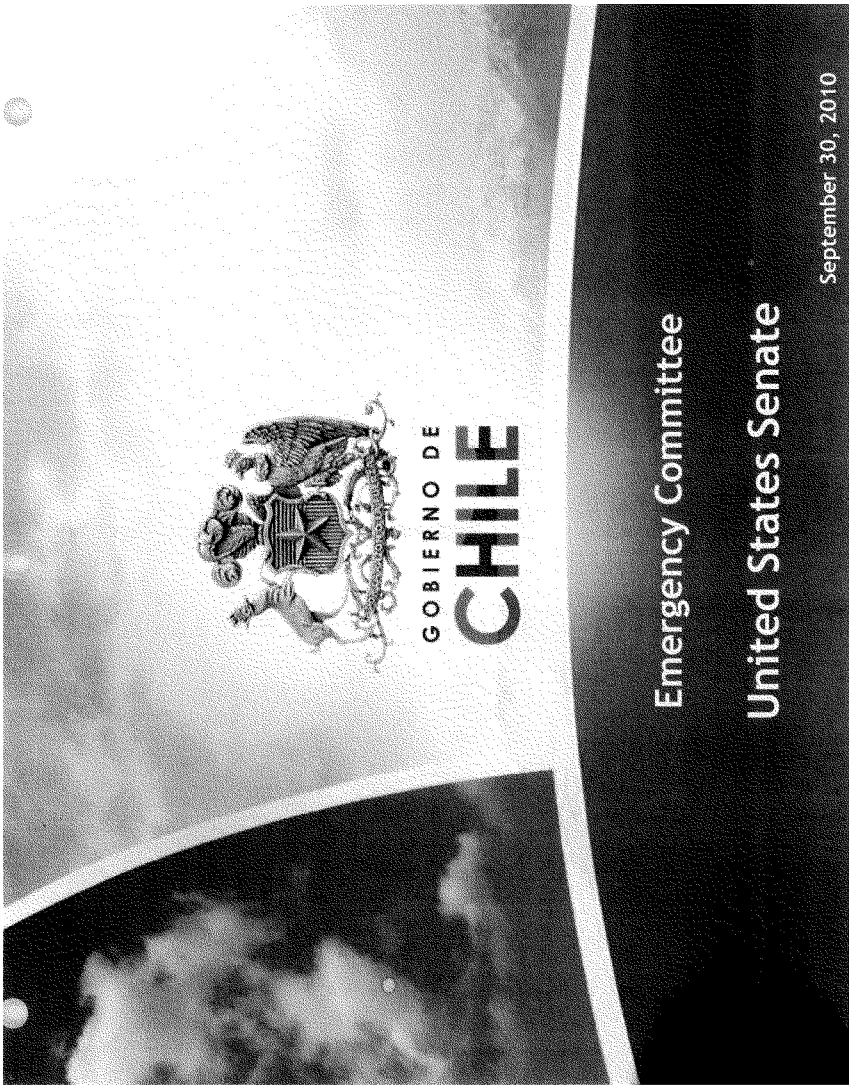
The Armed Forces were very important in two stages of these emergency. First, working to restore the public order that was missing after the earthquake. And second, changing their guns for tools to help to build emergency houses and remove debris from the streets.

A fundamental aspect to have a permanent knowledge of the situation and deliver fast and adequate solutions, was that the government worked permanently in the field, distinguishing their people with colorful red jackets.

Since the beginning of the government, we have worked together with Mckinsey trying to have a good diagnosis of what worked well, and what didn't work during this emergency. I would like to share with you these learnings, and how we are working to be better prepared when the next emergency comes.

Finally, I would like to give you some material that gives more information on the topics I have talked about before:

- A copy of the "Sustainable Reconstruction Plan" of Constitución, so you can see how we have been developing the reconstruction plans since the beginning of the government.
- Information about Onemi, the Chilean National Emergency Office, and how they are working in the prevention, response and recovery for future emergencies.
- I will also give you a presentation from the Minister of Finance, were you can find more information about the costs that this emergency implied for our economy and how the government is preparing to finance these costs.
- The final daily report from the Emergency Committee, were you can find details about all the aid delivered in the area affected by the earthquake and tsunami.


GOBIERNO DE
CHILE
Emergency Committee
United States Senate
September 30, 2010

Emergency Committee

Contents

- **Earthquake and tsunami impact**
- Government reaction and organization
- Initiatives in place and learnings captured

Material de Uso Interno

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Chile Had One of the Strongest Earthquakes On Record

Location	Date	Magnitude
Chile	22/05/1960	9.5
Alaska	28/03/1964	9.2
Northern Sumatra	26/12/2004	9.1
Kamchatka	11/04/1952	9.0
Chile	27/02/2010	8.8
Ecuador	31/01/1906	8.8
Alaska	02/04/1965	8.7
Indonesia	28/03/2005	8.6
Assam - Tibet	15/08/1950	8.6
Alaska	03/09/1957	8.6

The total loss was 14.9% of GDP

Source: USGS

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- **Consequences: Juan Fernández before**

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- **Consequences: Juan Fernández after**

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63864.027

Emergency Committee

- **Consequences: Talcahuano after**

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- **Consequences: Santiago, Vespucio Sur highway**

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- **Consequences: highway to the south before**

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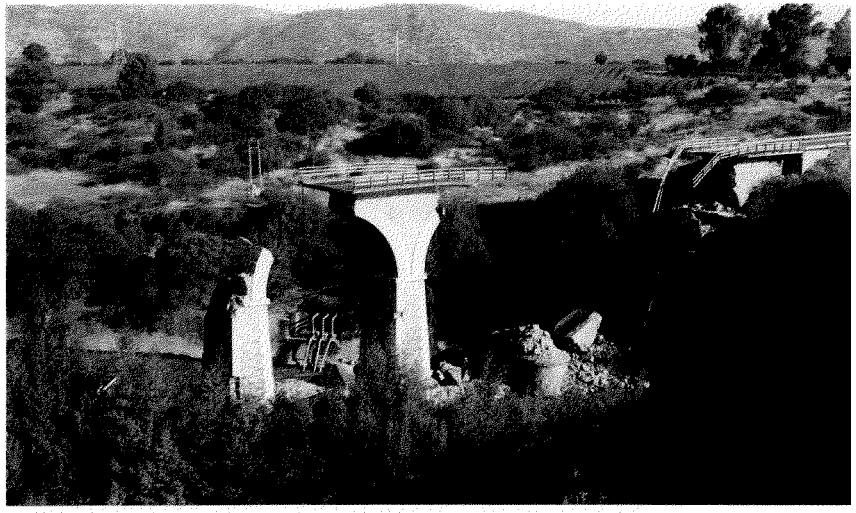
Emergency Committee

- **Consequences: highway to the south after**



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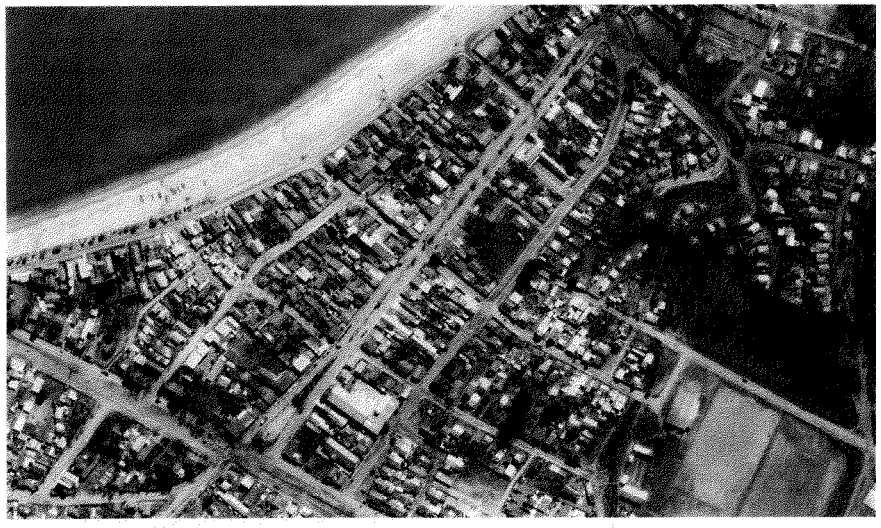
Emergency Committee

- **Consequences: Dichato before**



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- **Consequences: Dichato after**

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Emergency Committee

Consequences: Concepción

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Enormous impact of Earthquake and tsunami

- **521** fatal losses and **56** dissapeared
- **370.000** destroyed and damaged houses (11% of total)
- **73** destroyed hospitals
- **3.049** destroyed and damaged schools; **1.250.000** children out of school
- **221** destroyed and damaged bridges
- **900** towns and communities affected

Material de Uso Interno

Emergency Committee

The cost of the damages was USD 30.000 million

Sector	Amount (million USD)
Industry, Fishing and Tourism	5.340
Housing	3.943
Education	3.015
Health	2.720
Energy	1.601
Public works	1.458
National Assets and others	1.376
Agriculture	601
Transport and Telecommunications	523
Other infraestructure	267
Local governments	96
Infrastructure loss	**20.940**
GDP loss	**7.607**
Other expenditures	**1.117**
Total	**29.662**

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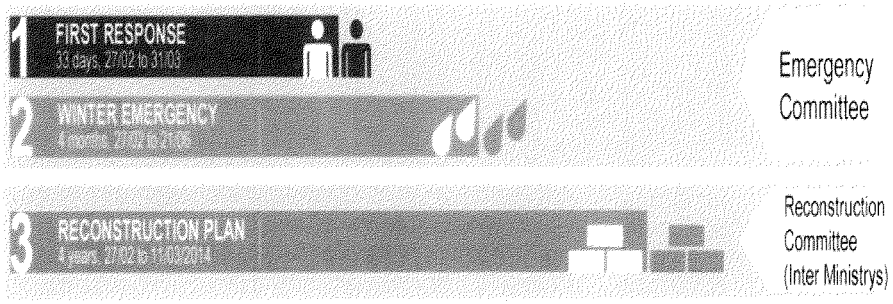
Government responded with a structure to overcome the emergency

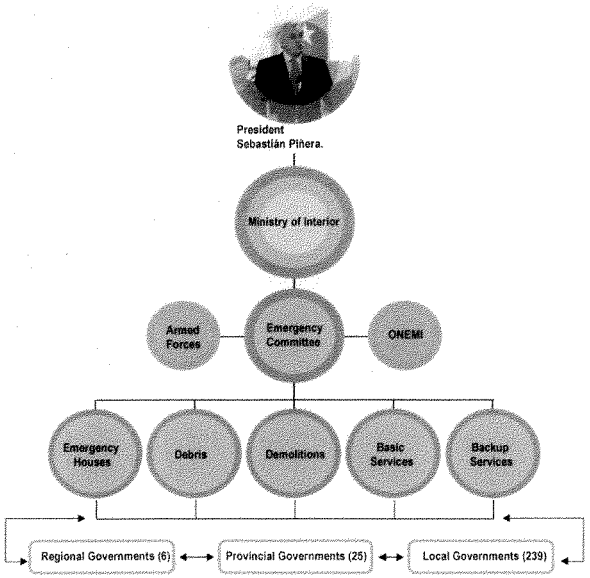


Triple response plan by the government

Material de Uso Interno

Emergency Committee

Government response: Organization after emergency



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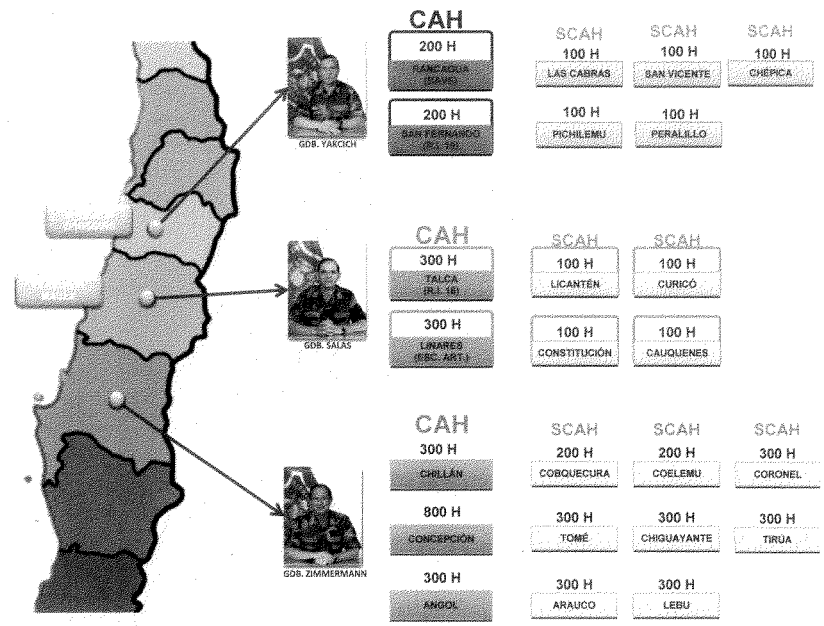
Army – Division by territory



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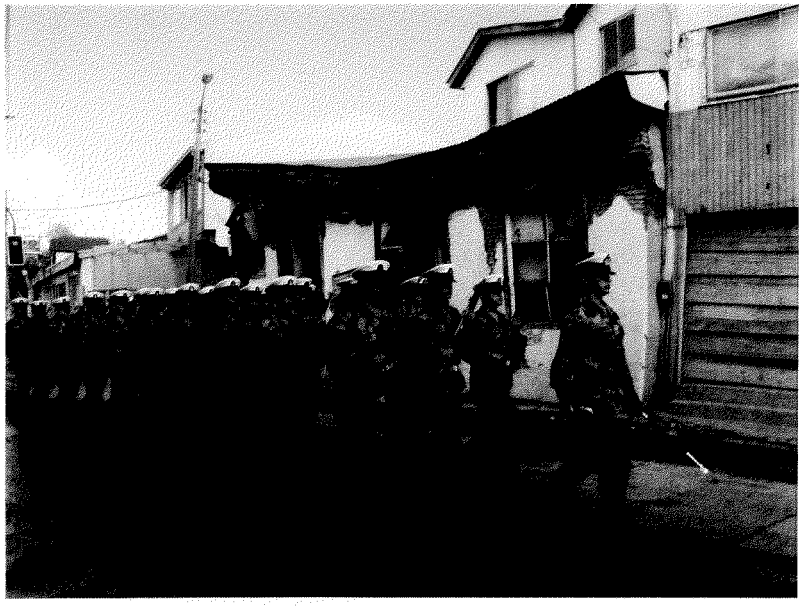
Emergency Committee

Restoration of public order



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Humanitarian aid by the armed forces

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Humanitarian aid by the armed forces

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- **Government: work in the field**

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We learned hard lessons from different things we were missing... (1/2)

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	Problems observed	What we are working on
1 **Seismological and telecommunications infrastructure**	Communications were down for more than 12 hours Sensors took more than 2 hours to provide the information	Investments in real time monitoring process and robust telecommunication systems with multiple backups
2 **Issuing alarms process**	Process to issue an alarm involved: Unclear communication protocols Multiple unnecessary decision points No use of mass communication channels	Streamlined process with: Clear communication protocols Single responsibility for decision Use of mass communication channels
3 **Emergency task force**	No special force dedicated to help in initial evaluation of damages nor specialized in emergency procedures	Development of an army emergency task force specialized in emergency procedures

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We learned hard lessons from different things we were missing... (2/2)

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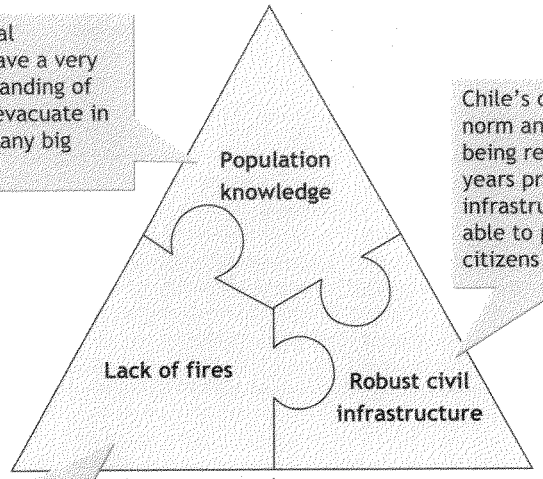
	Problems observed	What we are working on
4 **Chain of command**	No clear chain of command in place: - Too many direct reports - Organized by institutions instead of functions - Leadership duplicity	Clear chain of command: - No more than 8 direct reports - Organized by functions - Single leadership
5 **"War room" dynamics**	Unrestricted access Everybody sitting around the same table randomly Press with direct access to everything	Restricted access Decision makers in one table separated from support staff in separate tables grouped by functions
6 **Looting**	Heavy looting begun 18 hours after the earthquake	Procedures to deploy armed forces to ensure safety in the first hours of the emergency

Material de Uso Interno

GOBIERNO DE CHILE

...but we also learned from the good things we had in place



Chile's coastal population have a very good understanding of the need to evacuate in the event of any big earthquake

Chile's construction norm and developers being responsible for 10 years provided a civil infrastructure that was able to protect Chilean citizens overall

Chile's energy network shuts down automatically in the event of any major earthquake

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Written Testimony for:
James M. Wilkinson, Executive Director
Central United States Earthquake Consortium
(http://www.cusec.org)

September 30, 2010 10:30 a.m.
Ad Hoc Subcommittee on State, Local and Private Sector Preparedness and Integration

Thank you Chairman Pryor, Senator Ensign and other members of the subcommittee for the opportunity to share my thoughts concerning the seismic hazard and associated risk in the central United States.

The initial impact of a major earthquake (M 7.0- M 7.9) in the central U.S. occurring on any of the three major seismic zones which include: the New Madrid Seismic Zone, Wabash Valley Seismic Zone, and the East Tennessee Seismic Zone is anticipated to be catastrophic in its potential to cause human injury and death, as well as widespread property destruction.

Experts at USGS and other leading research organizations believe that major earthquakes - earthquakes whose effects are so severe that they cause unacceptable levels of damage to buildings and infrastructure, economic loss, mortality, morbidity, and adversely affect the environment, production facilities, economic markets, and distribution systems--are inevitable in the central United States. The USGS has placed a 7%-10% probability for a major earthquake similar to the historical 1811/12 and a 25%-40% of a 6.0 or greater event.

In 1977 Congress enacted the Earthquake Hazards Reduction Act (Public Law 95-124, Oct. 7, 1977) in recognition of the fact that earthquakes pose the greatest potential threat of any single-event natural hazard confronting the nation. It directed the President to "establish and maintain an effective earthquake hazards reduction program." In doing this, Congress created the National Earthquake Hazards Reduction Program (NEHRP) which gives the responsibility to the federal government to provide direction, coordination, research and other support to efforts aimed at earthquake hazard mitigation and preparedness. The Federal Emergency Management Agency (FEMA), the United States Geological Survey (USGS), the National Science Foundation (NSF), and the National Institute of Standards and Technology (NIST) were assigned specific roles. While national attention focused on high-risk areas such as California, the late Dr. Otto Nuttli of St. Louis University was pioneering research on the danger of earthquakes in the central United States. His research provided the conclusive evidence that prompted the creation of the Central United States Earthquake Consortium (CUSEC) in 1983 by those states most affected by the NMSZ. A contract between FEMA and the states was awarded on April 11, 1984, and the foundation for CUSEC was complete.

Authority for CUSEC is vested in the Board of Directors, which is composed of the Directors of the State Emergency Management agencies in each Member State. CUSEC Member States include the eight states most affected by the earthquake threat in the central U.S.: Alabama, Arkansas, Illinois, Indiana, Kentucky, Mississippi, Missouri, and Tennessee. CUSEC, a 501(c)(3) organization, is a working example of how individuals, businesses, communities, insurers, professionals, and local, state, and the Federal government can effectively work in partnership to address a common problem.

CUSEC also includes ten Associate Member States: Georgia, Iowa, Kansas, Louisiana, Nebraska, North Carolina, South Carolina, Ohio, Oklahoma and Virginia - which will serve a vital role in supporting the impacted states from a damaging earthquake in the CUSEC region

CUSEC's primary mission is "…the reduction of deaths, injuries, property damage and economic losses resulting from earthquakes in the central United States." In carrying out this mission CUSEC serves as the "coordinating hub" for an 18 state area with primary focus on the eight Member states performing the critical role of coordinating multi-state earthquake program efforts of the central region.

While each individual state is the primary implementer of emergency management functions, including earthquake preparedness through the state Earthquake Program Manager, CUSEC's role is largely facilitative in uniting and coordinating actions of the eight states.

TOPIC OVERVIEW

Describe what a catastrophic event would look like in the central US and the unique needs and challenges this part of the country faces.

An earthquake in the New Madrid seismic zone of magnitude 6 or greater could strike at any moment causing major physical, social, and economic disruption to a region that is home to more than forty million people. The potential losses from future earthquakes of magnitude 6 or greater in the New Madrid seismic zone are expected to be significant, for at least four reasons: 1) the population centers, notably Memphis and St. Louis, have thousands of structures that are not designed and constructed to withstand the effects of earthquakes; 2) large number of rural communities with high percentages of vulnerable structures; 3) the region is characterized by poorly consolidated sedimentary rocks, which are poor foundation material; and 4) an earthquake in the central US would impact a multi-state region (about 10 times larger than the area impacted by a California earthquake of comparable size). This is validated through recent and historical earthquakes (Figure 1).

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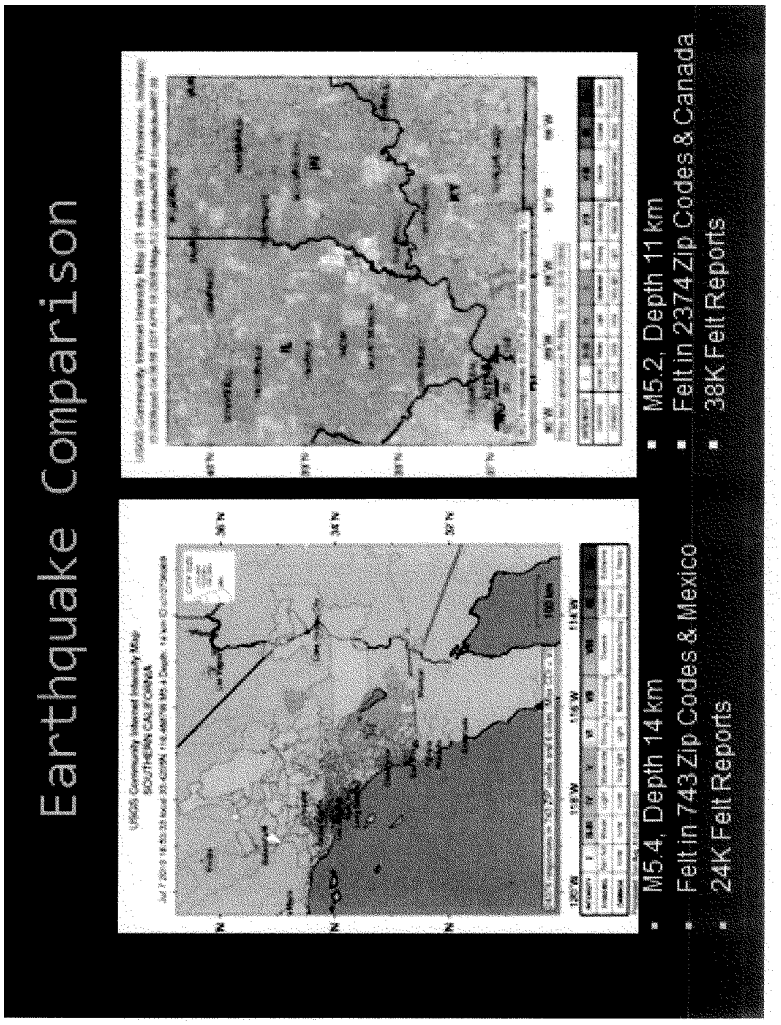
Earthquake Comparison
M5.4, Depth 14 km
Felt in 743 Zip Codes & Mexico
24K Felt Reports
M5.2, Depth 11 km
Felt in 2374 Zip Codes & Canada
38K Felt Reports

Figure 1

A repeat of the historical 1811/12 seismic event today would truly be catastrophic. Unlike the frontier of 1811 where there were few established communities, today the central US is home to more than forty million people of which approximately 7 million people live in the highest projected impact area encompassing 141 counties within the eight CUSEC states. Of these the city of Memphis has a population of 650k and the 350k for the city of Saint Louis with the remaining 6 million people scattered among suburban and rural communities spread out between Memphis and Saint Louis.

