出國報告（出國類別：考察）

# 參加第 37 屆「國際災害研究與應用工作研討會」報告

服務機關：內政部建築研究所

姓名職稱：陳建忠組長

派赴國家：美國

出國期間：**101** 年 **7** 月 **12** 日至 **101** 年 **7** 月 **20** 日

報告日期：**101** 年 **10** 月 **11** 日

# 摘　要

**關鍵詞：都市防災、減洪設施**

本所 101 年度「國際災害研究與應用工作研討會」派員出國計畫，由安全防災組陳建忠組長參加，國內尚有其他防災研究的專家學者及機構成員一同前往進行交流。旨揭研討會係國際具影響力之緊急事務管理與防減災規劃專業者國際研討會匯集當前國際間重要災害管理的研究議題，每年舉辦 1 次，由科羅拉多大學自然災害防制中心主辦，，本次研討會於 7 月 14 日至 17 日假美國丹佛召開，包括一系列之學術研討會、實務與案例研討工作坊等相關活動，會議主要議題包括：(1)乾溼環境課題、(2)社區規劃走向、(3)風險教育發展、(4)關注敏感課題、(5)復元與恢復力等。並就近考察都市減洪設施，本次研討會相關資料可供本所防災議題規劃，並納爲本所研究方向之參考。

# 目　次

# 第一章　　緣起與目的

美國 Natural Hazards Workshop 是由 Natural Hazards Center 自 1975 年起開辦，每年在科羅拉多州的丹佛地區所舉辦，今年是第 37 屆，是美國社會科學界最重要的災害管理研究及應用研討會。雖然與會者多爲世界各國美國聯邦、州政府、地方政府以及地方災害緊急防救人員，另外尚有社會科學者、民間非營利組織、顧問機構等專業人士參加，因爲 Natural Hazards Center 是以連結各學術與實作領域、促進各領域間交流爲最高原則，故也有許多社會科學以外，以及政策擬定、操作者參與。雖然研討會主軸是以美國經驗爲主，參與者則來自世界各國，亞洲地區則包含臺灣、日本、中國等等。會議形式藉由除大會邀請貴賓演講，尚有專題報告，工作坊等以小組分場面對面座談的討論方式，達成最深入且有效的成果與經驗交流。

本所歷來僅曾於 94 年派員參加此 Workshop，從中除吸取災害最新治理觀點與作法，亦同與會者分享臺灣經驗。本次台灣前往參加者，除本所一人以外，包尚有國內大學及研究單位參加合計 7 人，另包括國家災害防救中心陳亮全主任（發表主題爲地方行政人員對於水災調適策略之認知）、以及長榮大學薩支平教授（主題爲淹水預警對家戶應變行爲的影響）、邵珮君教授（主題爲莫拉克颱風災後遷居型重建）、台北大學洪鴻智教授（主題爲社會資本、社會參與氣候變遷調適能力），會後續於 international Research Committee on Disasters Researchers Meeting 進行發表。

# 第二章　　考察過程

本次考察計畫自 7 月 12 日至 5 月 20 日合計 8 天，除路程外共分爲 2 大部分。首先是 7 月 14 日至 7 月 17 日參加第 37 屆國際災害研究與應用工作研討會，而於 7 月 18 日前往兩地區現地考察都市地區雨洪防制規劃與減洪設施，行程安排如下表所示：

本次參訪行程表

| 日期 | 活動內容 | 備註 |
|---|---|---|
| 7 月 12 日(四)<br>～<br>7 月 13 日(五) | 1、台北-美國洛杉磯<br>2、美國洛杉磯-丹佛 | 路程 |
| 7 月 14(六)～<br>7 月 17 日(二) | 3、參加開幕式及研討會專題講<br>4、參加研討會專題報告<br>5、參加專題座談會 | 會議 |
| 7 月 18 日(三) | 6、參觀丹佛地區都市防災設施 | 路程 |
| 7 月 19 日(四) | 7、美國丹佛-美國洛杉磯 | 路程 |
| 7 月 20 日(五) | 8、美國洛杉磯-台北 | 路程 |