While it's clear that large cities have a concentration of population and infrastructure, they also have a distinct advantage over smaller communities in that they have economic and infrastructure diversity that will increase the survivability of the overall community. This is not to imply that large cities will not be negatively impacted - they will, and in some areas catastrophically. But by comparison, small rural communities which are already, by their very nature, remotely situated, are also often limited in their ability to attract and hold new industries and in many cases only have one or two key industries, with the remainder being medium to small business which are less likely to have a strong economic base, and thus are overall more at risk to losing a larger percentage of their community. This presents two challenges: one, the ability to respond in an efficient way to multiple communities simultaneously, and two, the ability of those communities to come back in the recovery phase of the disaster.

The economic, health and medical, and transportation concerns seen in these rural communities on a daily basis alone lead congress in 2000 to establish the Delta Regional Authority (DRA) to enhance economic development and improve the quality of life for residents of this region. A seismic event today will only exacerbate the current situation of these communities, many of which may never recover.

In addition to direct impacts to the community there are also secondary effects from earthquakes, such as flooding from damaged dams and levees, liquefaction, landslides and fire following the event.

As a major transportation corridor, it would be highly probable that transportation through the region would come to an abrupt stop affecting highways, rail, river systems, and airports. According to the 2002 Commodity Flow Survey by the Bureau of Transportation Statistics (BTS), more than 968 billion ton-miles, or about 31% of the total US commodities originate, pass through, or arrive in the central U.S. region (BTS, 2005)-(MAE Report 09-03, Oct 2009). Three-fourths of the nation's $7 billion exported soybean crop goes down the Mississippi River and the most northeastern county in Arkansas is one of the largest steel-producing counties in the country, with two Nucor mills – (St. Louis Post Dispatch-07/02/2005 Bracing for the Big One). Loss of the transportation infrastructure alone would be catastrophic.

Other key infrastructure interruptions, including oil, petroleum, and gas pipelines, and the electrical grid would cause a much larger indirect impact from a seismic event all along the east coast, including the District of Columbia making a NMSZ event a truly national crisis, especially if it should occur during a period when the US economy is already weak and many resources are diverted to international missions.

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The consequences from a major New Madrid earthquake would be substantial, estimated at nearly $300 billion – (MAE Report 09-03, Oct 2009). The destruction to the building and transportation systems would make up a significant portion of those losses.

Mid America Earthquake Center Phase 2 Modeling
Impact of New Madrid Seismic Zone Earthquakes on the Central USA – Report 09-03

- 8 State Population - 43 Million 400K Sq. Miles
- 141 County Study Region (Impact Counties)
- 7 Million People
- 15.7 Million Buildings (Eight State Total)
- 20,000 Schools
- 2800 Hospitals
- 165,000 Bridges
- 1,800 Rail Segments
- 2,000 Ports
- 3,700 Airport Facilities
- 715,000 buildings at least moderately damaged
- 25 Counties are catastrophically damaged at 60% or greater building loss
- 40 Counties incur substantial damage with 20%-60% building loss
- 300,000 buildings beyond repair
- 15-20% of manufactured housing at least extensive damage
- 3,500 Bridges at least moderately damaged
- 15,000 hospital beds unavailable
- 1,350 schools w/complete damage
- 1 Million households w/out Water
- 2.4 Million households w/out Electric
- $113 Billion in Building Damage
- $10 Billion in Transportation Infrastructure Damage
- $172 Billion in Utility Infrastructure Damage
- $300 Billion Total Direct Economic Loss

An additional impact from an earthquake 6.0 or greater is the process known as liquefaction. Liquefaction is a phenomenon in which the strength and stiffness of a soil is reduced by earthquake shaking causing the ground to lose its ability to support the weight of the overlying soil, buildings, roads, houses, etc., then the soil will flow like a liquid and cause extensive surface damage. Liquefaction and related phenomena have been responsible for tremendous amounts of damage in historical earthquakes around the world and according to Dr. Tish Tuttle, a Paleoseismologist and expert in Liquefaction fields in the central U.S. are some of the largest in the world.

Liquefaction induced damages could cause difficulty during rescue or recovery efforts following an earthquake in the central US. Many of these infrastructures will be needed but many will take a long time to repair. Long term impacts such to the agricultural communities would be significant with large tracks of land rendered un-usable do to the large volumes of sand deposited on the surface, displacement of irrigation and drainage canals as well as disruption to ground water systems.

An additional and unique feature about the seismic hazard in the central US that separates it from other seismic prone areas is the fact that earthquakes like those of 1811/12 are not single events. Research by USGS and others have clearly shown evidence of this sequence event in

A.D. 1450, A.D. 900, and 2350 B.C. – (USGS Fact Sheet 2009-3071) This added feature to earthquakes in the central US redefines catastrophic where damaging shaking could take place for months severely impacting response and recovery efforts and possibly changing the landscape of the central U.S. forever.

ACTION

What efforts are underway to address the needs and challenges?

For the past three and half years, the CUSEC Member states along with its primary planning partner, FEMA, have been involved in the New Madrid Catastrophic Planning Initiative. This initiative is a bottom up approach starting at the local level of government and moving up to the state, regional, and national levels to refine or develop the necessary plans to address a large damaging earthquake in the central US. The purpose of the Initiative is to improve response capabilities for a catastrophic earthquake event and related hazards within the NMSZ. What separates this effort from other planning efforts is the need to address the interconnectivity of these efforts for a hazard that cross state lines.

The planning initiative is based on the scenario-driven catastrophic response plan development process, which placed *Response Operations Personnel* and *Emergency Planners* in the same room to develop plans based on scientifically generated scenario data that:

- Combines the planning and exercise phases of plan development
- Produces functional plans ready to use immediately post-workshop
- Promotes communication and builds strong relationships between Federal, State, local, and volunteer agencies
- Partners FEMA, CUSEC, states, universities, business, volunteer organizations, local government
- Develop an environment for continued focus, planning, and exercises will greatly enhance our preparedness for earthquakes; help mitigate their impacts; and foster the level of local, regional, and national cooperation required to survive and recover.

Working with our planning partners workshops were held throughout the eight state CUSEC area focused on a select number of topical issues including: direction and control, communications, damage assessment, first responder issues, medical and mass care, transportation and evacuation, debris management, congregate shelter, reception areas and infrastructure recovery.

Plans will be tested as part of the Department of Home land Security/ FEMA National Exercise Program's (NEP) New Madrid National Level Exercise in May of 2011. The exercise which is being co-developed with CUSEC and its member states and FEMA NED along with various other local, state and federal partners will provide an opportunity to evaluate plans and determine what areas need improvement.

Although not originally developed for the NLE or in support to the NMSZ catastrophic planning effort we will be utilizing a survey developed by FEMA's Community Preparedness Division which conducts Citizen Corps National Surveys to measure the public's knowledge, attitudes, and behaviors relative to preparing for a range of hazards. This will be used baseline to look post NLE to see what has changed.

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In support of the NLE -2011 CUSEC, in partnership with FEMA, member states and the Southern California Earthquake Center are conducting the Great Central US ShakeOut (www.ShakeOut.org/centralus) scheduled for April 28th, 2011. Conducted as part of number of scheduled events in observance of the 1811/12 earthquakes, CUSEC is striving to raise awareness through a broad-based outreach program in partnership with media and public advocacy groups by hundreds of partners that earthquake preparedness isn't just a responsibility of the government.

A key aspect of the ShakeOut is the integration of comprehensive science-based earthquake research and the lessons learned from decades of social science research about why people get prepared. The result is a "teachable moment" on par with having an actual earthquake (often followed by increased interest in getting ready for earthquakes). ShakeOut creates the sense of urgency that is needed for people, organizations, and communities to get prepared, to practice what to do to be safe, and to learn what plans need to be improved

With a target goal of 1 million participants, the 2011 ShakeOut drill will be the largest earthquake preparedness event in central U.S. history.

Although great strides have been made in the level of preparedness in the central US clearly more effort is needed.

CHALLENGES

What areas of preparedness need improvement?

With the central US having less visibility than other areas of the country, preparedness efforts in the area of risk reduction, response and recovery planning can be a challenge. Add to the mix shifting priorities, budgetary constraints, and a complex set of issues involving multiple levels of government, and it's easy to see how difficult it can be to maintain a consistent level of support and focus on preparedness efforts.

Emphasis on establishing and maintaining some level of support to ensure that preparedness efforts continue to move forward without loss of momentum is paramount. Planning efforts undertaken during the NMSZ catastrophic planning initiative over the past few years were purposely built around a short set of achievable planning priorities defined by the CUSEC and its member state emergency management agencies but in partnership with FEMA. It was, and it remains, the intent of the CUSEC states to build on this list as we move forward, but it requires a commitment from our federal partners to do the same. The planning efforts thus far should not be viewed a box that simply gets checked off as if planning efforts are done. Success in preparedness efforts is highly contingent on a true partnership effort that links the states with its federal partners as well as the private sector.

CONCLUSION

The challenges presented by the earthquake hazard in the central US are numerous and in many ways unique to this region. The documented sequencing of large events, the lack of understanding and frequency of events coupled with a high percentage of aging infrastructure not built to withstand a seismic event, all provide a clear picture that much more remains to be done. The only manageable way to address it is by a thorough and deliberate approach that prioritizes the topic areas rather than approaching it as we do with many other smaller and more manageable hazards.

While we all have read and heard numerous times that earthquakes cannot be prevented, certainly we can minimize casualties and damages by being prepared. I cannot overemphasize the importance of awareness/self-preparation. We have been very fortunate in the United States not to have experienced a catastrophic earthquake in modern times but the clock is ticking and we must do everything in our power to reduce the vulnerabilities while we simultaneously prepare to respond and recover when it does occur.

It has been my honor to provide you with information concerning the seismic hazard and associated risk in the central U.S. as your Subcommittee works to identify areas for improvement in preparedness efforts across the United States.

Sources:

Mid America Earthquake Center:

- IMPACT OF NEW MADRID SEISMIC ZONE EARTHQUAKES ON THE CENTRAL USA, REPORT 09-03

Central U.S. Earthquake Consortium (CUSEC) Publications:

- EARTHQUAKE VULNERABILITY OF TRANSPORTATION SYSTEMS IN THE CENTRAL UNITED STATES
  REDUCING THE RISK: EARTHQUAKES IN THE CENTRAL UNITED STATES

US Geological Survey

- FACT SHEET 2009-3071 EARTHQUAKE HAZARD IN THE NEW MADRID SEISMIC ZONE REMAINS A CONCERN

TESTIMONY OF
Ellis M. Stanley, Sr., Vice President
Dewberry
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BEFORE THE
COMMITTEE ON HOMELAND SECURITY
AD HOC SUBCOMMITTEE ON STATE, LOCAL AND PRIVATE SECTOR PREPAREDNESS AND INTEGRATION
UNITED STATES SENATE
September 30, 2010

Chairman Pryor, Ranking Member Ensign, and distinguished Members of the Subcommittee thank you for the opportunity to testify before your committee today regarding **"Earthquake Preparedness—What the United States can Learn from the 2010 Chilean and Haitian Earthquakes."**

First, however, as a way for further introduction, for 32+ years I served as a local emergency manager, beginning in North Carolina for Brunswick County and Durham County then to Georgia for Atlanta-Fulton County and retiring in 2007 as the emergency manager for the City of Los Angeles, CA. Now that I am in the private sector I have continued to be actively involved in emergency management. I currently serve on the Board of Directors of the Greater Los Angeles American Red Cross and I recently had the opportunity to be a part of two different teams to visit Haiti and Chile, respectively.

How a government responds after a disaster usually captures the headlines. But most often, it is the role that government plays in preparing for these types of events that can be the single biggest factor in minimizing not only the event's initial toll, but also the recovery time necessary to bring a community back to a healthy, functional state. In this regard, an examination of how the government in Chile responded during the immediate aftermath of the earthquake and related tsunamis is appropriate. I will also address how southern California differs from Haiti in its preparedness as well as its recovery capability.

Our findings reinforced the importance of our "pre-disaster" relationships with all of our governmental, non-governmental and community partners. Properly done, these relationships require an organizational commitment, as well as a significant investment of time and personnel. The number and complexity of these relationships will vary based on local nuances, but as a general rule it is vital to ensure active participation in disaster policy, planning, response and recovery activities at all levels. It was no surprise to learn that the areas in Chile that made the most effective use of its resources were the very areas where some level of interaction had been ongoing before the earthquake struck.

In the United States, our government's approach to disaster response is well defined and emphasizes a "bottom up" approach, where local government is considered as having primary

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responsibility for emergency management. The National Response Framework describes the tiered approach and flow in this manner:

Even when a community is overwhelmed by an incident, there is still a core, sovereign responsibility to be exercised at this local level, with unique response obligations to coordinate with State, Federal, and private-sector support teams. Each organization or level of government therefore has an imperative to fund and execute its own core emergency management responsibilities.

There is little to suggest that Americans are willing to accept less readiness in this country, despite the significant costs associated with maintaining such a state of preparedness. As we saw in Chile and on many occasions in the U.S., the early days after a large-scale disaster will best reflect and will ultimately serve as a barometer for local community readiness.

Comparing the Chilean Earthquake to January 12, 2010 Haiti Earthquake and to Large Earthquakes on the San Andreas Fault in California

The figure below maps the distribution of intensity for three earthquakes, the February 27, 2010 M8.8 Chilean earthquake, the January 10, 2010 M7.0 Haiti Earthquake, and a hypothetical

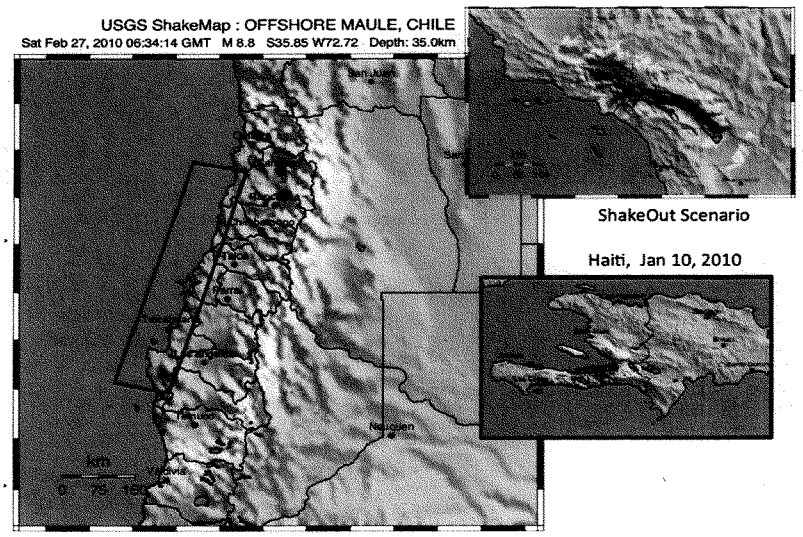

Figure 1: Maps comparing the intensity of shaking during three earthquakes: the February 27, 2010 M8.8 Chilean earthquake (left), the January 10, 2010 M7.0 Haiti earthquake (lower right), and a hypothetical southern California earthquake, the M7.8 ShakeOut scenario (upper right).

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southern California earthquake, the M7.8 ShakeOut scenario. All three are shown at approximately the same scale. The ShakeOut and Haiti earthquakes are both are vertical, strike-slip faults, that reach the surface of the earth in populated areas. The Chilean earthquake occurred on a fault that was almost horizontal, that comes to the surface in the seafloor. The area of the fault determines the magnitude of the earthquake. The area of the Chilean fault is 20 times the area of the ShakeOut fault, and almost 200 times the area of the fault in Haiti. Since the Chilean earthquake began in the middle of the fault and ruptured in both directions, the duration of the rupture was shorter than if it had begun at one end. Estimates of the duration are about two minutes, which is comparable to the ShakeOut earthquake (which ruptures from one end of the San Andreas northward). The Haiti earthquake rupture lasted for about 15 seconds.

We can see that the Haiti earthquake had a lower level of shaking for a shorter period of time than either Chile or the ShakeOut. The extremely high death toll and level of damage in that earthquake is directly attributable to the poor quality of buildings in the area. The Haiti experience, therefore, does not provide a basis for comparison to either the Chilean or ShakeOut earthquakes.

Compared to the expected San Andreas earthquake in California, the Chilean earthquake occurred on a longer and wider fault, with fewer people near the fault. This means the type of damage caused by being located near the fault (from very high frequency shaking) would be more prevalent in California compared to the Chilean earthquake. The type of damage that comes from the very large, low frequency waves of a great earthquake, will dominate the Chilean damage. This is the type of damage that will be more prevalent in a big San Andreas earthquake than in other previous California events, such as the Northridge and Loma Prieta earthquakes.

These examples highlight the fact that magnitude alone does not determine what the experience of an earthquake will be. The intensity of shaking at any one moment does not grow significantly at the largest magnitudes. Rather, the duration of the shaking increases, and the area exposed to the strong shaking gets larger. The population exposed to the shaking, however, is equally important. Many of the Chilean officials interviewed by this delegation said that they were surprised by the extent of the devastation because they know they had already experienced the largest earthquake in recorded history (the magnitude 9.5 event in 1960), and they that should have be able to handle anything else that came along. However, the 1960 event was in the southernmost part of the country, which has a limited population, and did not approach to the population exposure of the 2010 earthquake, which was located near Chile's second largest city. Similarly, California should recognize that a magnitude 7.4 on a fault that extends under most of Los Angeles would be much more devastating than the same size earthquake on a fault located in a more rural area. Magnitude, proximity of population, and local soil conditions all play a role in determining the level of damage in an earthquake.

Findings and Recommendations

Volunteers in Chile tend to be very resilient. They are able to work effectively with little or no direction from National Headquarters. This has been part of the reason that they were able to respond immediately to such a devastating event.

The following recommendations for improvement in California were based on observations in Chile:

1. Emergency plans need to be flexible and include alternative options in case primary plans are unable to be executed.
   - It is imperative to have at least one backup alternative plan and to communicate disaster plans with personnel. For example, there should always be more than one meeting place, and more than one designated person fully trained in each position in case the primary person is not available.
   - Plan for technology not working; ensure that staff has access to manual volunteer databases and the paperwork needed to handle staffing.

2. All volunteer leadership, at all levels, need to know emergency plans.
   - All responders at all levels should be aware of the disaster plan.
   - Leadership should be fully trained in their role, and strongly aware of the roles and responsibilities of additional team leaders and members.

3. Exercises need to be done on regular bases with volunteers rotating in their normal roles.
   - If only a few volunteers know the plan and they are unavailable after a disaster, no one will know what procedures to follow.

4. Involve local officials in regional planning.
   - Plans should be developed in coordination with government entities.
   - Partnerships with written MOU's should be developed in advance with non-government organizations.
   - Inter-agency training is strongly recommended for entities that would work together during a disaster.

5. Perform a realistic assessment of life-essential systems, such as potable water sources and emergency medicine supplies. Preparedness on the part of the community is a key element in dealing with these issues.

6. Personnel should be trained for the probability that core services may not be available, and know how to respond and support the community in such conditions.

7. Conducting comprehensive exercises (including joint Government, private sector, NGO, emergency responder, and community exercises) before the event is paramount to surviving and thriving after a natural disaster.

   Justification. When we visited the coastal towns hardest hit by the tsunami, we were told that communities often drill at least twice a year, practicing full evacuations to higher ground. Emergency drills need to be done on a regular bases with key players actively exercising in their specific roles. It is important to exercise within one's own organization; however, it is strongly advisable for entities to work together when drilling.

8. Individual resiliency and effective networking with local partners are vital to the continued success of a community after a disaster. It is critical to empower people to be prepared.

   Justification. Most of the hardest hit areas in Chile were cut off from aid and communication with the capitol for several days following the earthquake. All of the responders in these areas cited their personal resourcefulness and local partnerships (e.g., between the

firefighters, police, emergency management and the Red Cross) as critical in their ability to help their communities in the difficult first few days. The already strong ARC partnership with state and local governments should be maintained and enhanced when possible.

9. Education about what will happen during the event is an important part of preparing for a disaster; this information can save lives during a disaster.

   Justification. Most sources in Chile cited their "culture of resiliency" as a central factor in their ability to respond. It is clear that earthquake drills are more common than in California and that earthquakes are a more visible part of their society. At the same time, lack of information about the true nature of great earthquakes and tsunamis appears to have contributed to injuries and fatalities. For example, many people were taught to head for high ground if shaking was so strong they could not stand; this appears to have saved many lives in the tsunami. At the same time, it is not clear that the occurrence of multiple waves over many hours in tsunamis was anticipated.

10. Emergency and earthquake professionals should work with representatives of the print and broadcast media before the disaster to determine how to best serve the community.

    Justification. The media played a mixed role. Only a single radio station remained on the air in Concepción immediately following the earthquake, but was very helpful since no one else had situational awareness or means of receiving information. At the same time, several people commented that some of the media, especially television, exacerbated the chaotic situation by reporting only on the worst of the disaster, as well as emphasizing the dangers from looters and the potential shortages of supplies.

11. Emergency plans need to be redundant, flexible, and detailed to handle the unexpected in very large disasters.

    Justification. Emergency plans in Chile were in place for the Chilean organizations we met with but in all cases, they were described as inadequate for the situation they faced. Deficits were especially seen in flexibility and alternate plans. For example, plans had only one meeting place that could not be accessed, or one designated person in each position who was injured or out of town.

12. Recognize the competing personal and professional demands that will be made on an organization's staff after a disaster and include this in emergency plans.

    Justification. Immediately after the Chilean earthquake and tsunami, many critical staff members stayed with their property or left work to see if their families were safe. Other staff simply could not get to work. Staffing shortages have the potential to hamper response efforts in the hours, days, and weeks following a major disaster.

13. Organizations need to plan for nonstructural damage and the potential need to evacuate even without structural damage.

    Justification. After a significant California earthquake, it must be assumed that even buildings that are structurally sound will have significant non-structural damage with supplies and some equipment on the floor, fallen ceiling tiles, and other superficial damage, but this should not be the sole reason to evacuate.

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14. California must recognize vulnerabilities in our communications systems and make comprehensive backup plans to avoid complete communication collapse. It is important to do this as individual organizations, but also to team up with other organizations.

    Justification. Although most communications were re-established rapidly in Chile, initially it was very frustrating and difficult to have no communications. Health and other critical agencies and institutions need redundant communication systems to communicate situation status and resource requests within and between jurisdictional levels. Initial situation status may be impossible to determine without functional communications, which in turn makes resource allocation decisions very difficult. Emergency hand-held radios proved particularly useful for local primary responders, allowing them to coordinate initial activities.

15. Explore mechanisms to encourage building owners to adhere rigorously to existing building codes.

    Justification. In Chile, buildings performed extremely well, due to strong, well-enforced building codes. By law, if there is building damage or injuries within a building, the building owner may be liable. Both building professionals and lay people in Chile reported that this law serves as extra incentive for building owners to adhere to the building code during construction.

16. Collect all possible data about each disaster when it happens.

    Justification. Many of the consequences of the Chilean earthquake and tsunami have not yet been quantified, such as the numbers of fires or injuries caused by the events. Each disaster is a unique opportunity to learn how society is affected by the events and this information if captured can support researchers who are trying to minimize future losses.

Questions for California and the Pacific North West based on the lessons from Chile:

- It took the 1933 Long Beach earthquake to design schools to higher standards. It took the 1971 San Fernando earthquake to design hospitals to higher standards. What will it take to design tall, high occupancy buildings to higher standards?
- What is an acceptable collapse rate for new buildings and who determines it?
- Have the public and leading public figures been involved in setting safety and investment standards?

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AD HOC SUBCOMMITTEE ON STATE, LOCAL, AND PRIVATE SECTOR
PREPAREDNESS AND INTEGRATION
UNITED STATES SENATE
SEPTEMBER 30, 2010

Mr. Chairman and Members of the Subcommittee on state, local, and private sector preparedness and integration, thank you for the opportunity to testify on "Earthquake Preparedness - What the U.S. can Learn from the 2010 Chilean and Haitian Earthquakes". My testimony will highlight the risks associated with a potential catastrophic earthquake event in the United States, and address opportunities to improve infrastructure resilience. My perspective is as an earthquake engineer who has studied the performance of the built infrastructure in the US, with a focus on the Central and Southeastern United States (CSUS). Internationally, I have worked extensively in Haiti since the January 12, 2010 earthquake, having led a team of 28 engineers, scientists, and planners to study the effects and survey building damage in Port-au-Prince. My work in Haiti is on-going in two veins: first to provide structural advice as the recovery gets underway and second to better prepare Haiti, and by extension other places, for future earthquakes and other hazards.

Haiti Earthquake: January 12, 2010.

The Haiti earthquake is likely the most catastrophic natural disaster in modern times, particularly when viewed on a per capita basis. The magnitude 7.0 Haiti earthquake (January 12, 2010) resulted in over 250,000 deaths, over 300,000 injured, 1.3 million displaced, and 250,000 homes either destroyed or critically damaged. In contrast, the much larger magnitude 8.8 Chile earthquake resulted in less than 600 deaths, and less than 12,000 people injured

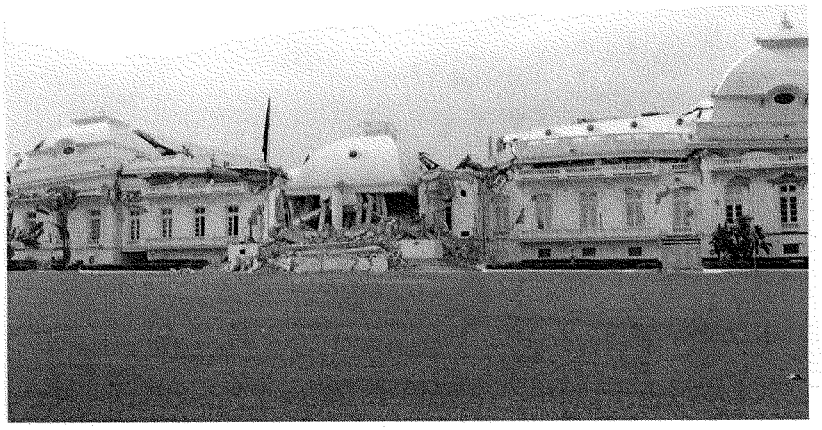

Figure 1: Collapse Presidential Palace in Port-au-Prince, Haiti

There are numerous reasons for the differences in the outcomes including the location of the epicenters of the two earthquakes to major city centers, fault mechanisms, and local soil conditions.

However, there is no doubt that the advanced level of seismic design and preparedness in Chile as compared to Haiti is the primary contributing factor in the significant differences observed between these two earthquakes. Chile has a long history of large earthquakes including the 1985 M8.0, 1960 M9.5, 1943 M8.2, and 1906 M8.2. Because of this history of large and frequent earthquakes, Chile has been diligent in ensuring its buildings and other infrastructure are designed according to updated seismic codes. On the contrary, Haiti had not experienced a major earthquake in over 200 years, and therefore was not prepared for the earthquake that struck on January 12, 2010.

Seismic Hazard in Central and Southeastern United States

There are several regions in the US that have a history of large, but infrequent earthquakes, and therefore are not prepared in terms of appropriate building designs with earthquake details. In particular, the cities around the New Madrid Seismic Zone (St. Louis, MO, and Memphis, TN), and the Charleston, SC, region are at risk of catastrophic failure from a large earthquake.

Although not generally considered a seismically active region, large earthquakes have occurred in the Central and Southeastern US, primarily due to the activity of the New Madrid Seismic Zone (NMSZ)). The NMSZ stretches from northeast Arkansas to southern Illinois, cutting through Missouri, Western TN, and western KY. The series of three earthquakes that struck the NMSZ in 1811-12 are considered among the largest earthquakes in US history (in the contiguous

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US), with magnitude estimated at around 7.5-8.0. The earthquake was felt as far west as Denver, CO, and as far east as Philadelphia, PA.

Charleston, SC, is also a region of large, but infrequent earthquakes. On August 31, 1886, a large earthquake hit the Charleston, SC region, with an estimated magnitude 7.0 was felt as far as Chicago, IL and Boston, MA.

While most earthquakes occur along plate boundaries, such as is the case with California's San Andrea fault, earthquakes in the NMSZ and Charleston, SC, known as "intraplate" earthquakes are less frequent, but equally damaging. Moreover, the geological conditions of the older crust in the central and eastern United States results in earthquake waves that travel much farther, and therefore, will have a much more wide-spread set of effects than a comparable sized quake on the west coast.

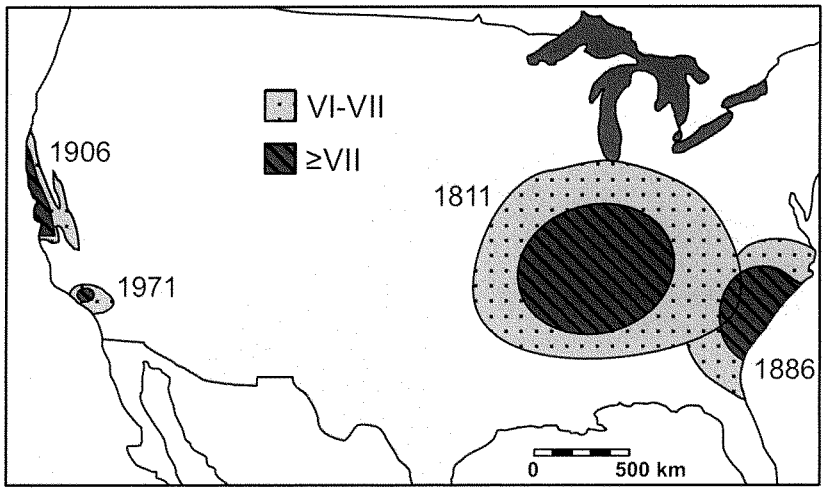

Figure 2: Map of US Showing Area Affected by 1811 New Madrid Earthquake, 1886 Charleston Earthquake, 1906 San Francisco Earthquake, and 1971 San Fernando Earthquake.

What are the risks associated with effects of catastrophic earthquakes in US?

The primary risk of catastrophic earthquakes in the US is the likely failure and damage to the built infrastructure. Today, the NMSZ region is highly populated and densely covered with homes, commercial buildings, and critical infrastructure such as bridges, pipelines, and power/telecommunications, Dams/Levees, etc. Damage to these critical infrastructure systems would have disastrous consequences on the regional, national, and global economies. The

transportation system in the central US serves as a primary means to move $2 trillion dollars worth of good through the US. It is expected that many of the bridges in the region, including some bridges crossing the Mississippi river could collapse and be unusable for weeks or longer. In addition, there would be severe interruptions to oil and gas services due to severely damaged pipelines.

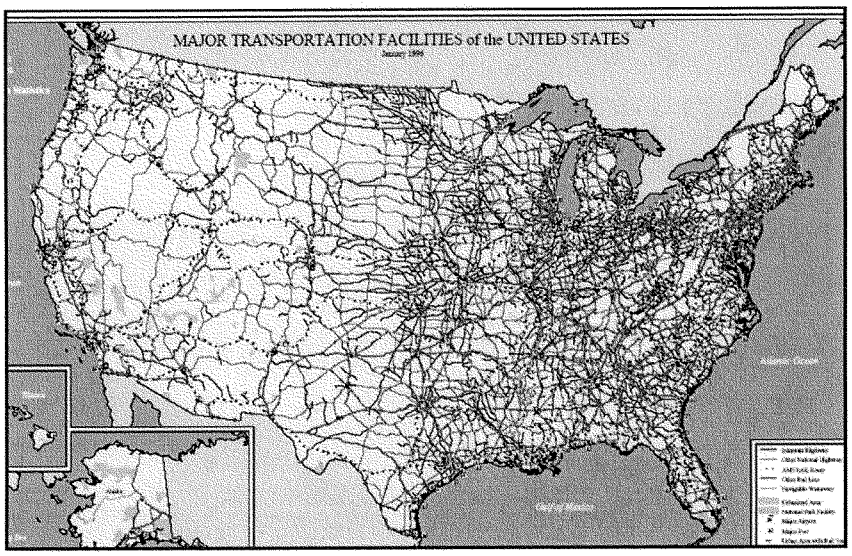

Figure 3: Map Show the Dense Transportation Network in the Central and Southeastern US.

Based on geologic research, the USGS estimates that there is a 7-10 percent probability of a New Madrid earthquake comparable to those that occurred in the 1811-12 series in the next 50 years. Such a strong earthquake would rock the entire eastern half of the country and prove devastating to a broad section of the country. A recent study[1] by the Mid-America Earthquake Center on the Impact of a New Madrid Seismic Zone EQ on the Central USA estimates that nearly 750,000 buildings would be damaged in the states surrounding the NMSZ. In addition, there would be over 3000 bridges damaged, and over 400,000 breaks and leaks to local and interstate pipelines. Approximately 2 ½ million households would be without power and 86,000 injuries and fatalities are estimated to occur. The study estimated direct losses at $300 billion, and indirect losses at $600 billion. Similarly, a 2005 study[2] of the Charleston, SC, region indicated that a repeat of the 1886 earthquake would be equally catastrophic, although more localized, with significant damage to schools, hospitals, fire stations, and lifeline systems such as bridges, pipelines, and ports.

Another factor compounding the risk of catastrophic effects of an earthquake is the nation's aging and deteriorating infrastructure. Physical infrastructure in the United States is deteriorating rapidly, becoming increasingly more complex, more interconnected, and thus more vulnerable to system-wide failure due to physical decay or inadequate design for current demands. Unless we address our aging infrastructure, we will find ourselves in much greater risk of catastrophic failure during a major earthquake.

Using Science and Engineering to Understand Risks and Improve Infrastructure Resilience.

The recent studies on the possibilities of catastrophic failures in the case of a large earthquake in the Central and Southeastern US(CSUS) demonstrates the scope of the problem and reinforces the need to implement measures to reduce seismic risk. We know that hundreds of thousands of buildings and key critical infrastructure systems remain at risk of significant damage when a large earthquake strikes the CSUS.

We cannot prevent the buildup of tectonic stress along fault lines, nor can we pinpoint the exact moment when a disastrous earthquake will strike. With the leadership of the NEHRP agencies, namely USGS, NSF, NIST, and FEMA, significant progress has been made in our understanding of the earthquake hazards in the various parts of the United States, as well as the vulnerabilities associated with different types of structural systems. New design codes and guidelines have incorporated lessons learned from recent earthquakes, as well as new knowledge developed from researchers and practicing engineers in cooperation with the NEHRP agencies. The transfer of scientific research successes from the NEHRP efforts to building and design codes is one important step towards earthquake preparedness in the United States. Still, there is more work to be done.

Earthquake preparedness involves a few different key elements, including pre-earthquake rehabilitation of buildings, bridges, and other key infrastructure systems subjected to earthquake loads. Reinforcement actions, such as adding steel jackets to existing columns, or adding steel restrainer columns are examples of measures that have been proven effective in mitigating the damage caused by earthquakes. Small investments now can yield significant savings later. The California Department of Transportation (CALTRANS) is a good example of the return on investment from retrofit of bridges. Following the 1971 San Fernando earthquake, CALTRANS initiated a retrofit program for bridges that were deemed vulnerable to damage from earthquakes. These same bridges, when subjected to shaking during the 1994 Northridge Earthquake, withstood the earthquake loads with minimal damage.

These types of applications of science and engineering to mitigate the effects of earthquakes can only be sustained over time with an educated workforce that is proficient in math, science, and engineering. As a Professor of Civil & Environmental Engineering, I would be remiss if I did not underscore the continuing need to strengthen STEM education at the K-12, university, and

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post-graduate levels. Such an educational foundation is dependent on sustained federal funding and is elemental in developing a workforce that is equipped to understand, plan for, and mitigate the effects of earthquakes, and other natural hazards on the built environment.

My main message to this panel is that it is critical that we continue to apply science and engineering knowledge to develop innovative technologies and designs to increase our earthquake preparedness. We also need to continue to enhance building codes and establish priorities for mitigation strategies that limit damage to key buildings and critical infrastructure. Prioritized mitigation strategies can assist in identifying infrastructure systems that are most at risk of damage and/or failure, so that we can begin developing ways to fortify them against future earthquakes.

Mr. Chairman, this concludes my remarks. I would like to thank you and the committee for the opportunity to share my thoughts with you.

Post-Hearing Questions for the Record
Submitted to the Honorable William Carwile, III
From Senator John Ensign

"Earthquake Preparedness: What the United States Can Learn from the 2010 Chilean and Haitian Earthquakes"
September 30, 2010

1. With all the assistance we have provided other countries with disaster aid, do we have enough needed supplies on hand in the event of a large disaster here at home: satellite phones and other communication devices, medical supplies, food, potable water, temporary shelters, and the like?

    - Follow-up: What procedures are in place to confirm the supplies are being maintained and adequately stocked?

    - Follow-up: Are these supplies in safe areas and not in areas that are potential disaster areas (e.g., basement in a tall building that is in a quake area and has not been retrofitted to withstand a quake)?

Response: The U.S. Agency for International Development (USAID) is in charge of and provides appropriate response/emergency personnel, equipment and commodities for international disasters and crises. USAID has prepositioned network of commodities worldwide that its regional disaster offices can draw upon in the event of a crisis. FEMA commodities are usually not used, and in the rare cases where they are, they are paid for by USAID through an interagency agreement. FEMA has the needed resources on-hand and a robust capability to acquire more resources in the event of a large disaster in the United States. FEMA's Logistics Management Directorate serves as the National Logistics Coordinator (NLC) and single integrator for national supply chain planning and coordination in response to domestic emergencies and special events. The national supply chain resilience rests on a combination of both national public and private capabilities and support. The NLC sourcing process begins with resources, supplies and services organic to FEMA and resident in our network of six distribution centers located in the continental United States and the three distribution centers located outside the continental United States. The second supply chain tier is the capability resident with our national volunteer agencies active in disasters and the third tier is the combined capability of our interagency partners: GSA, DLA, USNORTHCOM and USACE. The fourth tier is the commercial capability of the nation's industrial base in the private sector.

One of FEMA LMD's four core competencies is Distribution Management, which entails managing the Agency's warehouse facilities and transportation systems used to receive, store, maintain, issue, distribute and track supplies, services, materiel and equipment. FEMA Distribution Centers are strategically located in nine separate locations (six CONUS and three OCONUS) in the United States. The locations were selected in areas that are not high potential areas for disaster activity (hurricanes, earthquake fault etc.) but do provide sufficient response time capability for high risk areas. In addition, FEMA has agreements with many other

providers, including General Services Administration, Defense Logistics Agency, U.S. Army Corps of Engineers, and private sector contracting capability that are located in many different locations and provide supplemental assistance and a robust redundant capability for potentially large amounts of commodities and supplies.

2. Are there any geographical areas in the United States that FEMA believes are not prepared on the local or state level for a possible disaster, including earthquakes?

    - Follow-up: What areas and in what ways are they not prepared?
    - Follow-up: Has this been communicated to the elected leaders of those areas and if so, what was their response?

Response: FEMA does not grade, rate, or rank individual jurisdictions, including FEMA Regions, on their preparedness efforts. Through the National Preparedness Directorate's National Preparedness Assessments Division (NPAD), FEMA delivers national level assessments on the nation's overall capabilities to inform and help ensure the all-hazards preparedness of a series of jurisdiction types. National Level Exercise (NLE) 2011, organized and managed by the National Preparedness Directorate's, National Exercise Division (NED), will focus on a New Madrid Earthquake Scenario, and will include all the jurisdictions related to this scenario, including FEMA Regions. NPAD has, and will, coordinate with NED to collect and analyze the standards, data, and lessons learned from NLE 2011 to inform its production of the 2010 National Preparedness Report (NPR). The 2010 NPR's analysis will be rooted in the Administrator's Whole of Community planning process, which in turn utilizes a meta-scenario, or scenario of scenarios that accounts for the national capability requirements created by a potential, catastrophic earthquake.

FEMA encourages all communities to build capacity to respond to disasters regardless of cause. Having every community prepared enables our mutual aid system to work efficiently and towards building national emergency management capabilities.

3. At a similar hearing on disaster preparedness a while back, one witness spoke of "out of the box" thinking. One idea he had was to utilize the "big box" type stores – Costco, WalMart, and the like – for their supplies and parking lot sizes as triage centers, rescue centers, and gathering points for the affected community, much as schools are currently used.

    - What type of "out of the box" thinking is FEMA conducting currently that you can discuss?

Response: FEMA currently has in place a nationwide agreement with FedEx to utilize existing space at their distribution center locations as staging areas for positioning critical commodities and supplies during disaster response. Also, FEMA is coordinating with other large retail companies, (such as Walmart, Target, Costco, etc.) to identify store locations for the agency's recently created situational awareness tool called Situation Awareness Viewer Emergency Response (SAVER). This tool is a geospatial platform that allows emergency officials to view

real time location-based asset and personnel data during an emergency. Additionally, FEMA is working with these retailers to establish real time data feeds of store operating status.

FEMA coordinates with Federal, State and local governments as well as the private sector during disasters to coordinate resources and not compete with open business within an affected community.

4. The United States has many different ethnic groups with many different languages spoken: Tagalog, Spanish, Asian dialects and so on.

    - In the event it has to respond to a disaster site within the U.S., will FEMA have enough native speakers to adequately serve the people?
    - Does FEMA have a list of the personnel that have such linguistic skills and other skills and abilities that it can refer to in the event a disaster response is needed?

Response: FEMA captures its employees with language proficiencies in the Agency's Automated Deployment Database and periodically deploys these personnel to augment FEMA's disaster workforce when language support is required. In addition to the Agency's in-house capability, FEMA also has a contractor that provides language support for "phone" translations/interpretations for approximately 80 different languages. This contract is currently being re-competed and FEMA's new contract may encompass additional languages and services. FEMA also receives a great deal of incoming mail and has a mail contractor that translates all incoming mail regardless of the original language.

It's also important to note that FEMA is currently working with the rest of DHS and other components to identify DHS personnel to augment FEMA's workforce in support of a response to a catastrophic event and the Surge Capacity Plan required by the Post Katrina Emergency Management Reform Act. FEMA will identify the language proficiencies of these personnel once they are identified by DHS.

5. In the event of a major disaster caused by an earthquake, many services will be needed by the affected community and other agencies will be and should be enlisted in the efforts.

    - To what extent are other federal, state and local agencies involved in the pre-disaster planning, such as Customs and Border Protection, Immigration and Customs Enforcement, Citizenship and Immigration Services, state and local law enforcement and social services agencies, and others?

Response: Federal, State and local governments are partnering in a pre-disaster, deliberative planning approach for a possible disaster caused by an earthquake in the United States that is consistent and integrates all levels of government, vertically and horizontally. As an example of how this is facilitated, FEMA leads the Emergency Support Function Leadership Group (ESFLG), a senior level group that coordinates disaster preparedness and operational response and recovery responsibilities and policy implementation for the interagency community; addresses and resolves issues relating to interagency response and recovery activities at the national level; and provides planning guidance and oversight for the development of interagency

response and recovery focused plans and activities. The ESFLG is also responsible for identifying and resolving operational issues related to the National Response Framework (NRF), Homeland Security Presidential Directives (HSPD), and other related directives. The ESFLG membership includes federal department and agency senior officials who can speak authoritatively on behalf of their respective organizations.

Another example of how effective catastrophic planning is being accomplished is FEMA's Whole of Community (WoC) planning initiative. WoC planning embodies the legislative imperative to partner with state, local, and tribal governments and emergency response providers, federal agencies, the private sector, and non-governmental organizations (NGO) to plan and build a national system of emergency management that can effectively and efficiently utilize the full measure of the nation's resources to respond to natural disasters, acts of terrorism, and other man-made disasters, including catastrophic incidents.

During disaster response, FEMA coordinates response support from across the federal government and certain NGOs by activating, as needed, one or more of the NRF's 15 Emergency Support Functions (ESF). The ESFs are a critical mechanism for coordinating, bundling, and funneling the resources and capabilities of the federal government, along with resources from certain private-sector organizations and NGOs, to support local, tribal, State, and other responders during a disaster response. ESF functions are coordinated by NRF designated coordinating and primary Federal department(s)/agency(ies), but the responsible organization may also rely on other departments/agencies that can provide needed functional support and resources.

Federal grant funding, guidance and training assist State and local governments in planning and preparing for responses to all-hazards threats. For catastrophic events that stretch and break the local, state, tribal and Federal capacity, FEMA has initiated a "Whole of Community" planning approach to identify non-traditional resources and partnerships necessary to stabilize and recover from this type of disaster. This "Whole of Community" planning approach breaks the paradigm of 'nested plans' created for each level of government and enables planning for truly coordinated assistance to disaster survivors.

FEMA's Office of External Affairs identifies communications needs, and establishes outreach plans for populations with Limited English Proficiency/Additional Communication Needs, and multilingual media (the target groups); and ensures that diverse audiences receive critical, accessible, understandable, and simultaneous disaster assistance communications.

FEMA also pre-identifies the most commonly used languages with an initial language needs assessment to support the compliance with the Limited English Proficiency Level needs in communities affected by disasters. All of our preparedness information, located on www.ready.gov, is translated in the languages identified most critical by PKEMRA: ARABIC, CHINESE, FRENCH (Haitian-Creole), HINDI, ITALIAN, JAPANESE, KOREAN, RUSSIAN, SPANISH, TAGALOG, VIETNAMESE and URDU. In addition to providing language support, FEMA works to address additional communications needs by ensuring preparedness and disaster information is available in: Braille, American Sign Language, Transcription/Close Caption and Web Localization.

Post-Hearing Questions for the Record
Submitted to the Honorable James Wilkinson
From Senator John Ensign

"Earthquake Preparedness: What the United States Can Learn from the 2010 Chilean and Haitian Earthquakes"
September 30, 2010

1. You noted in your statement that the population centers have thousands of structures that are not earthquake resistant.

What attempts have been made to retrofit them to better withstand an earthquake?

Answer: In states that have a moderate to high seismic hazard throughout the U.S. each have active Earthquake as well as Hazard Mitigation Programs. It's through these program interactions, as well as working directly with local at risk communities, that seismic risk reduction takes place. The effectiveness of implementing a seismic retrofit on an existing building varies from community to community for numerous reasons. Cost is typically the largest barrier to retrofitting existing structures, unlike the very minimal cost associated with building a structure to a seismic standard from the ground up. Essentially without the financial support from the Federal government, implemented through the state in the form of hazard mitigation grants, it is difficult for local communities during good economic time, let alone conditions like we find today, to push retrofit programs forward.

In areas such as the west coast which has a higher frequency of seismic events, we see a higher percentage of buildings being retrofitted unlike the central and eastern US where benefit cost ratios are much harder to justify, coupled with a lower understanding of the hazard. The bottom line is fewer structures are upgraded further extending the risk in these areas of the country.

This is not to imply that retrofitting isn't taking place, it is throughout communities across the region, but at a pace which is not significantly reducing the risk. It's through the adoption and enforcement of proper building codes that we will make the greatest difference so that we are not adding to the problem but rather improving the survivability of our infrastructure for the future and more importantly saving lives.

Can they be retrofitted in the manner that buildings and structures in quake-prone California have been?

Answer: From an engineering design perspective, yes. But, the geology of the U.S. is very diverse and site conditions where buildings and other parts of our infrastructure reside differs causing the need for different design considerations. Each structure has to be assessed and a design plan devised on the unique characteristics of each building i.e. age of the structure, building type, site soil conditions, … before it can be retrofitted from a structural perspective.

2. I understand that earthquake forecasting is not possible at this time, but regarding that topic:

Does your group have any thoughts on the size of the next large earthquake to hit in the Central U.S. and/or the possible geographical area in which it may occur?

Answer: You are correct – Unfortunately the ability to predict exactly when and where a seismic event will occur is still outside the reach of the seismological community Extensive work by the USGS and other groups continues in an effort to achieve that ability.

As for the central U.S., the USGS tells us that the probabilities for a magnitude 6 and above is 25-40% and for a repeat of the 1811/12 types of earthquakes a 7-10% chance in a 50 year window. Research suggest that the most strain accumulated and thus the more likely place for a damaging seismic event to occur is along the southern arm of the New Madrid Seismic Zone which is closest to Memphis. This is not to imply that the other two segments of the New Madrid (Central and Northern arms) are not active, they are and historically all three went off producing major earthquakes.