以下就各段行程之考察內容分別概述。

## 一、國際災害研究與應用專題研討會情形

註冊報到首日，當場即利用機會拜訪 Kathleen Tierney 教授，其目前擔任科

羅拉多大學波爾德校區 Natural Hazards Center 主持人，曾於 2005 年初接受國家災害防救科技中心的邀請，來台擔任防災成果發表會專題演講的貴賓，與台灣關係良好。因此此次參訪對於日後相關部會與國家災害防救科技中心在防救災管理技術研發及落實應用方面有實質的助益。

註冊報到

拜訪大會主持人

第37屆國際防災研討會，茲整理會議主題分類如下:

本次第 37 屆「國際災害研究與應用工作研討會」正式會議於 7/14~7/17 舉行，討論議題相當豐富，詳細議程見附錄 2，本次參加，旨在瞭解國際間社區防災的研究趨勢，以及汲取歷經洪災、龍捲風或地震等大災難後的重建經驗，重點分述如下。

## （一）專題演講重點

主題：Adaptive to New Realities: Strengthening CommunityResilience in a Time of Change。

主講者：David Kaufman，前 FEMA 政策分析中心主任。

講者首先界定近年來美國主要社會變遷，包含都市化、海岸人口成長、高齡化、高度依賴科技、所造成的資訊焦慮、以及聯邦在州政府財政提供上扮演重要角色、國際依賴、健康狀況全球化、非正式組織因此而崛起。而 FEMA 出

版的手冊<<Crisis Response and Disaster Resilience 2030:Forging Strategic Action in an Age of Uncertainty>>即有提及，要能因應緊急狀況，必須要了解社會變遷的原因、培養共識、跨部會與跨單位合作（例如，設施、系統、計畫、服務間的合作）、針對並非一成不變的需求，事先規劃因應對策，並立即採取行動。

主講者認爲，過去觀察發現，緊急時候民眾覺得信任的對象或資訊管道，已漸漸從正式社會網絡轉移至非正式社會網絡。另外，因爲民眾通常不會遵循別人替其設計好的計畫，政府單位（正式網絡）在作規劃時，應要採取從下而上的方法，了解使用者需求及行爲模式，或由使用者參與設計。

主講者強調自助和互助的重要性，因爲居民是災害發生第一時間的應對者。另外，經驗亦發現，成功的災害復原過程通常是由災民自己主導。所以，學界可以扮演的角色，或許是從行爲科學的研究成果，分析居民行爲模式，以評估出較好的自助、互助模式。

提問者認爲主講者歸納之架構欠少對弱勢族群的討論，主講者回應時認爲，弱勢族群之於災害治理，最重要的議題是經濟資源取得。

## (二)專題座談會重點

### 1. 氣候變遷和極端事件：科學和實踐

今年 3 月，解決氣候變遷問題的政府機構提出氣候變遷下極端氣候和災難危險的調適報告，簡稱 SREX 報告。該報告在氣候變遷和極端氣候的關係提出科學研究的成果，有助於了解氣候變遷及極端氣候對人類造成的影響，例如對社會脆弱度的影響。報告也概述科學家目前的共識和意見相左之處，提出許多尚待驗證的假設，以及如何應用工程手段對氣候變牽及極端氣候進行調適，以減少社會和經濟的損失。在本次會議裡，不同領域的研究人員將進行報告，提供最新的研究成果，可作爲相關從業人員決策和執行的參考。

主席：凱瑟琳・蒂爾尼，科羅拉多大學自然災害中心

講者：麗莎・迪林，科羅拉多大學博爾德分校；比爾・特拉維斯，科

羅拉多大學博爾德分校；布萊德・尤德爾，Western Water Assessment

**2. 地區調適計畫：更好的計畫，更有彈性的社區？**

十多年前，國會提出調適策略，由聯邦政府對進行危險災害減輕計畫的社區提供經費援助。目前爲止，FEMA 已執行約 20,000 件社區危險災害減輕計畫，檢視這些社區防災策略執行成果相形重要。本次會議將對 4 個重要議題進行討論：(1)社區危險災害減輕計畫成效爲何？(2)社區危險災害減輕計畫如何運作？(3)是否由適當的人員負責社區災害減輕作業？(4)聯邦政府對計畫內容的指導是否簡單明瞭？

主席：Ken Topping，Cal Poly 州立大學，San Luis Obispo

講者：伊芳恩・海德，科羅拉多緊急管理部門；Evelio Astray-Caneda III，佛羅裡達國際大學；凱瑟琳・史密斯，聯邦緊急事務管理局；Ken Worman，加利福尼亞緊急事件管理代理

組織：Ken Topping，Cal Poly 州立大學，San Luis Obispo

**3. 綠色規範和標準的未來：有抵抗災難的能力嗎？**

ICC-700 綠建築標準、國際綠營建規範(IGCC)及美國綠建築協會的領先能源與環境設計(LEED)將越來越影響建築物的設計、建造及營運。綠色(green)普遍被認爲有改進性能的意思，常用於形容能源節省、水的使用效率、室內環境居住品質以及和場所多功能發展等效益。採用綠建築設計概念的建築已逐漸流行，因此綠建築是否能抵抗自然災害的影響將是重要的課題。本次會議討論重點爲綠建築規範、如何規定建築物的使用年限，以及永續抵抗自然災害的調適策略。

主席：愛琳・沃爾什，聯邦緊急事務管理局

講者：愛琳阿什利，公司；安東尼・弗洛伊芳德，Scottsdale 市，亞利桑那；Jeremy Sigmon，美國綠建築委員會；蓋理・埃利希，國

家建築師聯合會

組織：愛琳阿什利，公司

**4. 社區災害調適策略：國家研究委員會的發現和指導**

2010 年，科學、工程及國家政策委員會與國家大學防災聯盟起動社區災害改進調適策略計畫。他們被要求定義這個計畫爲國家級計畫，對美國逐漸面臨的災害，提供國家級的改善目標、災損底線及調適策略。他們於該計畫述及美國的調適策略、遇到的瓶頸及執行上的困難，並提出關於提升國家級調適策略方法的結論與建議。今年初夏，他們的主要成員將爲本次會議進行報告。

主席：Susan Cutter，南卡羅來納大學危險和脆弱研究院

講者：Monica Schoch-Spana，匹茲堡大學 Biosecurity 中心；吉羅德・加洛韋，馬利蘭大學；艾理斯・史丹尼，Dewberry

組織：勞倫亞歷山大-奧古斯汀，國家大學防災聯盟，Susan Cutter，南卡羅來納大學危險和脆弱研究院

**5. 日本研究會議：2011 東日本大地震和海嘯災難後初期的復原**

這會議將對 2011 東日本大震災後之反思和復原期程進行概述，並討論緊急繪圖隊繪製大眾化可應用之防災潛勢圖資供全國緊急與復原管理辦公室於緊急災難時使用，以及建立岩手縣地區協助整體復原工程的相關資料庫。

主席：立木茂雄，同志社大學

講者：田村圭子，新潟大學；猪口宗德，新潟大學；真紀立夫，京都大學

組織：林　春男，京都災難預防研究院；立木茂雄，同志社大學

**6. 把社區防火帶到下一個階段**

防火社區計畫已有 10 年且發展迅速。最近國際防火協會主席的準備! 設定! 執行! 計畫及火災適存社區開始擴大應用長時效防火技術於減少生命、財產及位於城市與郊區間自然資源的損失。本次會議將討論如何持續面對永續防火社區的挑戰，如何實施保險制度，以及解決涉及的各種層面問題，並且建立有效的預警系統與防災伙伴關係的模式。

主席：David Nuss，美國國家防火學會

講者：新基斯・沃利，美國國家防火學會；莫利・莫厄裡，美國國家防火學會；Hannah Brenkert-Smith，科羅拉多大學博爾德分校

組織：基斯・沃利，美國國家防火學會

**7. 鄉鎮防災的規劃及應用的升級**

很多的經費已用於改善城市地區的防災。在鄉鎮，防災調適的層級，準備，緊急反應和災難恢復則較少被知道。最近的研究已經集中於增加與脆弱度有關的意識並且在提升鄉鎮防災調適能力。本次會議將討論天然災害發生時，如何規劃防災調適策略，執行過程中的突發狀況以及提出策略改善鄉鎮永續防災管理能力。本次會議的講者也將強調網路訊息的傳輸如何影響個體與集體防災調適的意識。