Ironically the larger earthquakes within the region I the last several years have not occurred on the New Madrid but two less understood but equally concerning seismic zones – the East TN Seismic Zone (Alabama, Georgia, South and North Carolina and Tennessee) and the Wabash Valley Seismic Zone (Ohio, Indiana, and Illinois) . Each of these seismic zones are capable of producing up to Magnitude 7 events and have most recently demonstrated through smaller events their ability to impact a very larger region essentially 5 or more states as would a New Madrid event. So, while the seismic focus tends to be on the area that has the most research attention, New Madrid, we mustn't lose sight of these other potentials.

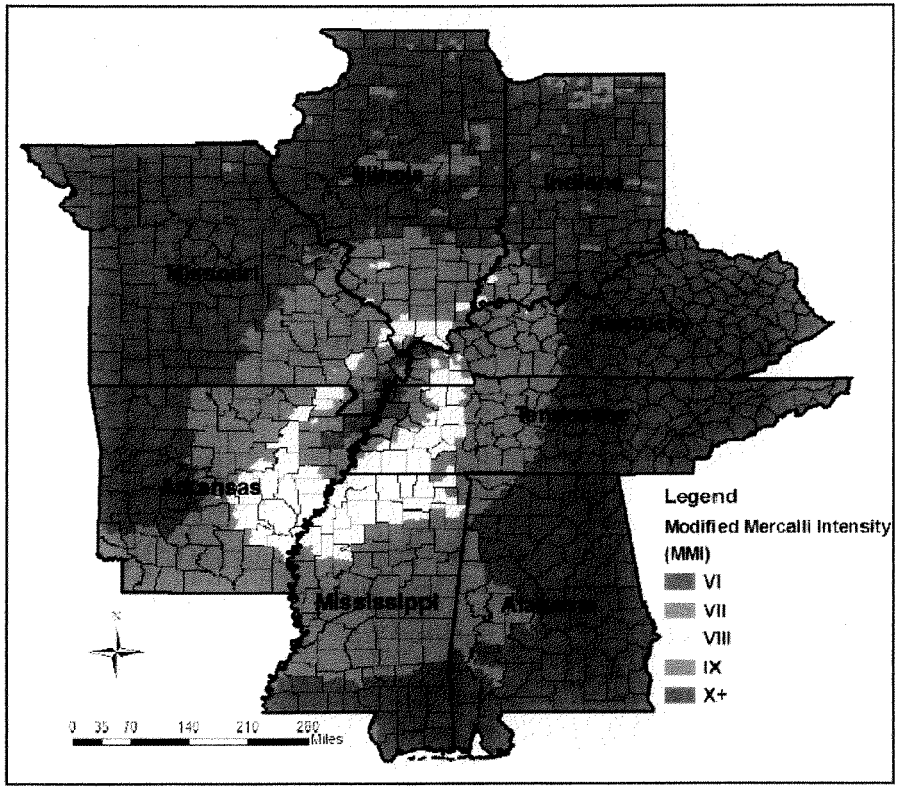
Other than retrofitting buildings and structures, what other precautions and preparations can the federal, state and local governments and the local populaces take in those areas?

Answer: The number one priority has to be public awareness and education. Without an understanding of the hazard and the associated risk communities and the people who live in them are not going to take the steps necessary to plan for and mitigate against an earthquake or any other disaster they might face.

Working with the NEHRP (National Earthquake Hazard Reduction Program) agencies we strive to develop appropriate mitigation, response planning, training and educational programs that are delivered at the local, state and national levels. CUSEC's primary mission is supporting the earthquake programs of the 8 states we serve in the central US. Through funding support of FEMA as well as the USGS we are able to deliver these programs, but like any program, the effectiveness and the ability to reach out is tied directly to the NEHRP and the funding that congress provides to carry out these efforts. We remain hopeful that the re-authorization of NEHRP which not taken up under the previous congress will be looked at closely under this congress and appropriate language as well as funding applied to enable the many partners which work in very close collaboration within the earthquake community to move forward in understanding the hazard while reducing the risk we face not only in the central U.S. but across the county.

Highest hazard
32-48
16-32
4-8
0-4
% g
Lowest hazard

Situation



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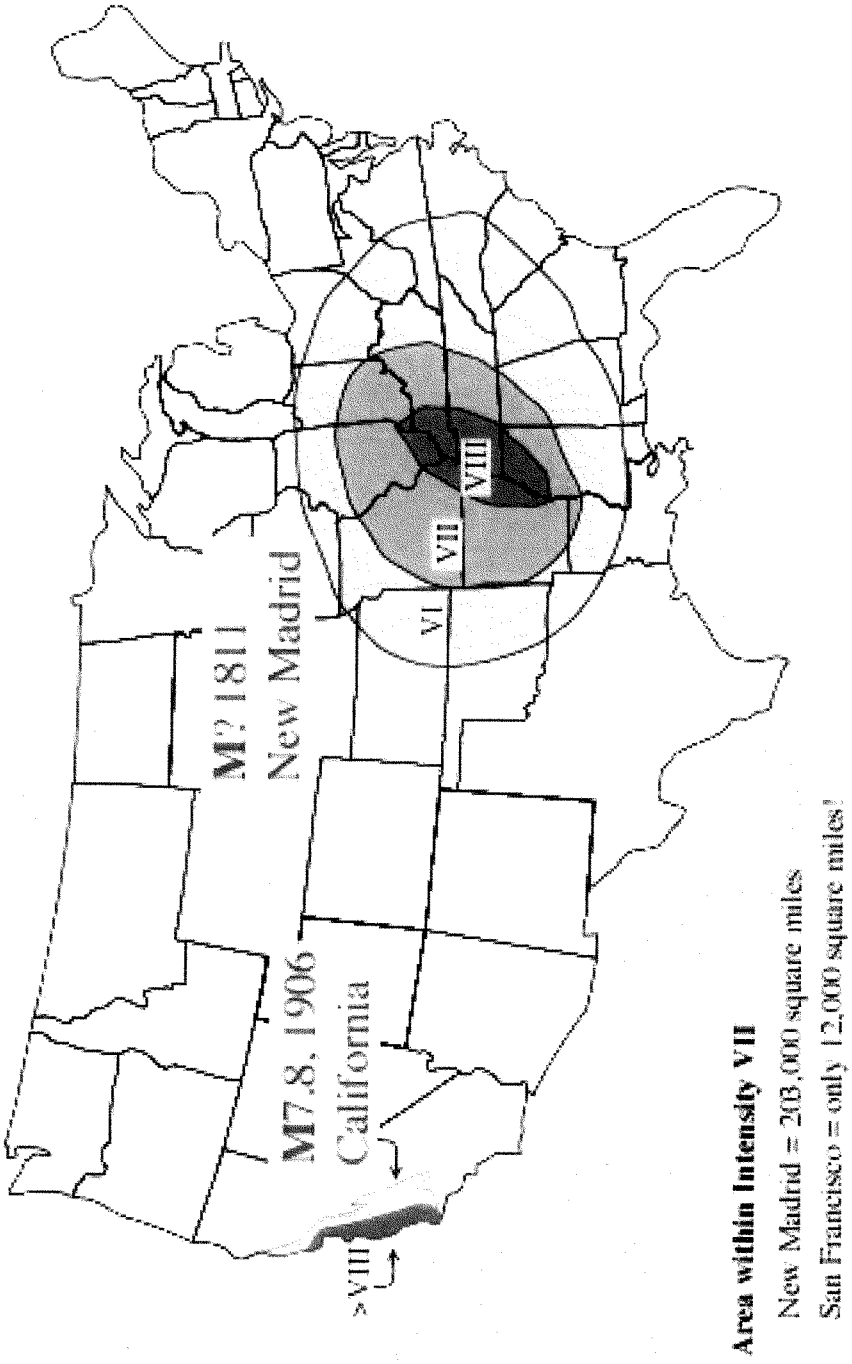
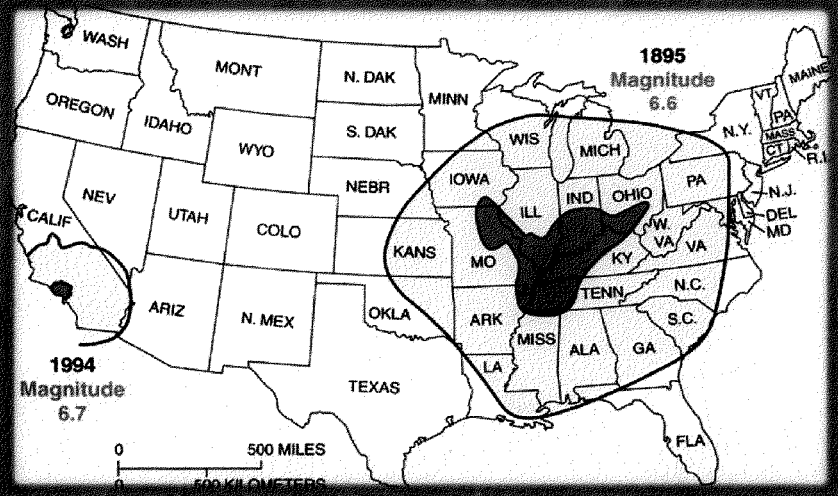

M? 1811
New Madrid
M7.8, 1906
California
>VIII
VI
VII
VIII
Area within Intensity VII
New Madrid = 203,000 square miles
San Francisco = only 12,000 square miles!

Situation – Threat

The ***large area that would be affected*** by damaging ground motion and associated ground failure ***(about 10 times larger than the area impacted by a California earthquake of comparable size)***



This Figure depicts the Northridge earthquake and compares the areas damaged and felt with an 1895 magnitude 6.6 NMSZ earthquake in Charleston, Missouri.

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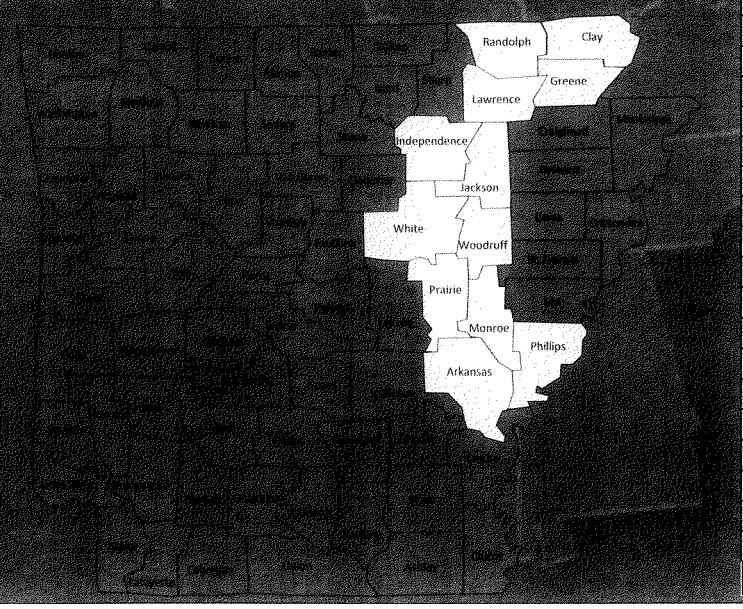
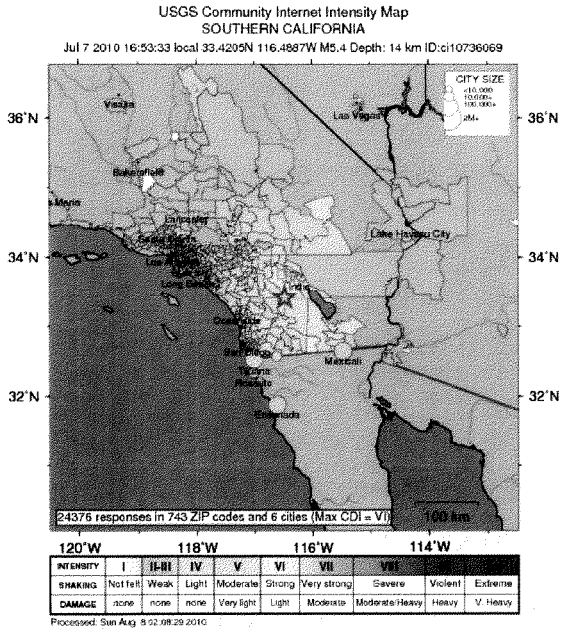
Situation – Operational Impact

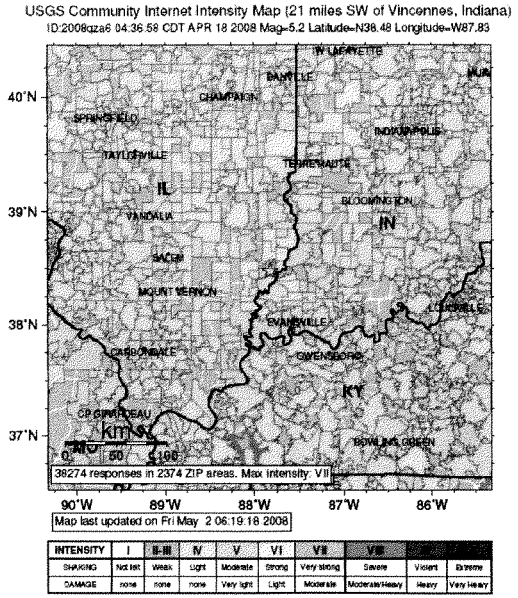
19 "Impacted Counties" in Arkansas estimated to incur the most severe damage, as estimated by the models used to generate the NMSZ scenario – *MAE Center Phase II Modeling Data*



Impacted Counties	
County	Population
Arkansas	20,749
Clay	17,609
Craighead	82,148
Crittenden	50,866
Cross	19,526
Greene	37,331
Independence	34,233
Jackson	18,418
Lawrence	17,774
Lee	12,580
Mississippi	51,979
Monroe	10,254
Phillips	26,445
Poinsett	25,614
Prairie	9,539
Randolph	18,195
Saint Francis	29,329
White	67,165
Woodruff	8,741
Total in IC	558,495

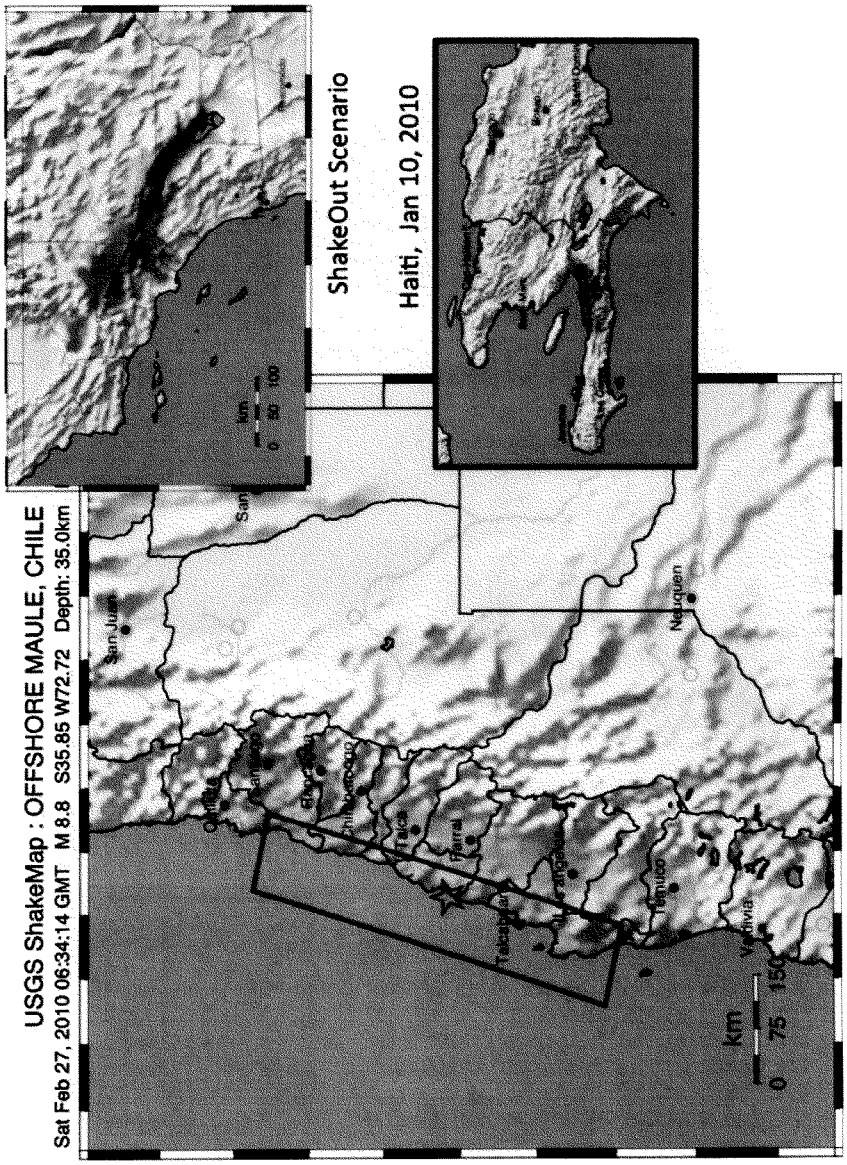
Earthquake Comparison





- M5.4, Depth 14 km
- Felt in 743 Zip Codes & Mexico
- 24K Felt Reports

- M5.2, Depth 11 km
- Felt in 2374 Zip Codes & Canada
- 38K Felt Reports


USGS ShakeMap : OFFSHORE MAULE, CHILE
Sat Feb 27, 2010 06:34:14 GMT M 8.8 S35.85 W72.72 Depth: 35.0km
ShakeOut Scenario
Haiti, Jan 10, 2010
San Juan
Talca
Temuco
Neuquen
km
0 75 150
km
0 50 100

Bitácora
FUERZA DE
APOYO HUMANITARIO
Organización y Personal
Viviendas de Emergencia
Ingeniería
Maquinaria/ Escombros/
Puentes/ Patrullas Rescate
Salud
PAMEs y Hospital
Militar de Campaña
Logística
CHILE Y SU EJÉRCITO
1810 - 2010

APOYO
FUERZA DE
HUMANITARIO
Organizacion
y Personal
Organización
Personal
CHILE Y SU EJÉRCITO
1810 - 2010

FUERZA DE APOYO HUMANITARIO

JRMAH Jefatura Regional Militar de Apoyo Humanitario — **Rancagua**

Región VI

- Rancagua
  - SCAH / SubCentro de Apoyo Humanitario — Las Cabras
  - SCAH / SubCentro de Apoyo Humanitario — San Vicente
- San Fernando
  - SCAH / SubCentro de Apoyo Humanitario — Pichilemu
  - SCAH / SubCentro de Apoyo Humanitario — Peralillo
  - SCAH / SubCentro de Apoyo Humanitario — Chépica

JRMAH Jefatura Regional Militar de Apoyo Humanitario — **Talca**

Región VII

- Talca
  - SCAH / SubCentro de Apoyo Humanitario — Curicó
  - Traspasado a la División Fraternidad — Licantén
- Linares
  - SCAH / SubCentro de Apoyo Humanitario — Constitución
  - SCAH / SubCentro de Apoyo Humanitario — Cauquenes

JRMAH Jefatura Regional Militar de Apoyo Humanitario — **Concepción**

Región VIII

- Chillán
  - Traspasado a la División Fraternidad — Cobquecura
  - Traspasado a la División Fraternidad — Coelemu
- Los Angeles
  - SCAH / SubCentro de Apoyo Humanitario — Arauco
  - SCAH / SubCentro de Apoyo Humanitario — Lebu
- Angol
  - SCAH / SubCentro de Apoyo Humanitario — Cañete
  - Traspasado a la División Fraternidad — Tirúa
- Concepción
  - SCAH / SubCentro de Apoyo Humanitario — Tomé
  - SCAH / SubCentro de Apoyo Humanitario — Chiguayante
  - SCAH / SubCentro de Apoyo Humanitario — Coronel

Organización y Personal — Organización — Personal

CHILE Y SU EJÉRCITO 200 AÑOS DE COMPROMISO 1810 - 2010

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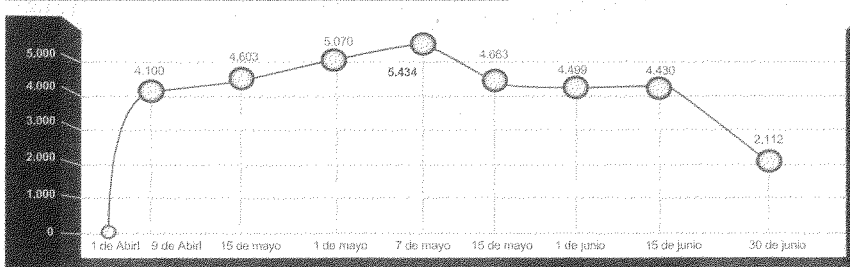
FUERZA DE APOYO HUMANITARIO

AMIAH — Autoridad Militar Institucional de Apoyo Humanitario — Santiago Cuartel General	11 Personal Militar	Total 3.947.189 Horas Trabajadas
JRMAH — Jefatura Regional Militar de Apoyo Humanitario — Región VI	774 Personal Militar	
JRMAH — Jefatura Regional Militar de Apoyo Humanitario — Región VII	640 Personal Militar	Pick 5.434 Personal Militar
JRMAH — Jefatura Regional Militar de Apoyo Humanitario — Región VIII	1.171 Personal Militar	

Total 920 Personal Militar en CMT

Total Personal Militar 3.516 Desplegados en forma permanente

Disponibilidad: 10.000



Fuerza Militar desplegada durante abril, mayo y junio

Organización y Personal | Organización | Personal

CHILE Y SU EJÉRCITO JUNTOS DE COMPROMISO 1810 - 2010

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FUERZA DE APOYO HUMANITARIO

CMT Cuerpo Militar del Trabajo

Personal Civil Contratado
Total 17.355

Presencia en 74 Comunas y 2 islas

VII
De O Higgins
Cachapoal
Graneros
Rancagua
Machali
Requinoa
Rengo
San Vicente
Las Cabras
Pichidegua
Colchagua
San Fernando
Chimbarongo
Santa Cruz
Chepica
Peralillo
Subtotal
Cardenal Caro
Marchihue
Paredone
Pichilemu

VII
Del Maule
Curico
Curico
Teno
Molina
Talca
Curepto
Talca
Maule
San Clemente
Pencahue
Constitucion
Linares
Linares
Parral
San Javier
Longavi
Cauquenes
Cauquenes
Chanco

VIII
Del Bio Bio
Concepcion
Talcahuano
Penco
Concepcion
Tome
San Pedro de la Paz
Lota
Coronel
Isla Sta. Maria
Arauco
Arauco
Lebu
Isla Mocha
Contulmo
Tirua
Cañete
Los Alamos
Curanilahue
Nuble
Chillan
San Carlos
San Fabian
Coihueco
Nequen
Pinto
Chillan Viejo
San Ignacio
El Carmen
Yungay
Bulnes
Quillon
Pemuco
Treguaco
Cobquecura
San Nicolas
Ninhue
Quirihue
Coelemu
Ranquil
Portezuelo
Bio Bio
Cabrero
Yumbel
Laja
Nacimiento
Mulchen
Santa Barbara
Quilleco
Los Angeles

Labores del personal civil CMT (Div. Fraternidad)

Limpieza y remoción de material:

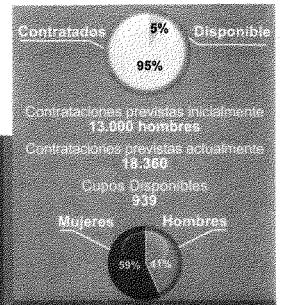
Calles, canales y asequias			
U.M.	Program.	Avance	%
ml.	995.055	799.231	80%

Escombros			
U.M.	Program.	Avance	%
m3	41.992	34.976	84%

Espacios públicos			
U.M.	Program.	Avance	%
m2	1.386.266	1.068.481	77%

Levantamiento de V/E

VI	VII	VIII	Total
586	838	987	2.411



Contrataciones previstas inicialmente
13.000 hombres

Contrataciones previstas actualmente
18.360

Cupos Disponibles
939

Presencia en 74 comunas y 2 islas de las 117 en las tres regiones lo que representa el 65%

Por regiones:

VI región
en 16 comunas de las 33
lo que representa el 48%

VII región
en 15 comunas de las 30
lo que representa el 43%

VIII región
en 43 comunas de las 64
lo que representa el 67%

Además de 2 Islas
(Mocha y Sta. María)