主席：勞裡・皮爾斯，皇家凱道大學

講者：珍妮弗・霍尼，北卡羅來納大學查珮兒希爾分校；珍妮特・薩頓，科羅拉多大學科羅拉多斯普林斯創傷，健康和危險中心；羅賓・康克斯，皇家凱道大學

組織：珍妮弗・霍尼，北卡羅來納大學查珮兒希爾分校；勞裡・皮爾斯，皇家凱道大學

**8. 天然災害對環境的影響**

這個會議將聚焦於土地使用，土壤和水污染等天然災害對環境的影響，尤其是漏油和化學分散劑的污染常是災區居民憂心對身體健康有不良

影響的重要議題。本次會議的講者將加強說明天然災害和不斷發生的人為災害對環境的影響。本次會議討論的內容將找出地區應注意的環境災害議題以及建立立即反應機制以提供社區更多元化的地區性防災調適策略。

主席：菲利普・巴爾克，北卡羅來納大學查珮兒希爾分校

講者：潘蜜拉・詹金斯，新奧爾良查特大學；湯姆・巴爾克蘭，北卡羅來納州立大學；黛娜・格林，北卡羅來納大學

組織：黛娜・格林，北卡羅來納大學

**9. Silver Jackets: 調控資源以整合洪水風險管理解決辦法**

2005 年開始，美國陸軍工兵署 Silver Jackets 計畫持續支援整合單一機構來執行減少洪水危險、抵抗洪水與水災重建的支出。Silver Jackets 計畫成員不同於以往，他們都是來自與聯邦政府單位有合作經驗的 USACE、FEMA，以及實際參與地方政府或自治區洪水防災推動的單位。現有 33 個 Silver Jackets 計畫團隊和眾多的州政府正努力整合出單一機構中。最近，USACE 為個別的 Silver Jackets 計畫團隊提供資金鼓勵找出整合洪水風險管理的解決辦法，其重點在有效率調控現有的資源，以及提出證明使民眾能相信 Silver Jackets 計畫是可以成功的。同時，FEMA 的危險潛勢地圖已朝實際應用規制化發展中。本次會議將討論各級政府及相關單位成功執行 Silver Jackets 計畫的原因以及面臨哪些挑戰。

主席：勞瑞・拉森，國家洪泛區協會經理

講者：珍妮弗・鄧恩，美國陸軍工兵署；麥克・安德森，Stantec；Mark Stephensen，愛達荷州的國土安全局；湯姆・莫裡，堪薩斯州農業部

組織：愛德華・赫克，美國陸軍工兵署水資源工程研究所

**10. 防災調適的基本知識與複雜網絡**

建立社區對自然災害的調適策略一直被廣泛的討論著，但只有很少的

研究在探討利用政策技術強化調適策略。各式各樣的防災調適政策是有用的，包括內部機構間的網路管理，社區的規劃和發展，社區社會化的資源和網絡。本次會議將說明利用防災調適基本知識作爲架構，組織由複雜的議題，管理、領導和永續所形成的網絡。

主席：尼斯・溫格，國家科學基金會

講者：路易士・康福特，匹茲堡大學災難管理中心；大衛・約翰遜，密蘇里州立大學；Naim Kapucu，中佛羅裡達大學；Branda Nowell，北卡羅來納州立大學

組織：Naim Kapucu，中佛羅里達大學

**11. 經歷龍捲風侵襲的社區如何恢復**

過去 5 年已發生多件龍捲風侵襲及由龍捲風造成的相關災難事件。2007 年，一個 F5 等級的龍捲風破壞了大約百分之九十五的堪薩斯州葛林斯堡市。2011 年，另一個 F5 等級的龍捲風則重創密蘇里州卓柏林市嚴重的損傷，造成大規模的破壞及 160 人死亡。麻薩諸塞州去年也遭受龍捲風的襲擊，在蒙森市有數百個社區家庭及公司行號遭到破壞。本會議的特色在於來自上述三個災區的防災人員分享面對龍捲風災難的經驗，並依本次會議主題，報告如何克服災區重建的巨大挑戰。

主席：Dennis Mileti，科羅拉多大學自然災害中心

講者：Gretchen Negers，麻薩諸塞州蒙森市；Edward Thomas，卓柏林學校；Bob Dixson，堪薩斯州葛林斯堡市

組織：Kristina Peterson，新奧爾良查特大學；愛德華・托馬斯，國家災害減輕協會；Shirley Laska，新奧爾良大學

**12. 災難後環境的防災調適策略**

歷經卡催娜和莉塔・路易絲安娜等颶風造成的嚴重災害後，聯邦緊急

管理署（FEMA）提撥 14.7 億美元規劃大型防災調適計畫（HMGP）以減少天然災害對生命和財產的損失。由州及地方政府直接撥付數百萬美元於 HMGP 來提升建築物高度超過平均每年淹水高度。

以紐奧良作爲研究案例，說明地方政府利用 HMGP 經費來積極解決地區淹水問題，而不是補貼個人財產的損失。提高建築物高層是對有淹水潛勢建築物的標準防災調適策略，這個慣用的方法對於社區淹水風險的降低具有很好的成效。

本研究檢核政府相關單位在使用 HMGP 經費減少淹水暴露危機所採用眾多調適策略的優先順序及效溢。分析重複發生水災的損失及來自國家水災保險計畫的嚴重損失數據顯示，對於重複發生水災的地方最佳的處理方式即購買居住該地方民眾的資產、升級該地方的排水設備、改善面臨暴雨的風險管理方式及嚴格落實執行建築相關規定。

連結州及聯邦政府資源可降低每年洪水發生機率的百分之一，這樣的方式可提供地方政府有效利用 HMGP 經費獲得最佳調適策略以減少未來可能發生水災的損失。

MIRIAM BELBLIDIA，新奧爾良市

## 二、參訪都市防災設施

### (一)參訪 Broomfield 市防減洪設施

Broomfield 是大會開會所在地，週邊多爲高業區以及大型休閒場所，距科羅拉多大學 BOULDER 校區及其所設防災中心僅約 20 分鐘車程，附近之建築基地亦運用整体開發方式，且多屬坡地地形，開會地點位居上游及地較高地區，因此並不會發生洪水災害，惟其有控制開發逕流量之必要，因此利用地形設置的滯減洪設施，處處可見。

滯減洪設施(一)

滯減洪設施(二)

在此之滯減洪設施亦巧用谷地地形，本次大會係於風景優美地區，地形高低起伏，因此，集地利用規劃是將集水區以及水路整体設計，並於下方低窪地設置自然貯洪池。以便在上游地區於暴雨時，能在第一時間就將洪水暫時貯存，降低下游地區受洪害的機率，在山丘頂部則施作眺望休憩場所。

眺望休憩場所

眺望休憩場所

研討會場地週遭，所植花木，經詢非以色彩美觀爲主，也非講求本土原生種植物，而是以能配合當地季節氣候之耐旱條件爲要。停車場及相關設施亦配合地形及排水坡度之需設置。

耐旱植物

停車場坡面排水

## (二) 參訪 Westminster 市防減洪設施

威斯敏斯特 （Westminster, Colorado）是美國科羅拉多州的一個城市，位於州府丹佛西北。行政上分屬傑佛遜縣和亞當斯縣。面積 85.1 平方公里，2006 年人口 105,753 人，是該州第七大城市。

本次參訪的是住宅區及週邊公共設施有關都市防減洪設施，首先是河川上地區，由於正值乾旱期，而且沒有明顯水源源頭。而本住宅的上方是旅館區，存有各種休閒、商務型旅館，而在旅館區上方則是便利商店、小型零售店等相關商業設施。在溫蒂漢堡旁邊，已設有穿越銜接橫向主要幹道公路上方集水區的大排，此一大排右側已就地取材，使用洛磯山當地的石材做爲主排水道的緩衝坡面，另一側則運用植栽，以實施美化。