Organización y Personal | Organización | Personal CMT

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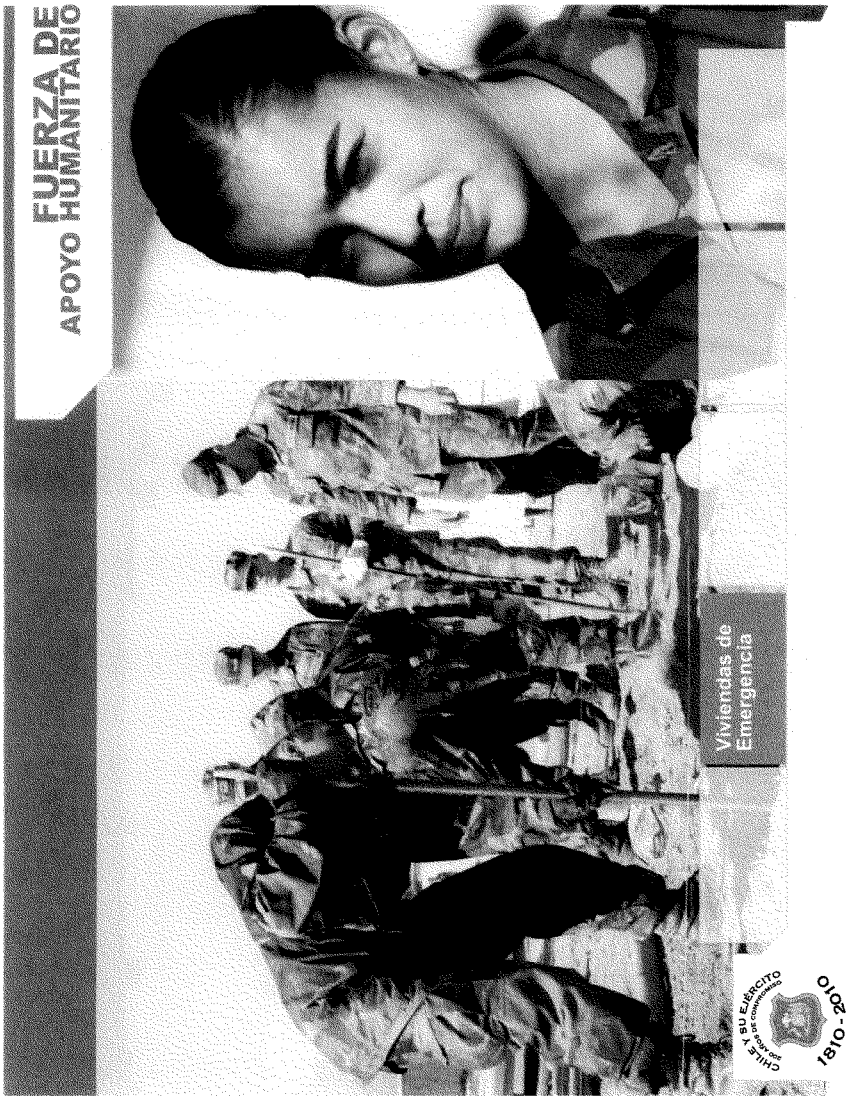
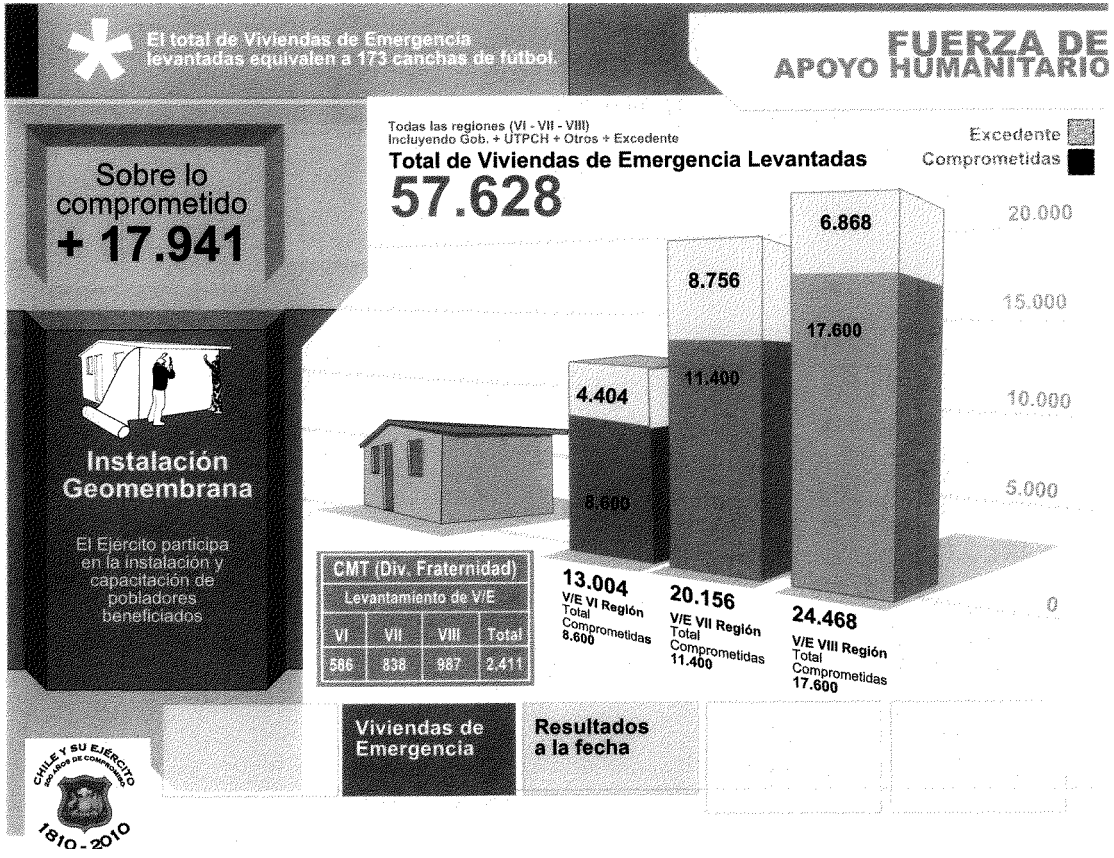

FUERZA DE
APOYO HUMANITARIO
Viviendas de
Emergencia
CHILE Y SU EJÉRCITO
1810 - 2010



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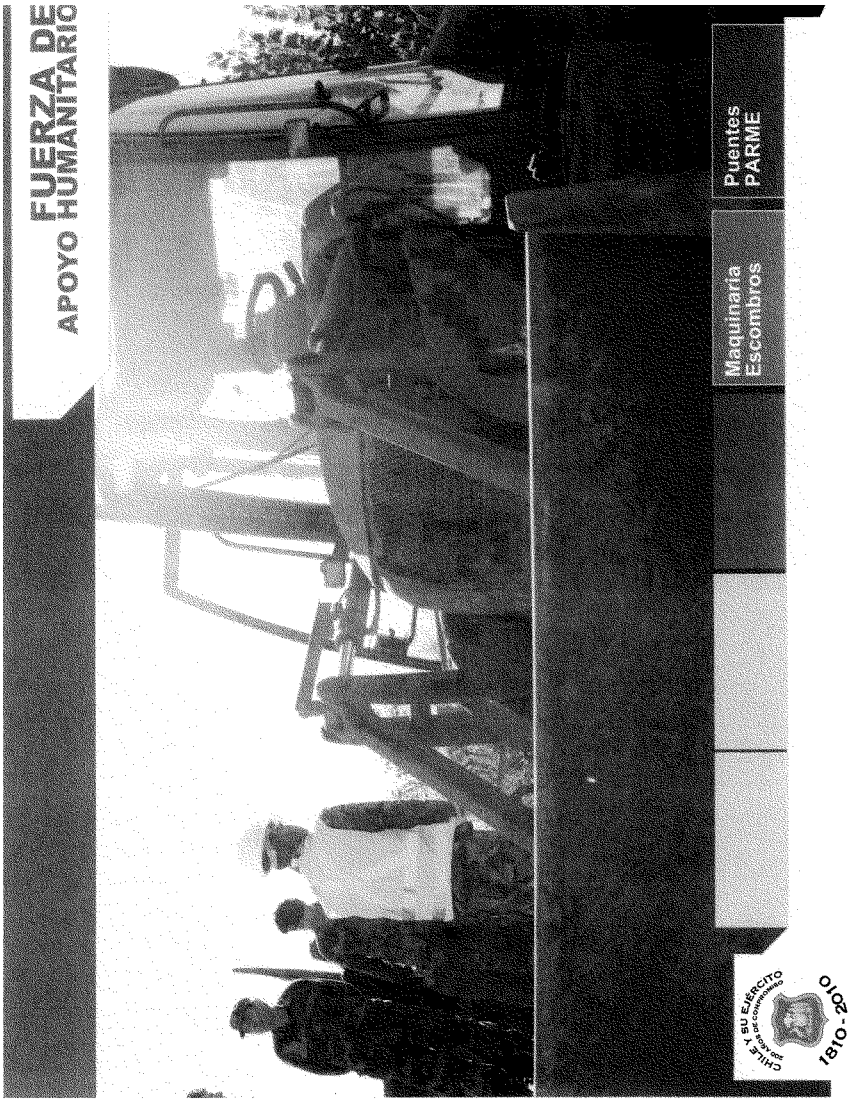
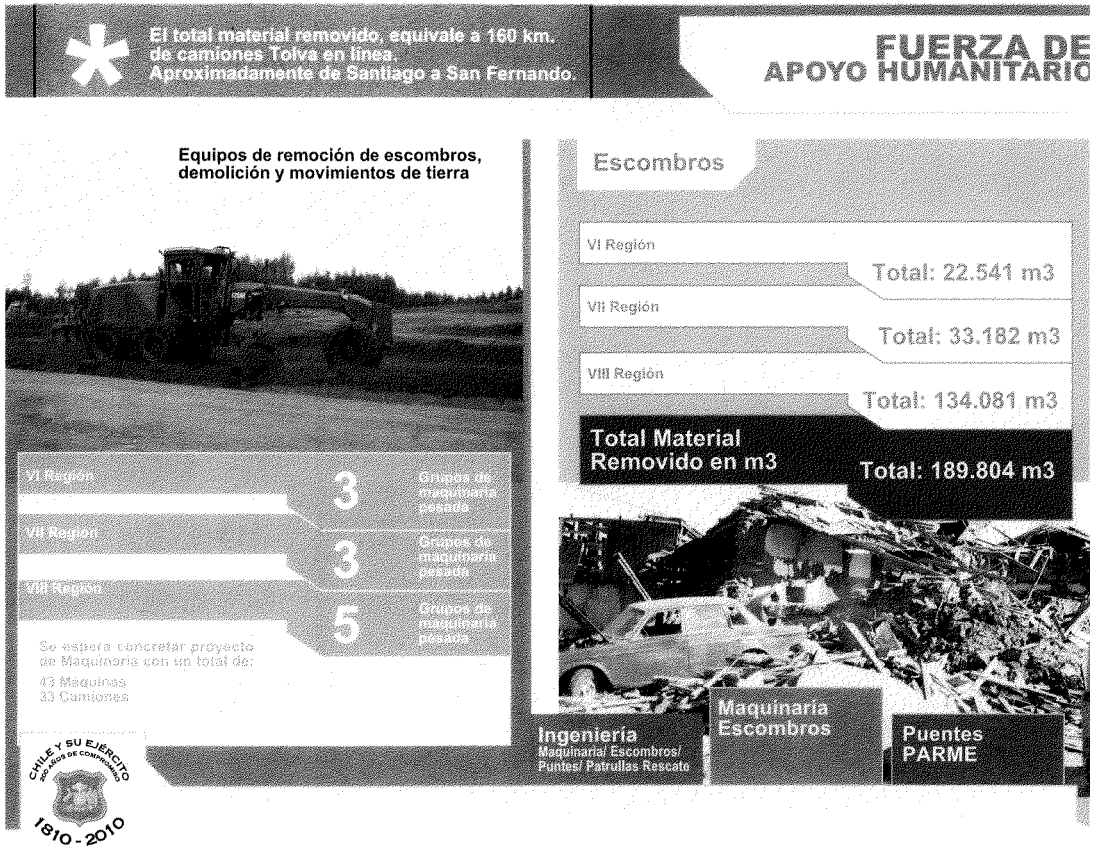

FUERZA DE
APOYO HUMANITARIO
Puentes
PARME
Maquinaria
Escombros
CHILE Y SU EJÉRCITO
1810 - 2010



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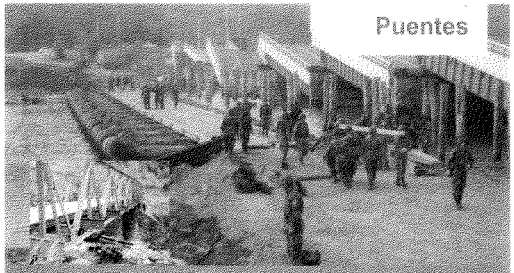
FUERZA DE APOYO HUMANITARIO

Por cada uno de estos puentes, pasan aprox. 350 vehículos diarios, lo que equivale a un tránsito de 1.500 personas, o 140 equipos de fútbol.

Puentes



Largo: 21 m./ Capacidad: 50 Ton/ Ubicación: Curanipe

Puente BAILEY

Largo: 104 m./ Capacidad: 16 Ton/ Ubicación: Tubul

Puente MANN

Puentes en condiciones de ser desplegados:

- Acrow panel doble simple reforzado, largo 40 m y capacidad 30 ton.
- Acrow panel simple simple reforzado, largo 30 m y capacidad 20 ton.

PARME

Patrulla de Auxilio y Rescate Militar del Ejército

26.640 horas/ hombre en 117 días de operación.

Fuerza empleada en estas labores: 24 Hombres inicialmente

Se han encontrado 25 personas y falta por encontrar a 10 personas en Constitución.

Ingeniería
Maquinaria/ Escombros/ Puentes/ Patrullas Rescate

Maquinaria Escombros

Puentes PARME

CHILE Y SU EJÉRCITO
SOLIDOS DE COMPROMISO
1810 - 2010

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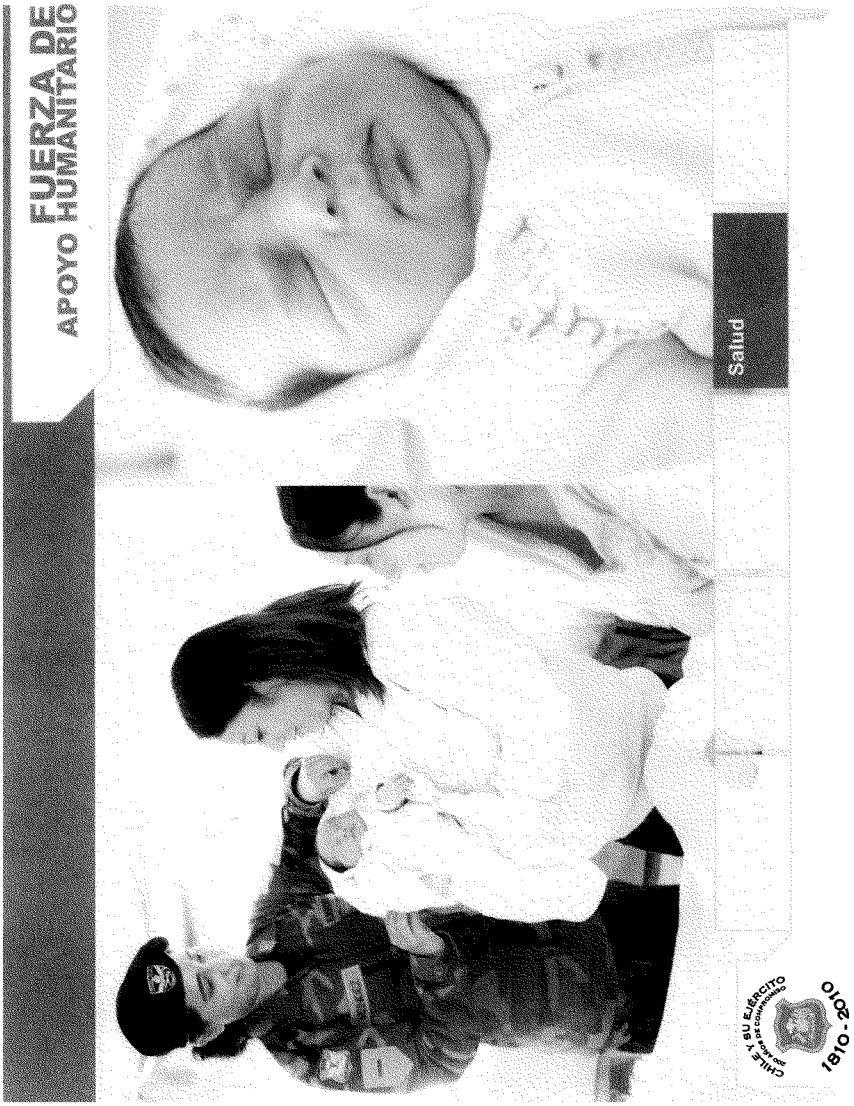

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FUERZA DE APOYO HUMANITARIO

% Ocupación	Salud	Cantidad de Camas	Días Cama Ocupada	Cirugías	Nacimientos	Atenciones Ambulatorias
92.55%	Hospital de Campaña Ejército **Talca**	20	1.921	867	0	1.121
		Atenciones veterinarias e higiene ambiental: 575				
91.58%	Puesto Atención Médica Especializada **Talca**	12	1.129	294	0	235
82.58%	Puesto Atención Médica Especializada **Curicó**	31	4.999	553	179	395
85.56%	Puesto Atención Médica Especializada **Cauquenes**	27	3.208	473	1	287
94.69%	Puesto Atención Médica Especializada **Constitución**	26	2.712	701	120	1.013
	Totales	118	13.969	2.888	300	3.049

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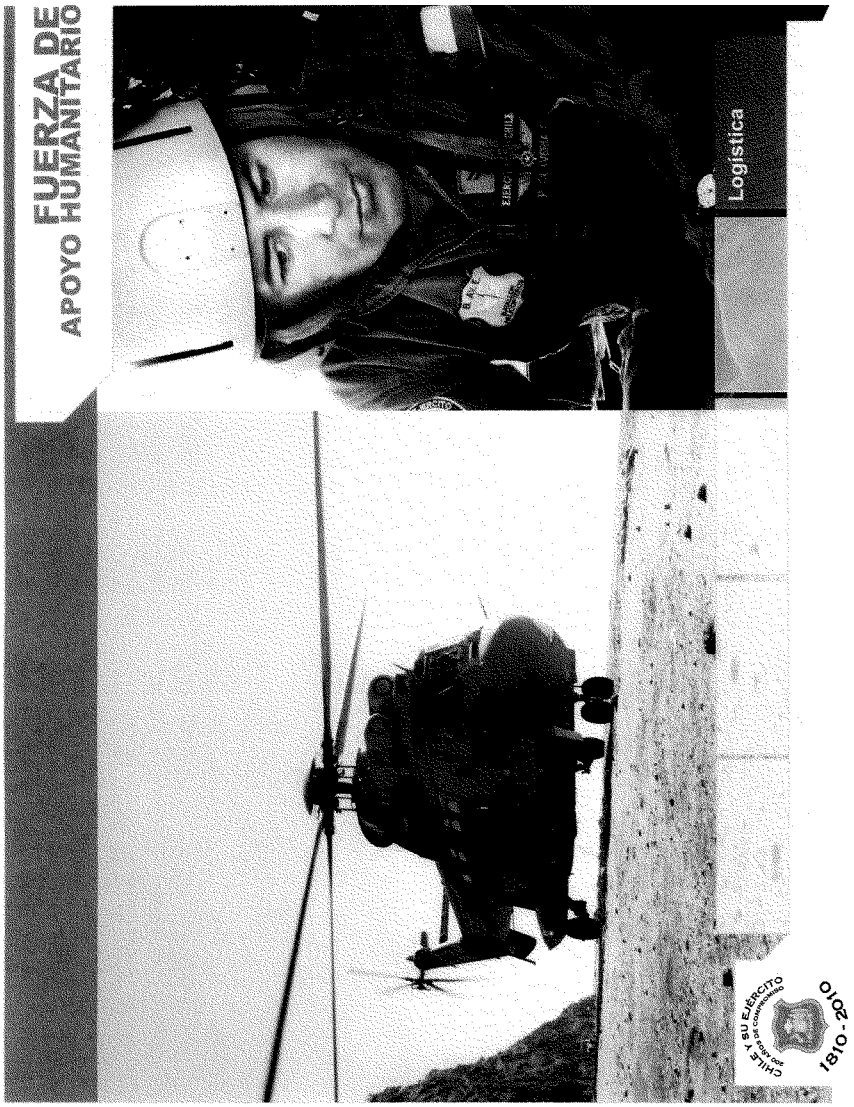
APOYO FUERZA DE HUMANITARIO
Logistica
CHILE Y SU EJÉRCITO
1810 - 2010

FUERZA DE APOYO HUMANITARIO

Vehículos

Vehículos Pesados	459
Vehículos Medianos	303
Vehículos Livianos	129
Vehículos no Motorizados	50
Total de Vehículos	**941**

Aeronaves

Misiones	970
Total de Horas de Vuelo	1.270,40

Transportes

Carga en Toneladas	5.704
Personas Transportadas	11.753
Litros de Agua	1.540.608
Volumen M3	14.466

CHILE Y SU EJÉRCITO
DOS AÑOS DE COMPROMISO
1810 - 2010

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GOBIERNO DE CHILE
OFICINA NACIONAL DE EMERGENCIAS
MINISTERIO DEL INTERIOR

ONEMI

NATIONAL EMERGENCY OFFICE

MINISTRY OF INTERIOR

September, 2010

63864.096

CHILE

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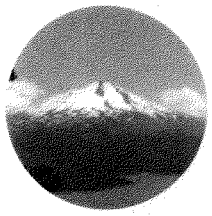
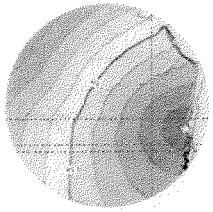
Geographical Features



VOLCANOS

RAINFORESTS

COAST



NAZCA PLATE

CLIMATIC VARIETY

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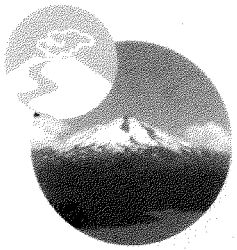
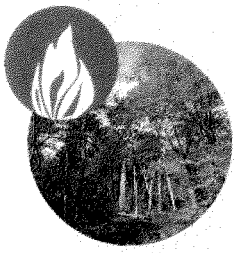
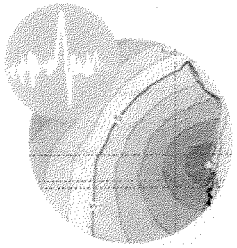
CHILE
HIGH NATURAL HAZARD


VOLCANO ERUPTIONS


WILDFIRES

TSUNAMIS


EARTHQUAKES

FLOODS / DRAUGHTS

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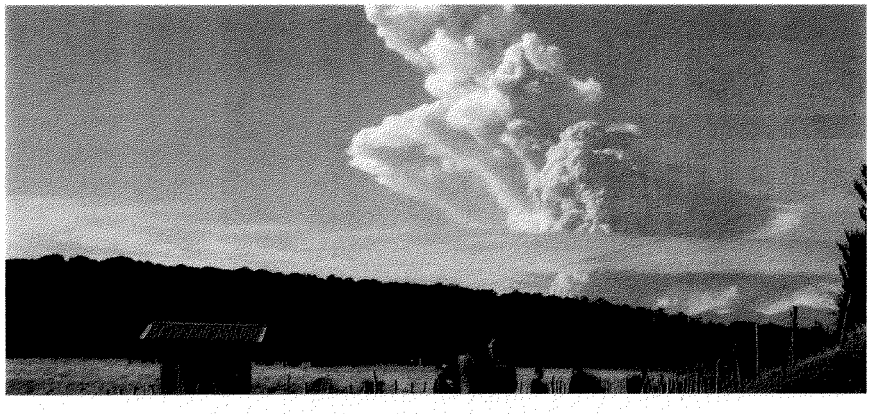
Historical Catastrophes

VOLCANO ERUPTION / CHAITÉN (Los Lagos) – 2008



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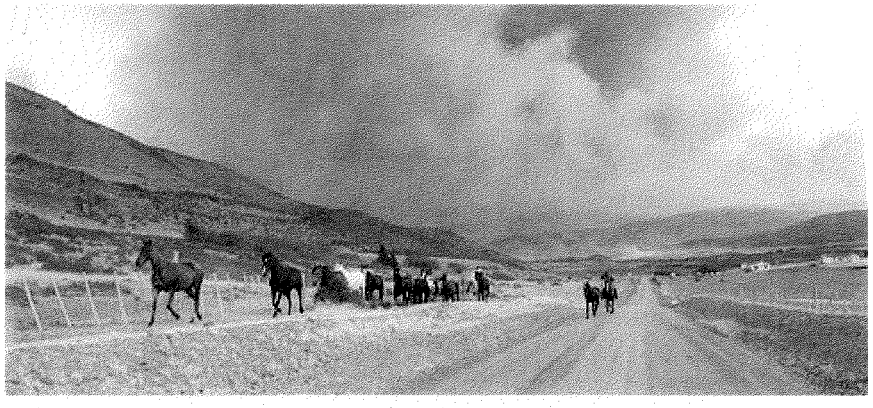
Historical Catastrophes

WILDFIRE / TORRES DEL PAINE - 2005



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Historical Catastrophes

EARTHQUAKE AND TSUNAMI / VALDIVIA - 1960

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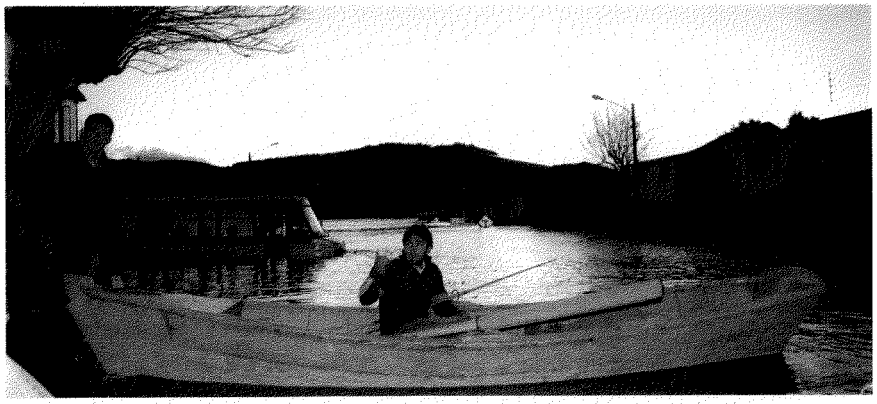
Historical Catastrophes

FLOOD / LA ARAUCANÍA - 2008



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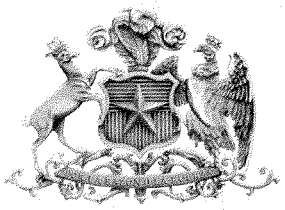
ONEMI



GOBIERNO DE
CHILE
ONEMI

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GOBIERNO DE CHILE

¿What is ONEMI?