設於建築基地或計畫街廓之陰井，種植當地原生種植物，以過濾自建築物排放出的污水，做初步的水質淨化。

大排水溝

初步的水質淨化

建築基地街角多以喬木或灌木簇群布植，以具有美觀之效果，這些景觀設施座落所在的區域，亦使用當地加以輾碎石材(由鋪設材料爲粉紅或錯紅色可證是當地石材)， 並非以混凝土施築，如此，可推測其下方即具有滲透及功能，可將污水或雨水於地表透過此途逕，入滲地下。

地表入滲工法(一)

地表入滲工法(二)

部分建築基地，與大排水溝臨接處，不採隔離防堵方式，而是以順接，兩者並無明顯界，且該處均是處於水流較緩、坡度較平的場所，而且該段排水溝的橫斷面均與原排水溝比較，大有數倍之多，有雨洪時，可做緩衝區，與本(內政)部，在今年推動的都市內水防治的策略不謀而合。

雨洪緩衝區(一)

雨洪緩衝區(二)

其次，在旅館建築用地較低一側，運用了傳統式的滯洪池，但擴大了用地面積，並遍植草，於滯洪池中間地帶始予留設恆常性排水溝，供日常排水使用，照片中即可見到，在目前乾旱季節，仍在進行排水中。因而型成超大排水溝。

超大排溝(一)

超大排溝二)

## (三) 參訪 AURORA 市防減洪設施

AURORA 市地處平原，極易面臨洪患之苦，經旅美學者，目前任科羅拉多大學丹佛校區的郭純園教授介紹，更能掌握該市商業區開發與治水全貌。

就其在丹佛地區工作經驗而言，全區的治水規範是對愈小的基地採愈嚴格的標準，如果台灣要訂指導原 則不宜太細，其重要事項爲：法源、當地水文、經濟風險分析、設計方法模式、許可作業等。全區洪水治理，由都會區大尺度的規劃管理開始，考量防洪、沈砂、溼地、洪水流速、深度及安全要求。水文

計算面則考量設計降雨颱風、梅雨及洪災相關環境問題，第二：降雨量、進水量、土壤流失量、逕流歷線(可引用國內家學者所做的基礎資料)第三：電腦軟体(如美國 EPA 開發的，其會隨時更正)。

在風險安全程度面，應考量全國性的一致標準，無論是供 2 年、10 年 100 年使用的排洪道，大家要將統一的水文標準先確定起來。台灣計算評估標準郭教授建議可用 SWMM（storm water management model，暴雨洪水管理模型），SWMM 是由美國 EPA（Environmental Protection Agency，環境保護署），是一個動態的降水-徑流類比模型，主要用於類比都市某一單一降水事件或長期的水量和水質模擬。其徑流模組部分綜合處理各子流域所發生的降水，徑流和污染負荷。其匯流模組部分則通過管網、管道、蓄水和處理設施、抽水機、調節閘等進行水量評估。該模型可以跟蹤比較不同延時任意時刻每個子流域所產生徑流的水質和水量，以及每個管道和河道中水的流量、水深及水質等情況。 SWMM 自 1971 年開發以來，在世界廣泛應用於都市地區的暴雨洪水以及其他排水系統的規劃、分析和設計，在其他非都市土地也被廣泛的應用。目前最新版本是 5.0 版，可以在 Windows 作業系統下運算，SWMM5 提供研究區輸入的資料進行編輯、比對水文、水力和水質情況，可顯示項目，包括對排水區域和系統輸水路線進行彩色編碼，提供時間序列曲線和圖表結果、坡面圖以及統計頻率的分析結果。