The **National Emergency Office - ONEMI**, is the institution in charge of **COORDINATING** the National Sistem of Civil Protection.

This aims for developing the national actions of prevention, mitigation, preparation and response in the event of emergencies or disasters

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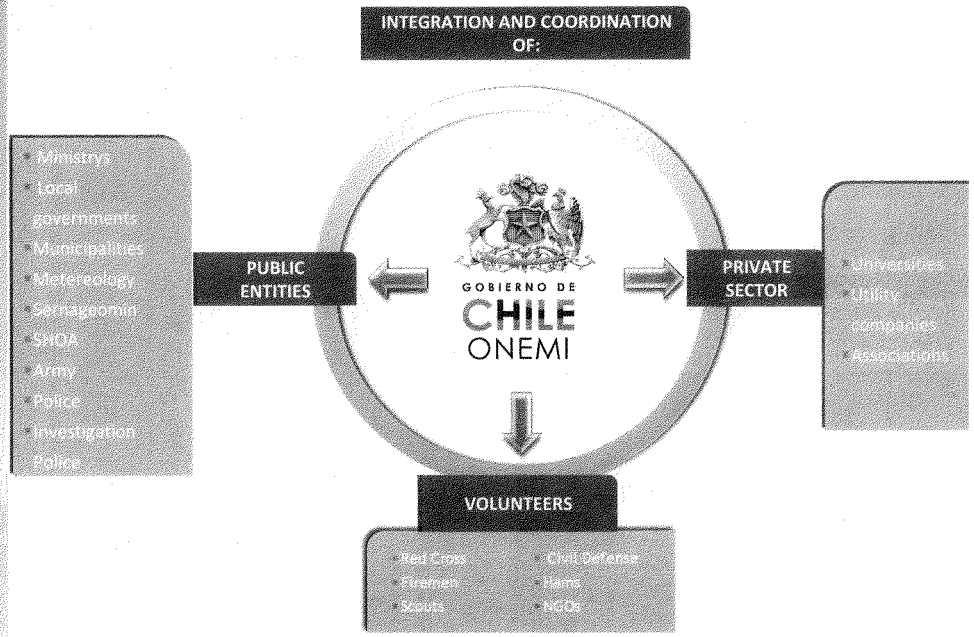
ONEMI: Emergencies and Disasters



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Our History

1960 1970 1980 1990 2000 2010

A first response Committee is formed after the Valdivia Earthquake in 1960...

A National Emergency Plan is created.

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Our History

1960 1970 1980 1990 2000 2010

1974, ONEMI is born
National Emergency Office

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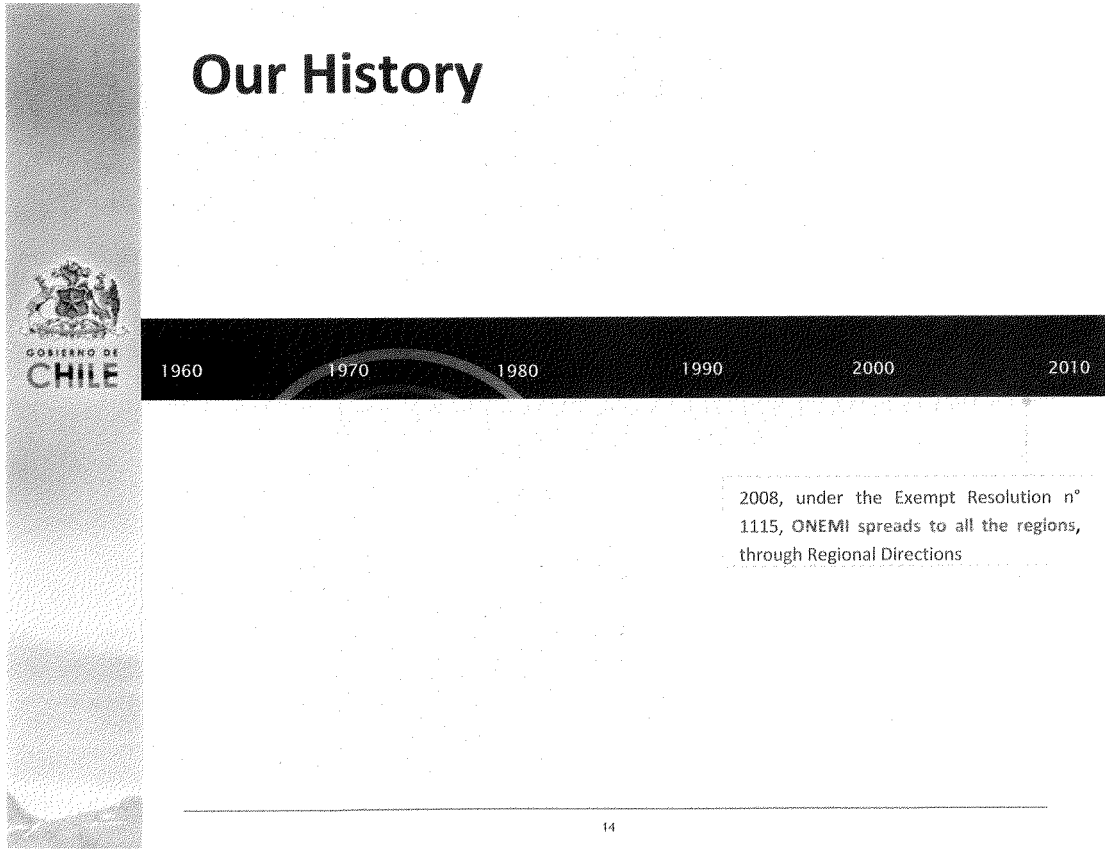
Our History



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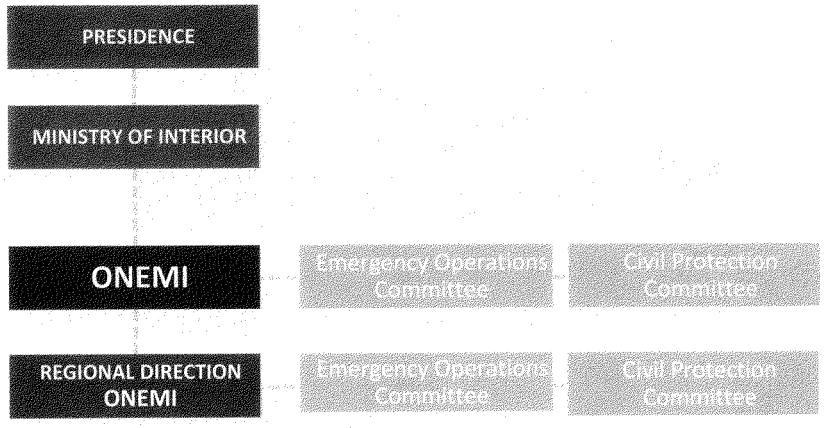
ONEMI

The Office is a part of the Ministry of Interior



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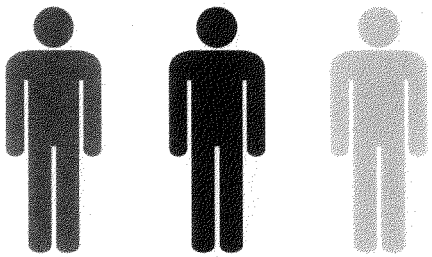
ONEMI

STAFF



Professionals Technicians Administratives

All over the country, **228** people builts the ONEMI task force

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ONEMI

BUDGET

Annual National Budget

US$50.093.664.056

Annual ONEMI Budget

US$14.562.214

Equals a 0,03% of the Annual National Budget

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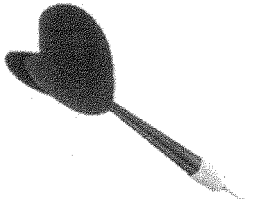

OBJECTIVES

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ONEMI

OBJECTIVES

1. **Articulate** the **State crisis management** in the event of a **natural or human threat**

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GOBIERNO DE CHILE

ONEMI

OBJECTIVES

Articulate the State crisis management in the event of a natural or human threat

2. Strength the National Civil Protection System organization.

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GOBIERNO DE CHILE

ONEMI

OBJECTIVES

Articulate the **State crisis management** in the event of a **natural or human threat**

Strength the National Civil Protection System organization.

3. Perfect the Early Warning National System through the country.

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GOBIERNO DE CHILE

ONEMI

OBJECTIVES

Articulate the **State crisis management** in the event of a **natural or human threat**

Strength the National Civil Protection System organization.

Perfect the Early Warning National System through the country.

Develop a **systemic and combined process for emergencies, disaster and catastrophes.**

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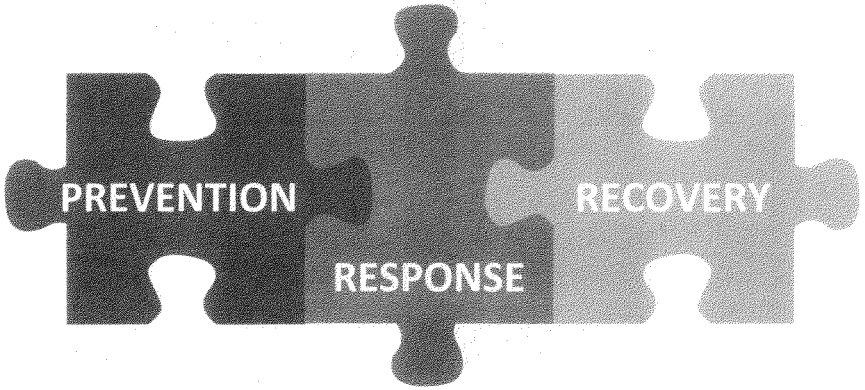
GOBIERNO DE CHILE

SCOPE OF ACTION



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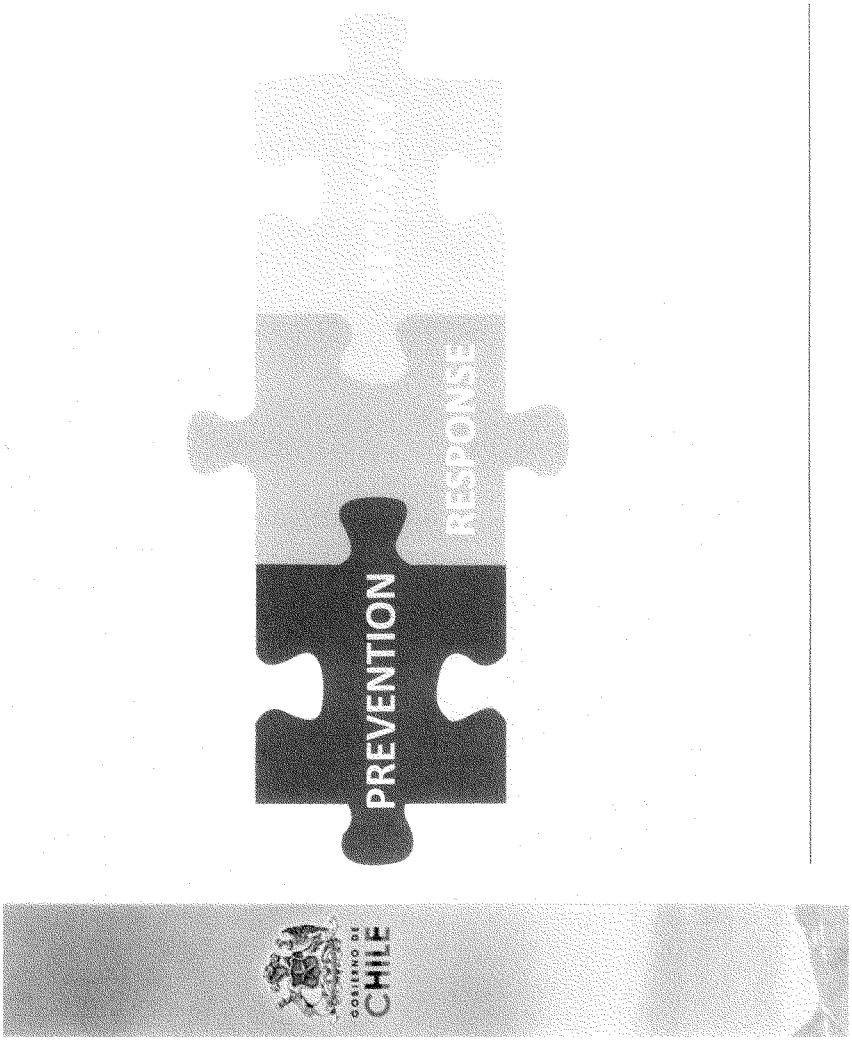
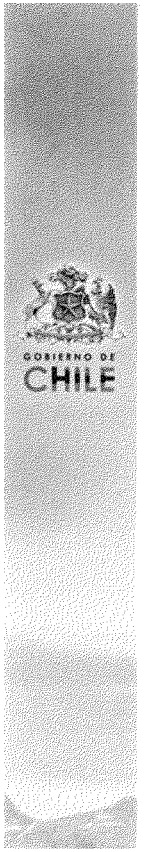

GOBIERNO DE
CHILE
PREVENTION
RESPONSE



PREVENTION

Actions previous to an event, intended to minimize the effects of a catastrophe.

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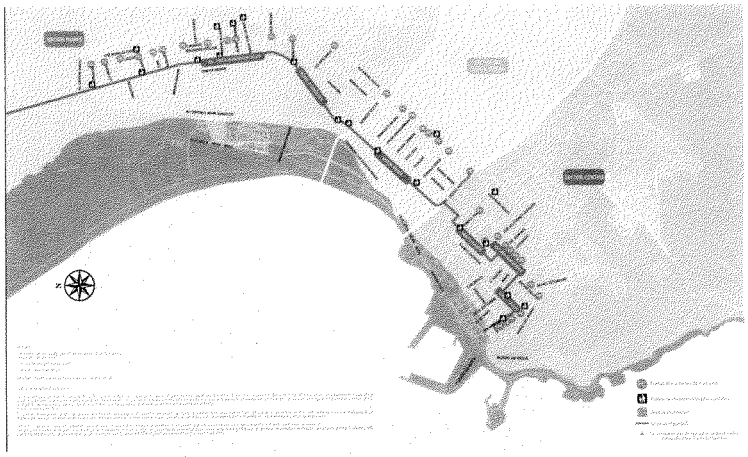
PREVENTION

Main action points

Ensure the **update** of **hazard maps** and **flooding charts**.



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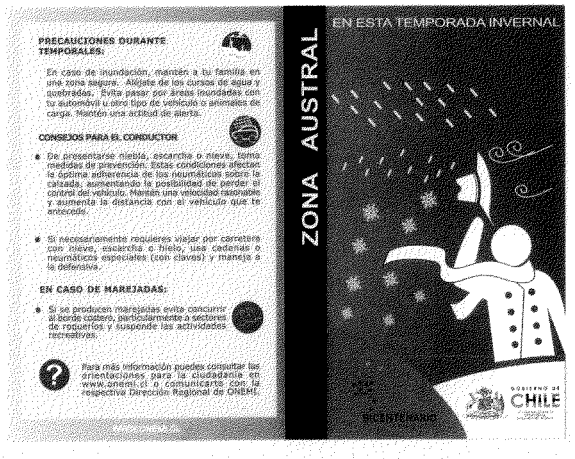
PREVENTION

Main action points

Permanent **educational campaigns** for the population.



PRECAUCIONES DURANTE TEMPORALES:

En caso de inundación, mantén a tu familia en una zona segura. Aléjate de los cursos de agua y quebradas. Evita pasar por áreas inundadas con tu automóvil u otro tipo de vehículo o animales de carga. Mantén una actitud de alerta.

CONSEJOS PARA EL CONDUCTOR

- De presentarse niebla, escarcha o nieve, toma medidas de prevención. Estas condiciones afectan la óptima adherencia de los neumáticos sobre la calzada, aumentando la posibilidad de perder el control del vehículo. Mantén una velocidad razonable y aumenta la distancia con el vehículo que te antecede.
- Si necesariamente requieres viajar por carreteras con nieve, escarcha o hielo, usa cadenas o neumáticos especiales (con clavos) y maneja a la defensiva.

EN CASO DE MAREJADAS:

- Si se producen marejadas evita concurrir al borde costero, particularmente a sectores de roquerío y suspende las actividades recreativas.

Para más información puedes consultar las orientaciones para la ciudadanía en www.onemi.cl o comunícate con la respectiva Dirección Regional de ONEMI.

ZONA AUSTRAL

EN ESTA TEMPORADA INVERNAL

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PREVENTION

Main action points

Create Training Programs for the **National Civil Protection System.**

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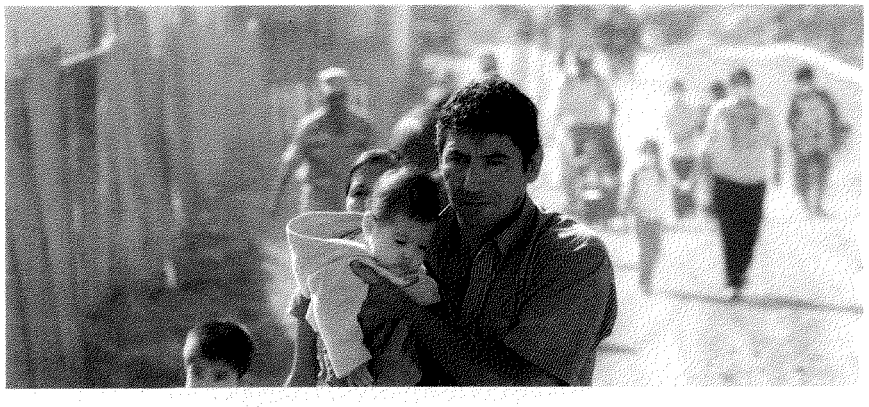
PREVENTION

Main action points

Develop simulation excercises for different types of hazards.



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ATENTO
NORTE
PROGRAMA DE SIMULACROS 2010

IQUIQUE 2010

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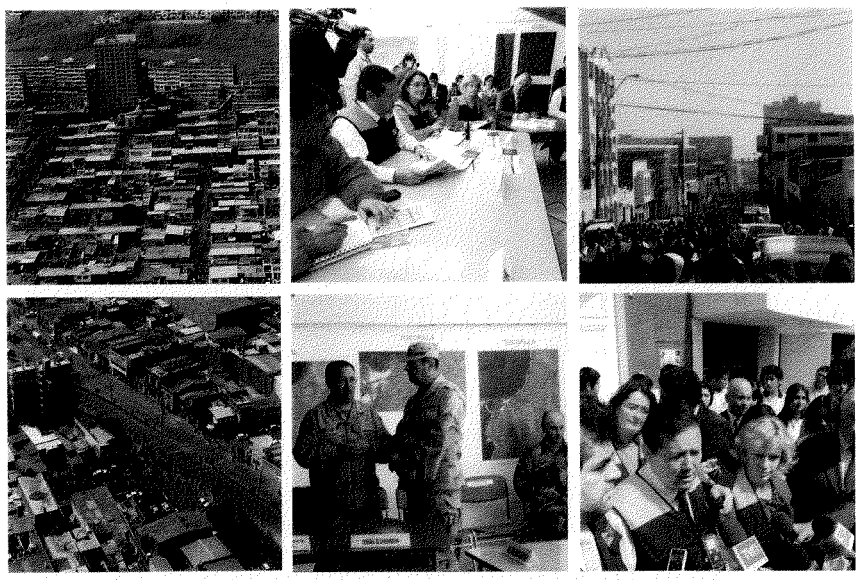
ATENTO NORTE

PROGRAMA DE SIMULACROS 2010

ANTOFAGASTA 2010



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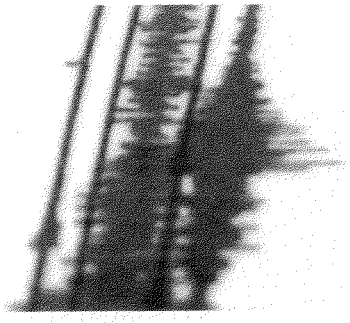
PREVENTION

ALERTING

Constant monitoring and surveillance of threats and vulnerability conditions. This task is performed by the National Early Warning Center (CAT).



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GOBIERNO DE CHILE

National Early Warning Center

Permanent **surveillance** of the **different hazard scenarios** in or outside the country in order to request, evaluate and broadcast as soon as possible the available information regarding a potential o actual destructive event that would qualify as emergency or disaster.

PREVENTION

NATIONAL WARNING SYSTEM

GREEN ALERT

Permanent monitoring of hazard variables in the national territory

As part of the Green Alert, the **Early Preventive Warning** is the enhanced attention and constant surveillance over a particular threat.

Enlistment. Resources preparation and increase management

RED ALERT

Operation and Movilization of resources needed for the situation control.

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RESPONSE
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RESPONSE

Activities regarding attention and control of a destructive event. Aim to save lifes, reduce the negative impact and reduce loses.

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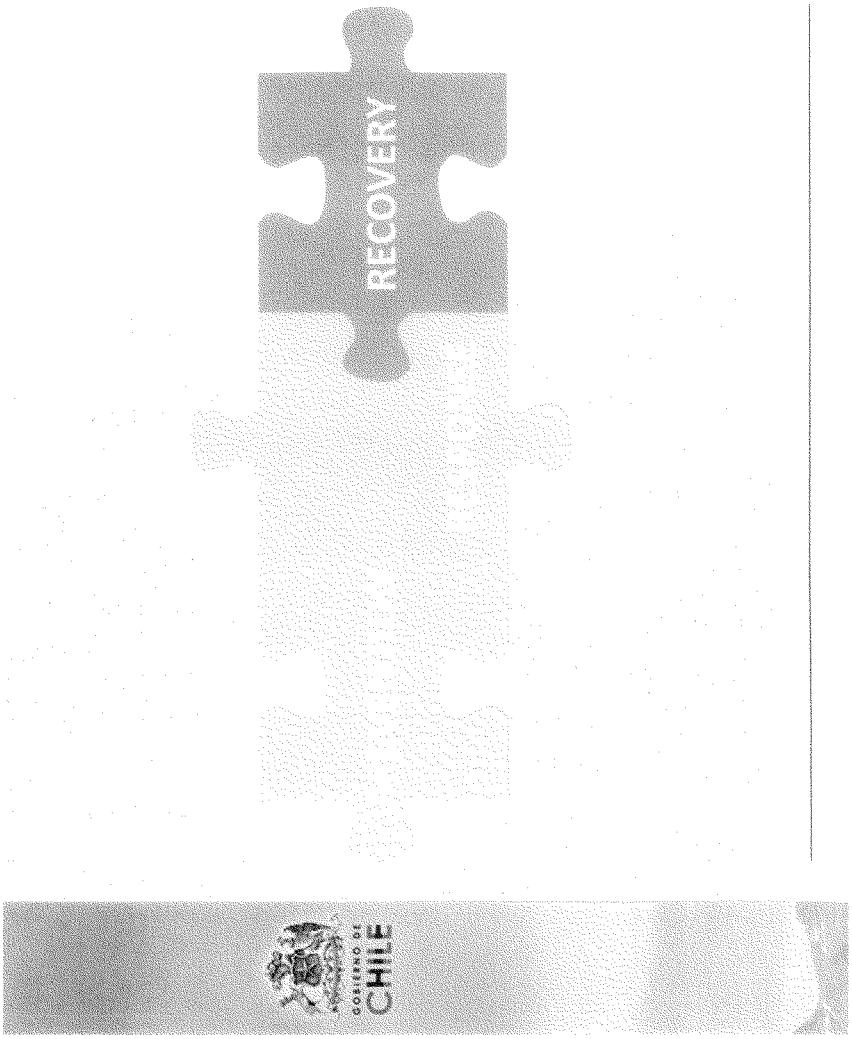
RECOVERY
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CHILE

RECOVERY

Activities intended to restore basic life conditions on a first stage. On a second stage, they intend to bring the affected to the previous development stage, or even better to overcome it.

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RECOVERY

REHABILITATION

Recovery, on the short term, of the infrastructure, basic services and the beginning of the physic, social and economic damage repair. Intended to provide the affected communities at least with six basic elements: food, water, warmth, shelter, light and communication.

RECONSTRUCTION

Reparation in the middle and long term of the damaged infraestructure and the restore and perfection of the production systems.

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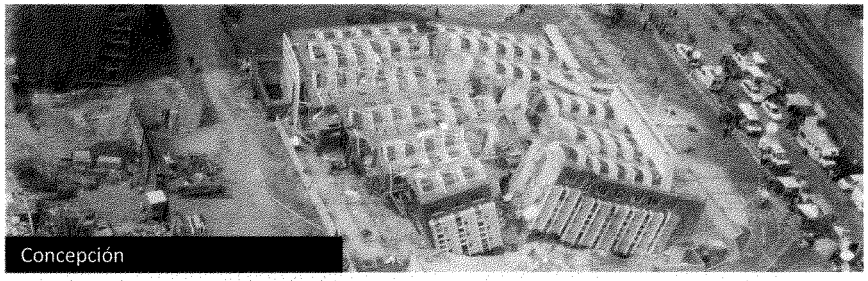
GOBIERNO DE CHILE

A strong earthquake woke us up the morning of February 27th, reminding us of where we live…



A 8,8 earthquake on the Richter scale shook the whole country, affecting 8 regions

Dichato

Santa Rosa de Pelequén

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GOBIERNO DE CHILE

Causing a tsunami that devastated the coast of Chile

Talcahuano

Pelluhue

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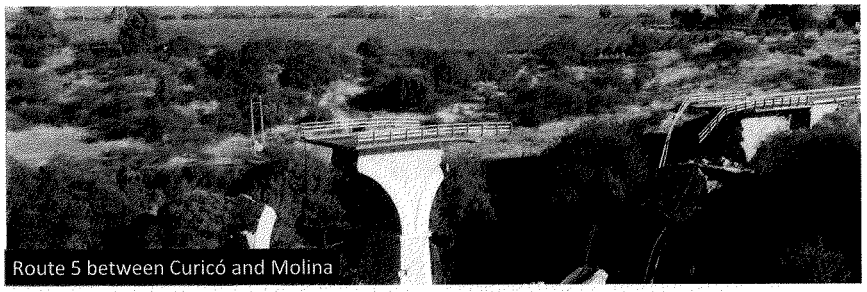
521 dead, 56 missing and over 600 thousand casualties


Route 5 between Curicó and Molina

Iloca

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As a country, we have a huge challenge…

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GOBIERNO DE CHILE

Six months from the earthquake…

"We are going to entirely restructure ONEMI, building a new **National Emergency Agency** in order for it to establish an effective early warning system and help to the victims in the event of the emergencies our country suffers."

Sebastián Piñera Echeñique

President of Chile

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FIN PRESENTACIÓN

September, 2010

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OFICINA NACIONAL DE EMERGENCIAS
MINISTERIO DEL INTERIOR

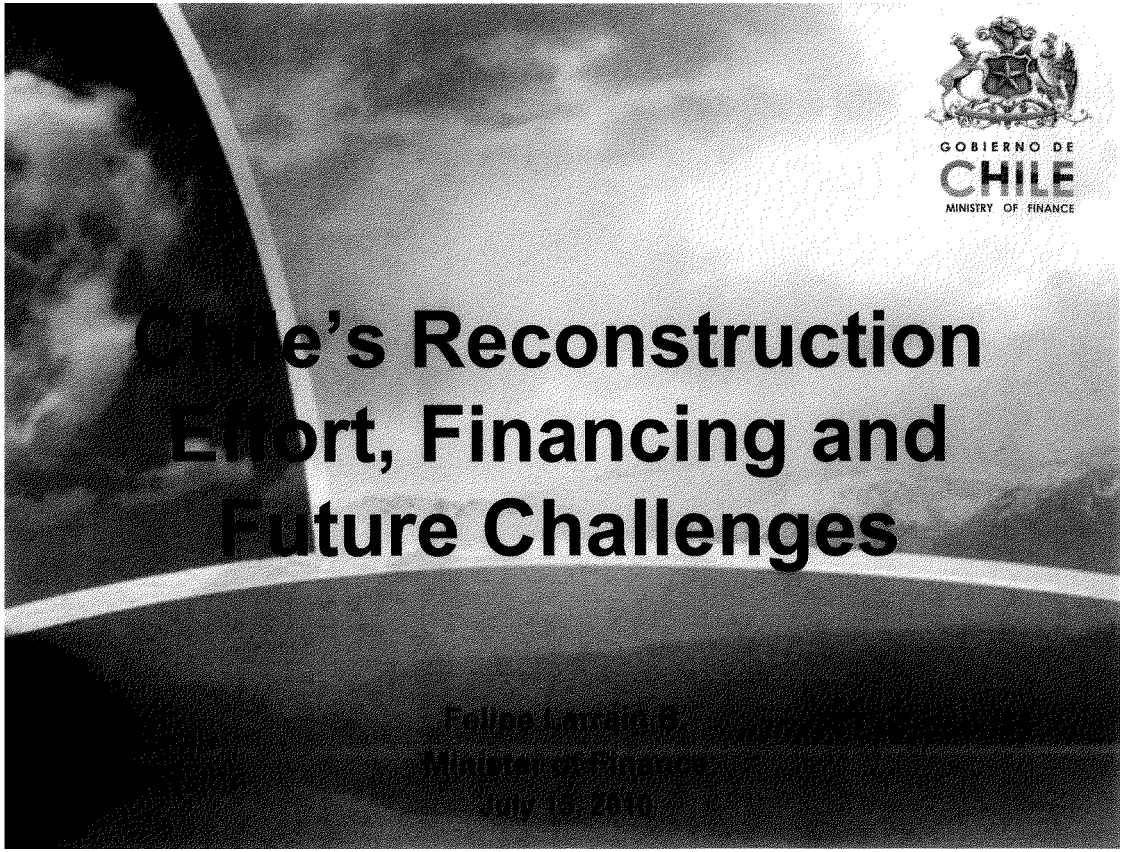
ONEMI

NATIONAL EMERGENCY OFFICE

MINISTRY OF INTERIOR

September, 2010

63864.142



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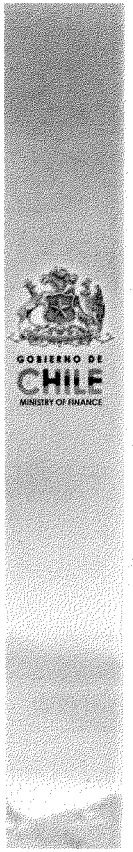
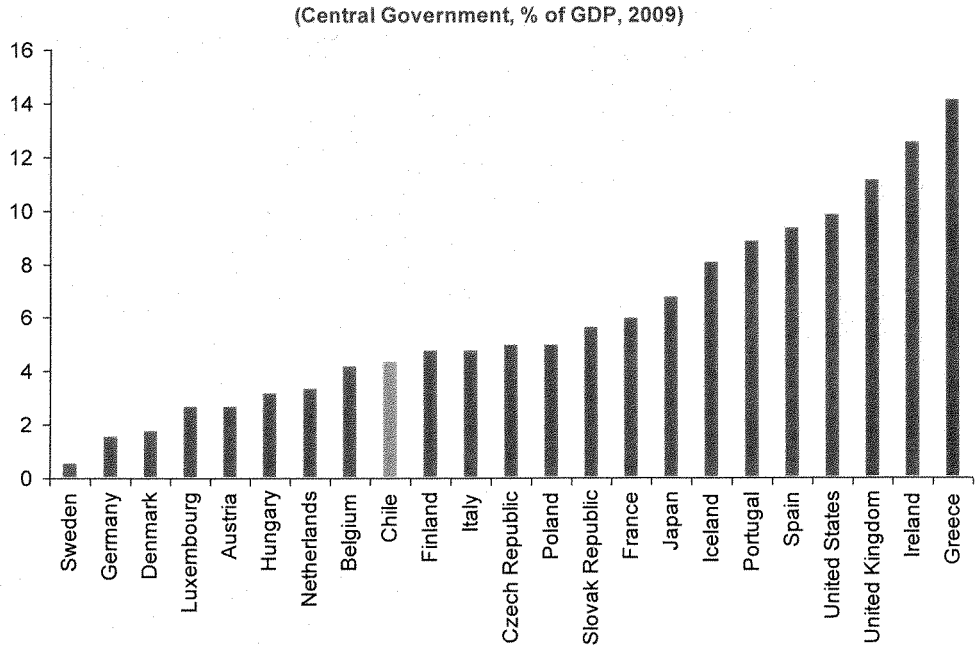


PUBLIC FINANCE: AN INTERNATIONAL COMPARISON

63864.144

Fiscal Deficit During Global Recession



Source: Eurostat, OECD, IMF and DIPRES

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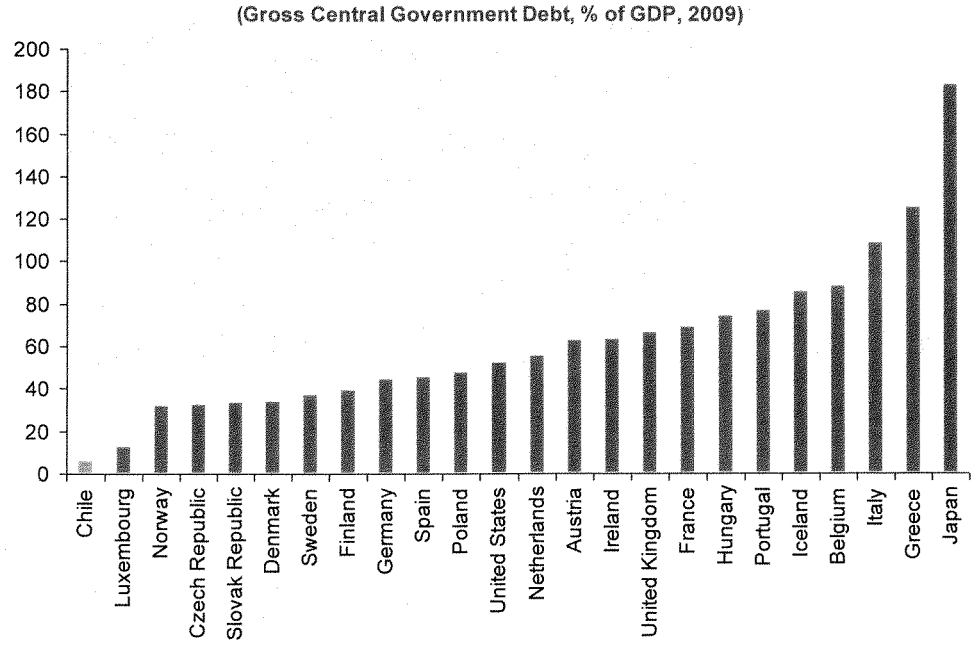
Public Debt Burden: A Comparison



Source: Eurostat, OECD, IMF and DIPRES

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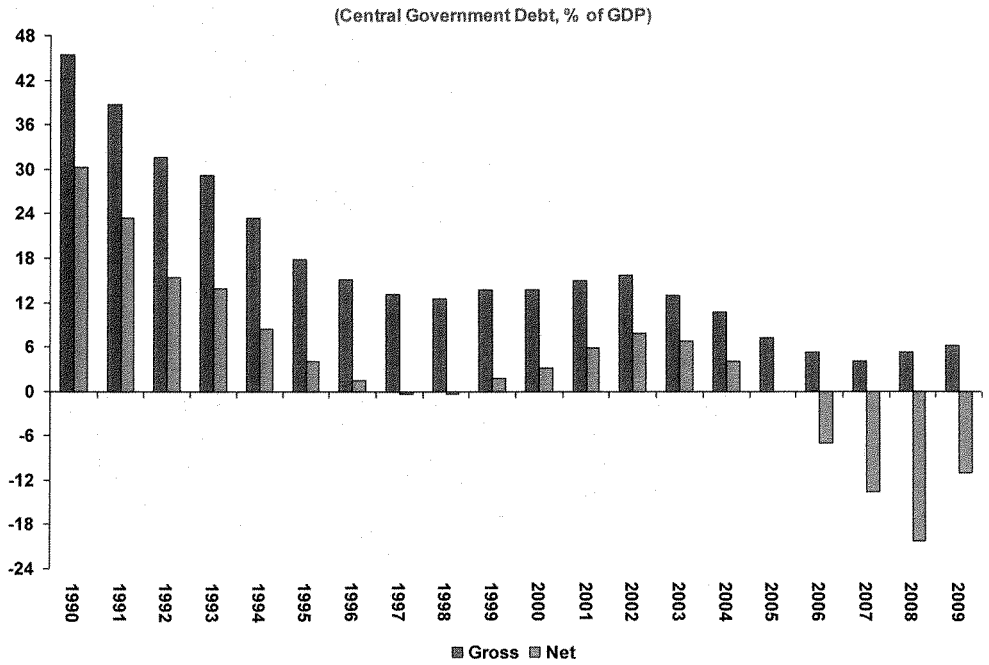
The Government of Chile: A Net Creditor



Source: DIPRES

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The Budget: Structural Balance Rule

- The SBR isolates the impact of the economic cycle on public finances
- The SBR commits to a balanced budget (zero deficit) when
  - The economy grows at its potential rate
  - Copper price is at its long-term level
- In practice, this means
  - Saving during economic booms, when extraordinary revenues are received
  - Disaving in downturns, when fiscal revenue drops

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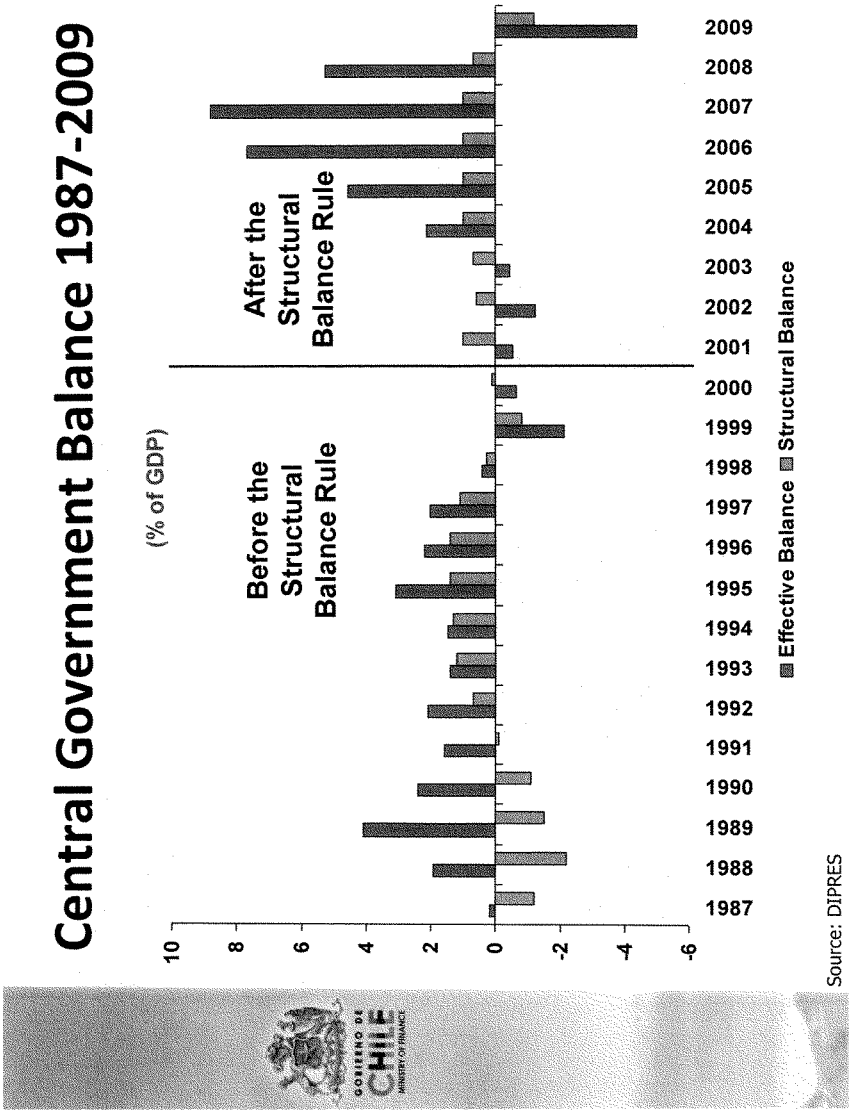
Central Government Balance 1987-2009
(% of GDP)
Before the Structural Balance Rule
After the Structural Balance Rule
10
8
6
4
2
0
-2
-4
-6
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
Effective Balance
Structural Balance
Source: DIPRES
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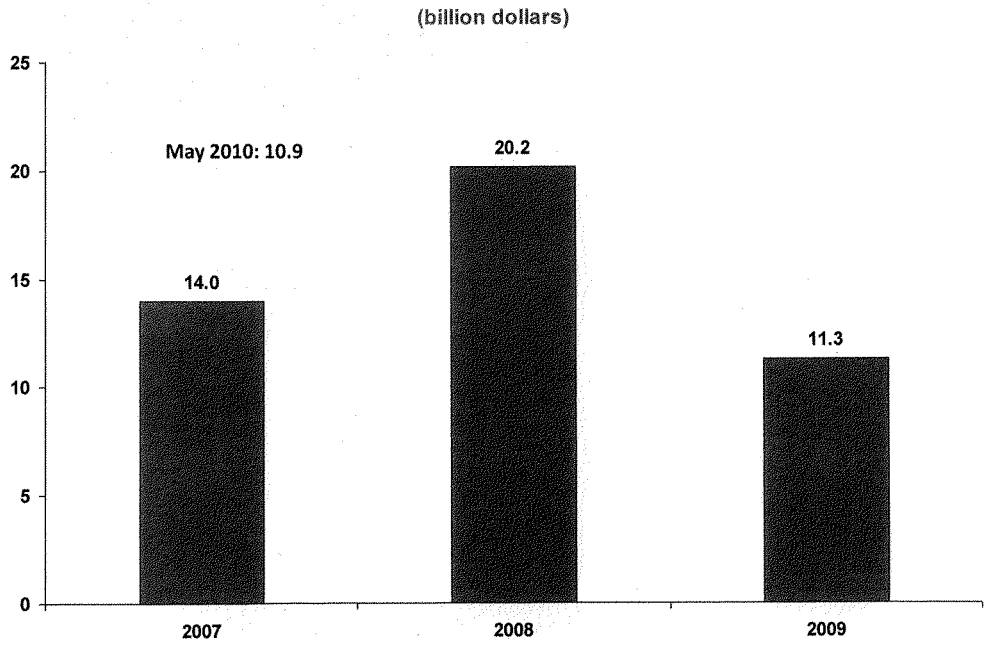
Chile's Economic and Social Stabilization Fund (Sovereign Fund)



Source: DIPRES

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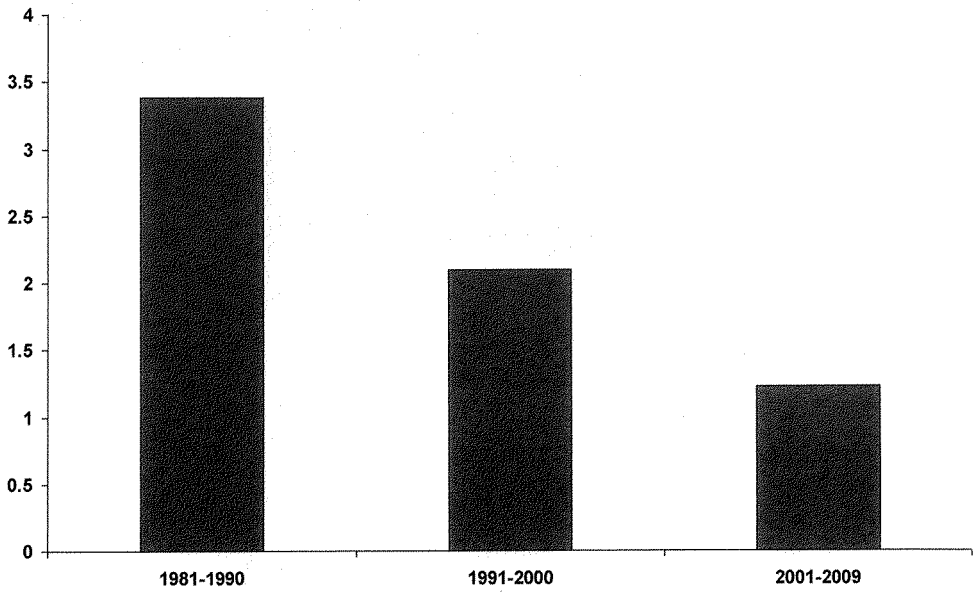
Chile´s Declining Macroeconomic Volatility

(average of four-quarter trailing standard deviation of GDP growth)



Source: Own elaboration based on Central Bank of Chile

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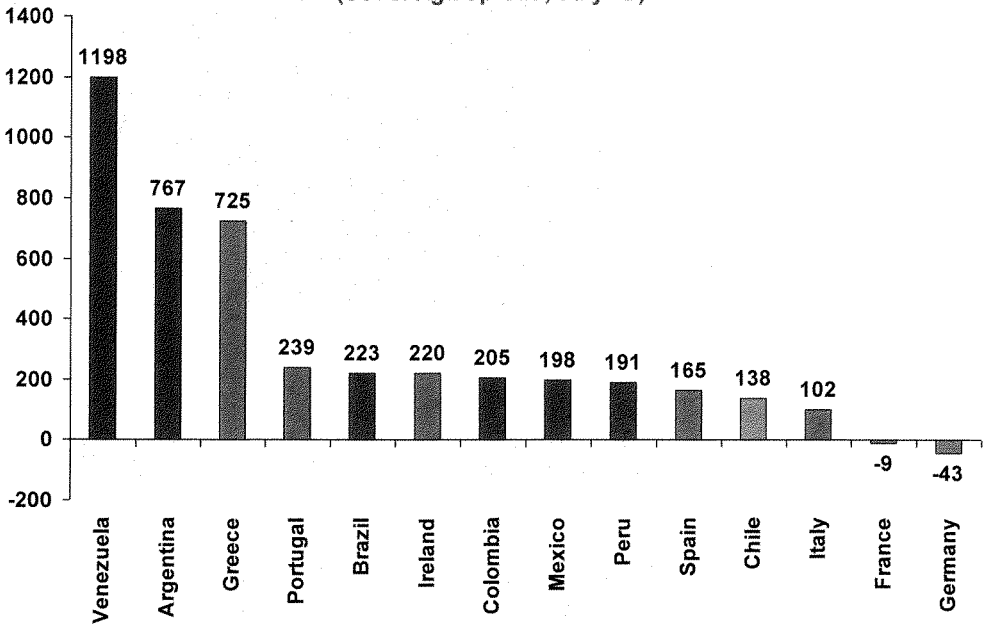
Chile´s Very Favorable International Credit Conditions

(Sovereign spread, July 12)



Source: JP Morgan and Bloomberg

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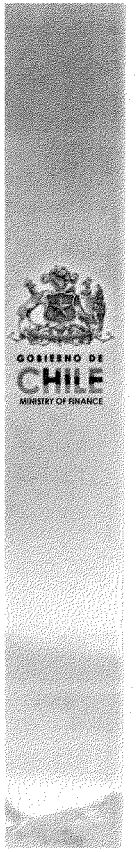

CHILE: FROM RECESSION TO RECOVERY

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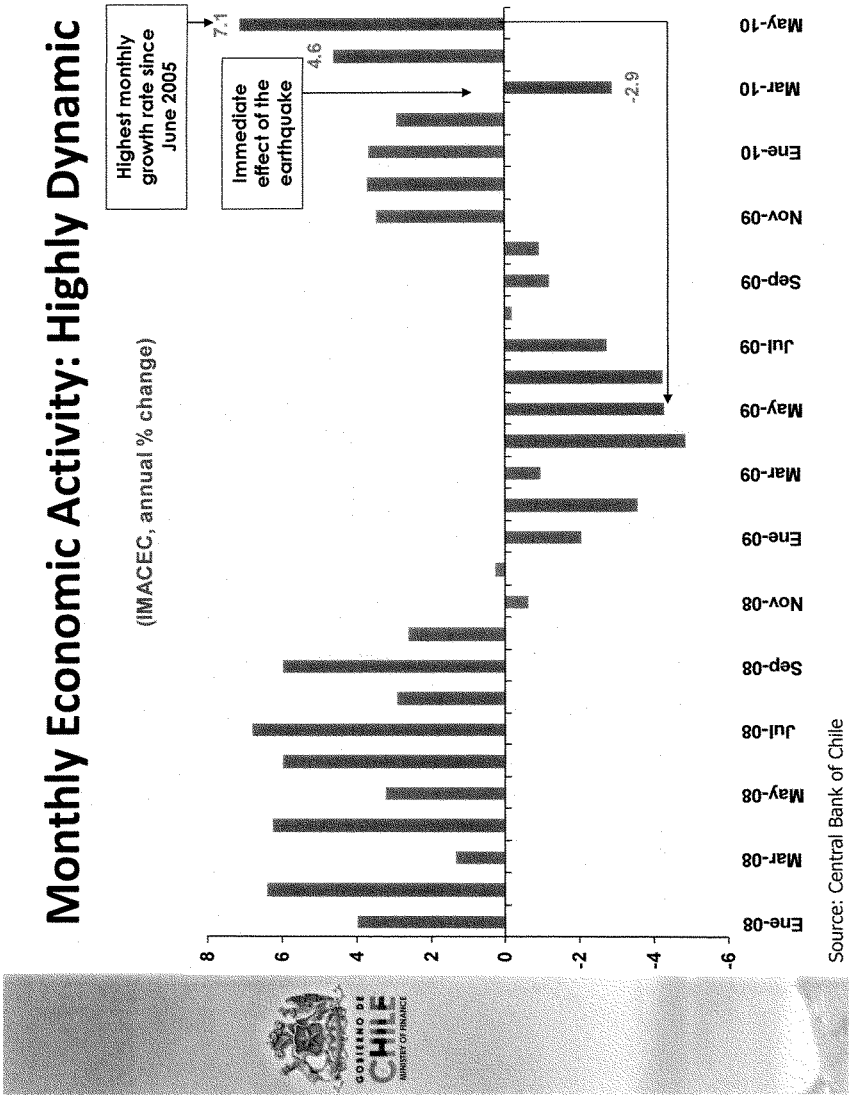
Monthly Economic Activity: Highly Dynamic
(IMACEC, annual % change)
Highest monthly growth rate since June 2005
Immediate effect of the earthquake
7.1
4.6
-2.9
8
6
4
2
0
-2
-4
-6
Ene-08
Mar-08
May-08
Jul-08
Sep-08
Nov-08
Ene-09
Mar-09
May-09
Jul-09
Sep-09
Nov-09
Ene-10
Mar-10
May-10
Source: Central Bank of Chile

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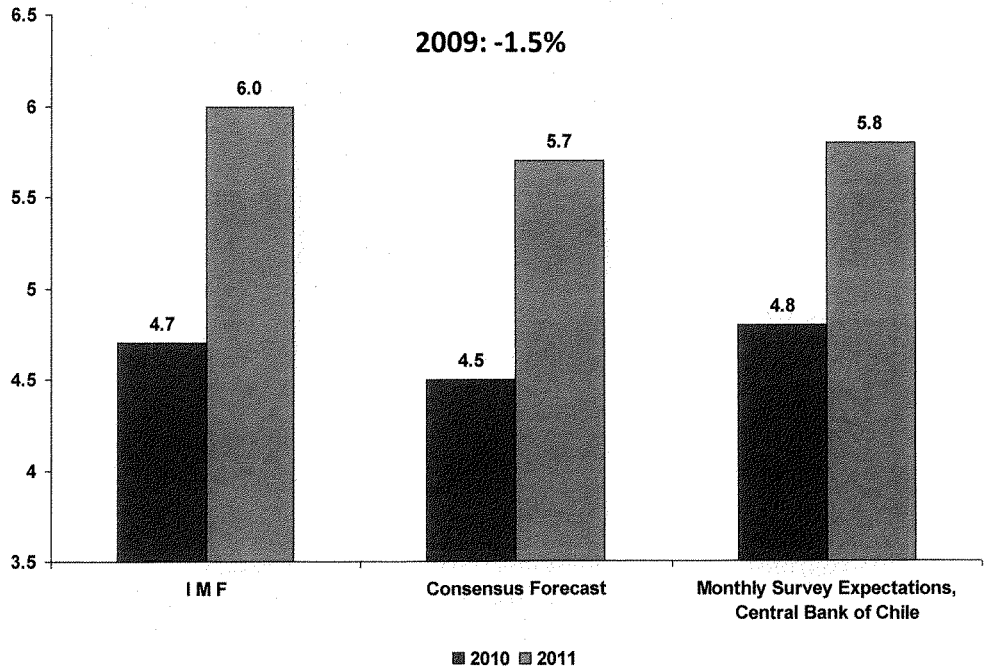
High Economic Growth Expected in 2011



Source: IMF, Consensus Forecast and Central Bank of Chile

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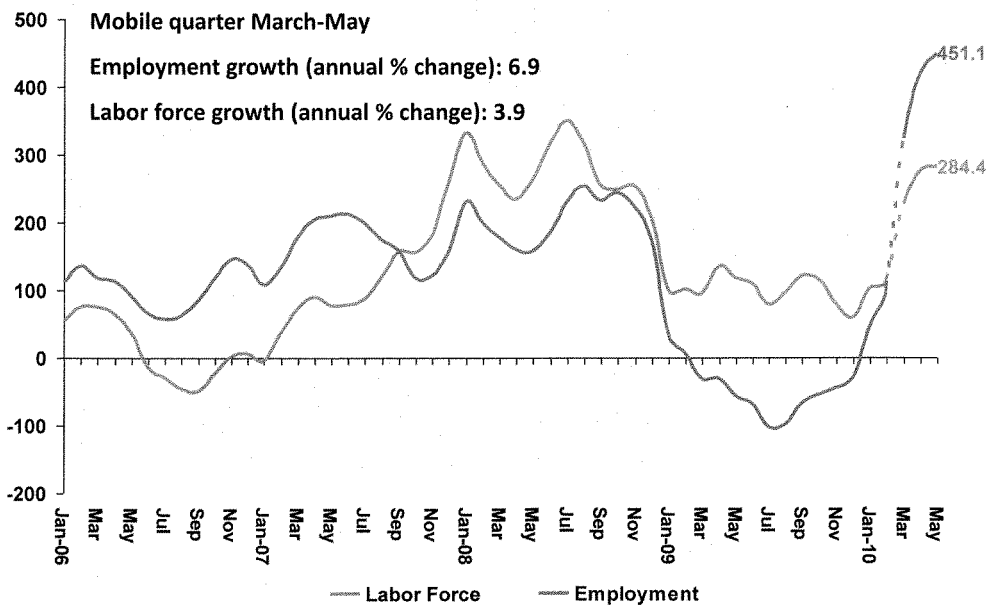
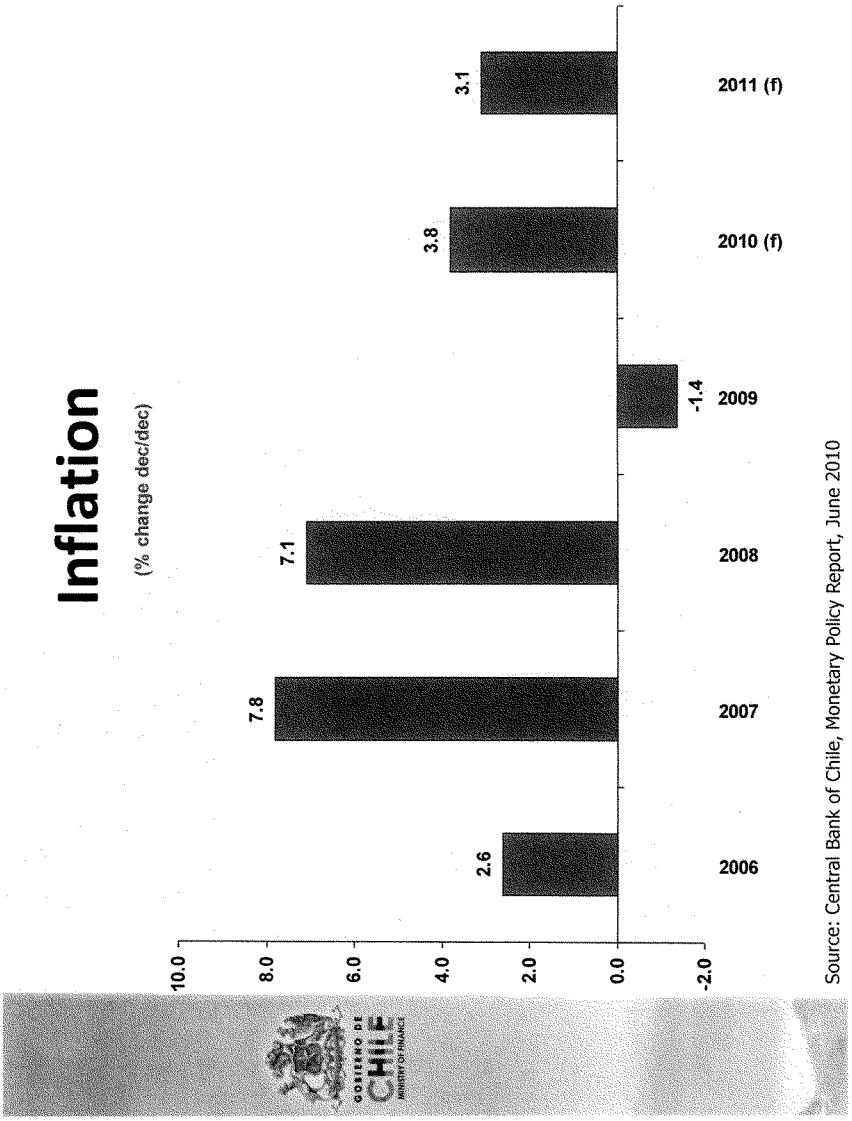
Strong Employment Creation

(annual employment growth, thousands, mobile quarters, March-May 2010)



Since mobile quarter January-March 2010 data are based on the New National Employment Survey. Due to the conceptual differences between the new survey and the older one, data can not be spliced.

Source: INE



Source: Central Bank of Chile, Monetary Policy Report, June 2010

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CHILE's EARTHQUAKE: COSTS AND EFFECTS

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Chile Had One of the Strongest Earthquakes On Record

Location	Date	Magnitude
Chile	22/05/1960	9.5
Alaska	28/03/1964	9.2
Northern Sumatra	26/12/2004	9.1
Kamchatka	11/04/1952	9.0
Chile	27/02/2010	8.8
Ecuador	31/01/1906	8.8
Alaska	02/04/1965	8.7
Indonesia	28/03/2005	8.6
Assam - Tibet	15/08/1950	8.6
Alaska	03/09/1957	8.6

Source: USGS

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Economic Damages of the Earthquake and the Tsunami

	US$ bn	% of GDP
Total losses	29.7	14.9
Infrastructure losses	20.9	10.5
Public infrastructure losses:		
• Total	10.6	5.3
• Net of insurance payments	9.3	4.7
• Reconstruction costs (including efficiency gains)	8.4	4.2

160

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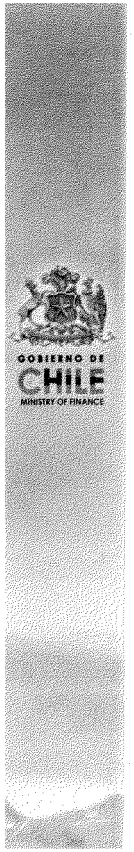
Macroeconomic Effects of the Earthquake

- The earthquake reduced economic growth in the first half of 2010
- Reconstruction efforts will give a strong boost to the economy later on
- Most relevant investment projects underway in the second half of 2010 and in 2011-12
- Inflationary effects have not been significant

161

63864.161



FINANCING RECONSTRUCTION AND THE GOVERNMENT PROGRAM

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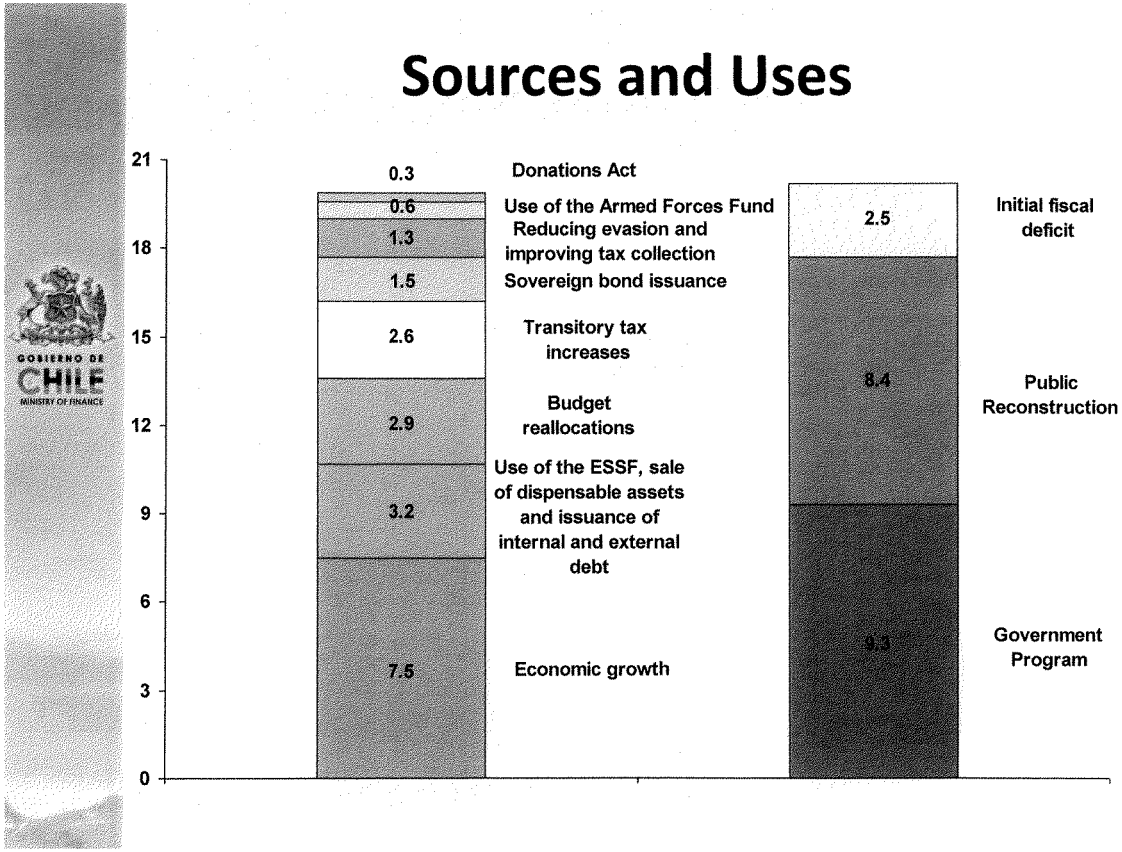
Multiple Financing Sources

- Faster economic growth will increase revenue
- Austerity and budget reallocations total US$2.9 bn
- Donations Act
- A (mostly) transitory tax component:
  - Corporate Tax (business)
  - Tobacco tax
  - Real estate tax
  - Reducing evasion
- Sale of dispensable public assets
- Issuance of internal and external debt
- Use of the Economic and Social Stabilization Fund (ESSF) and of the Armed Forces Fund



Sources and Uses

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Importance of Balanced Financing

- Balanced financing of the reconstruction effort is the key to avoid undesirable macroeconomic effects
- This was recognized when Moody´s upgraded Chile's government bond ratings from A1 to Aa3 :

"Fiscal saving by themselves would be enough to cover the government's estimated $8.4 bn in post-earthquake financing needs, but the new center-right administration has chosen to rely mainly on a combination of taxation and new debt issuance, and keep most of the fiscal savings for future use"

Moody's Statement, June 16, 2010

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BICENTENNIAL CAPITAL MARKETS AGENDA (MKB) AND NEW FUNDS LAW

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MKB

- The capital market has played a decisive role in Chile's economic growth and development.
- Chile has carried out a continual process of reforms that have allowed its capital market to develop: acquiring increasing liquidity and depth and gaining experience in managing significant financial resources.
- But we have greater aspirations. Some of the main goals are:
  - greater financial integration with global markets
  - more transparency
  - greater liquidity
  - higher safety standards for transactions
- We will provide a new legal framework to improve regulation for investment instruments.
- Our target is a competitive capital market both domestically and internationally.

63864.167

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A New Law for Financial Funds

- The Chilean law recognizes 5 main different types of funds (investment funds, mutual funds, funds for the investment of foreign capital, funds for the investment of foreign venture capital and funds for home savings purposes), each of them regulated by different laws:

Investment Vehicle	Regulation (Legal Framework)	Number of Funds (Dec' 09)	Managed Assets - US$MM (Dec' 09)
Mutual Funds	Law 1.328 / Bylaw	455	34,613
Investment Funds	Law 18.815 / Bylaw	164	6,442
Foreign Capital Funds / Foreign Risk Capital Funds	Law 18.657	9	384
Funds for Home Savings	Law 19.281 / Bylaw	8	226

Source: Chilean Superintendency of Securities and Insurance (Superintendencia de Valores y Seguros, SVS)

- Additionally, the Securities Market Law regulates fund managers, supervised by the SVS.
- Although these instruments are functionally similar and may face comparable problems, the legal frameworks applicable to each of them establish several differences, many of them without any technical justification (i.e.: existence of series of quotas, tax treatment, number of quota holders, etc) generating confusion among investors, unjustified discrimination among industries and allowing regulatory arbitrage.

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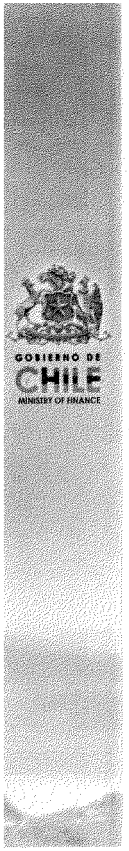
New Funds Law: General Proposal

- The project seeks the creation of a new legal framework, simplified and symmetric, to be applicable to all types of funds:
  - Standardize the regulatory framework
  - Define a reasonable and equitable tax treatment for the funds industry
  - Specify restrictions and requirements among the funds considering the type and number of investors and the liquidity of the underlying assets and the quota
  - Promote foreign investment in Chile
  - Require certification for traders and investment advisers
  - Make the operation and fund management much simpler and at a lower cost (i.e.: quota holders assemblies, summons requirements, proxies, etc)
- For these purposes, the Ministry of Finance will call representatives from the private sector, the SVS and SII in order to hear them and prepare the final project to be delivered to Congress during the first semester of 2011

BEYOND THE EARTHQUAKE: OUR MAIN GOALS



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Despite the Difficulties We Maintain Our Main Goals

- Grow at 6% average annual rate
- Create 200.000 jobs annually (2010-2014)
- Increase investment (Gross Fixed Capital Formation) from 22% of GDP (2009) to 28% of GDP in 2014
- Eliminate extreme poverty by 2014
- Lay the ground to become a developed country by 2018

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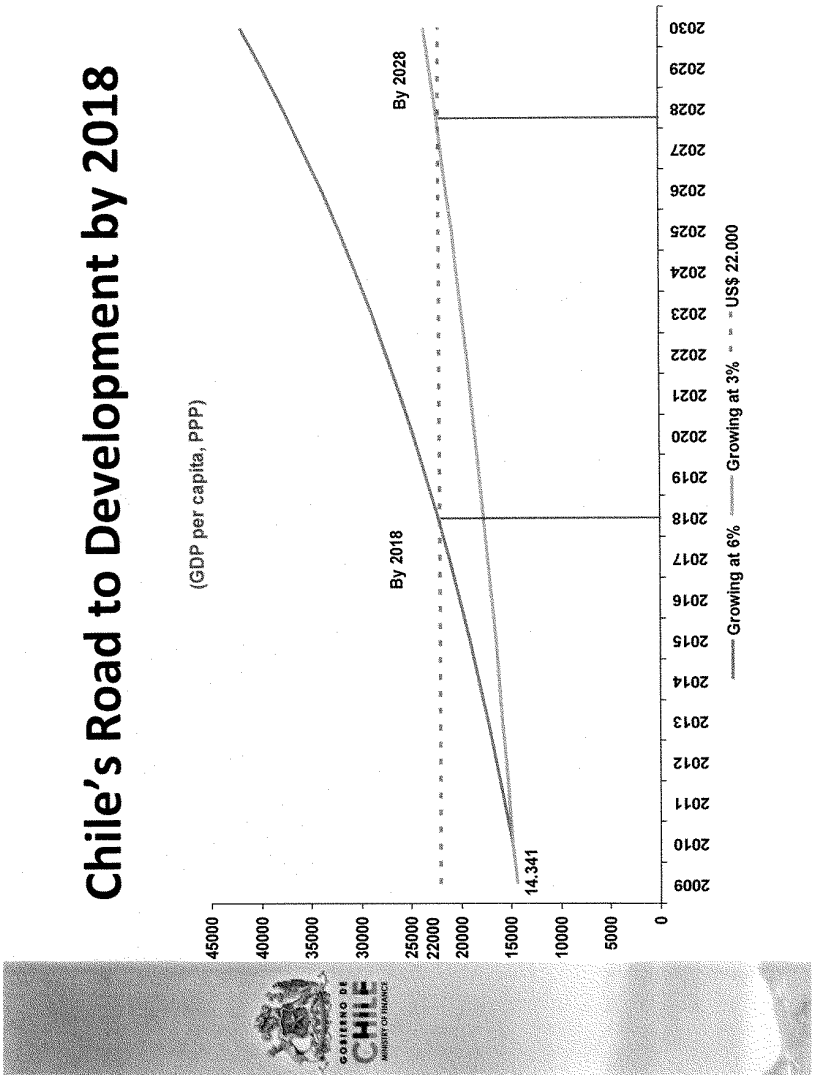
Chile's Road to Development by 2018
(GDP per capita, PPP)
45000
40000
35000
30000
25000
22000
20000
15000
10000
5000
0
14.341
By 2018
By 2028
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
Growing at 6%
Growing at 3%
US$ 22.000
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