商業區末端貯洪池(一)設有清理道路

商業區末端貯洪池(二)右側進水口

貯洪池出水口(一)水口在直上方

貯洪池出水口(二)水口在側面

# 第三章　心得及建議

本次 9 天考察行程包括參加國際災害研究與應用工作研討會及數處現地參訪，行程相當緊湊，但也獲得許多寶貴的經驗，此行可以瞭解到國際間目前對於都市防災的趨勢與防災的實施方式，近年來因極端氣候，以致災害頻仍，或許對國內公部門要進行因應氣候變遷研究都市防災策略，並未受到全面性重視之時，不啻是一新的契機。不過，氣候變遷及災害防制，存有極強烈的地域因素，需予以因地制宜問題，以致在研究與討論之際，，目前在國際上深受討論與爭議，，或許是因爲對於人類永續生活的觀念與經濟發展尚需進一步調適，否則與國際間爲因應氣候變遷在環保意識以及防災投入，仍有有著極大的衝突與落差。而有關社區防災，非僅是工程手法，尚有非工程方法待了引進運用，尤其災地區普遍而言，

**本次考察謹提出以下建議：**

1. **都市防災研究與應用宜增列防耐災社區**：

由於國內開始研究都市防災，肇始於國科會，後由內政部建築研究所因應日本坂神大地震，及其經驗，逐漸發展成型的都市空間規畫系統，著重都市計畫面，利用公共設施檢討避難疏散、收容安置六大空間等系統，以供都市計畫通盤檢討及都市計畫變更之需，然而，就都市組成而言，居住單元是以家庭爲主，在生活園來看，最小單元即爲社區，在面對災害時，需要各種的生活設施，其項目即與都市防災空間系統一致，且社區居民於平時即多有來往，關係緊密，爲因應災害，更易型成一生命共同体，本次研討會工作坊研討議題大架構，諸如：(1)社區乾溼環境課題、(2)社區規劃國際走向、(3)社區風險教育發展、(4) 社區關注敏感課題、(5)社區重建與恢復力等議題可供研究層面多，對於因應氣候變遷防災技術日新月異的進步速度，以及國際上風險意識趨勢，對於國內相關都市計畫法規，如都市計畫定期通盤檢討實施辦法增訂社區規劃手冊，以調整在世界銀行評定世界各國災害風險將台灣列覆蓋在三種災害的第一名之負面印象。而本所「都市與建築安全減災與調適科技發展中程計畫（3/4）」也有提到提出山坡地建築開發總量管制與永續利用策略，結合山坡地社區安全防治輔導與推廣經驗，研提公私合作之山坡地社區安全維護制度。如能充到非山坡地的

受災潛社區，則更能達到人與建築及都市俱能永續防災安全之目標。因此，期望藉由本此考察之成果，可以擴展在未來規劃課題及相關研究中。

2. **都市計畫參考美國防減洪整体規劃**：

美國科羅拉多州之丹佛地區，無論是 Broomfield 市、Westminster 市或 AURORA 市，綜觀其都市綜合規畫與建設，鮮少有大挖大填、大型整地的情形，反之，在國內無論是公共或民間開發工程卻爲多見，在各現地參訪結果，多係將主要路 先行順應地形開闢，並具体考量都市排水，依地形留設天然的滯洪池，各建築基地，要開發時，方予逐步局部小整地並依應留設的雨洪設施配置於基地內。深值我國借鏡，惟美國地幅員廣闊，建築基地大至數公頃者，比比皆是，則其應留設之法定空地兼作減洪設施，十分容易，而台灣地狹人稠，建築密度甚高，土地皆採高度利用，所餘法定空地有限，是宜尋求建築物及建築基地地下空間，如戶外法定車空間、建築物基礎部分等處設置雨洪水暫存貯留設施，平時可做節水再利，洪水汛期時，則可暫予貯留洪水，待水退後再予放流適度時調節。

3. **編製都市計畫內水防治減洪審議手冊要項：**

內部部年內已課責建築研究所提供相間都市內水防治相關成果供營建署作成都市計畫相關審議規範，其依計畫管理層級可分成三級，即，都市計畫、都市設計之審議，以及建築許可之審查。美國科羅拉多州所使用的科羅拉多都市排水總體規劃設計規範(Urban Storm Drainage Manual Volume)計有三冊，第一冊：排水系統設計規劃時應考量之基礎理念；第二冊：排水系統構造物規劃設計、不同地區之設計範例 ；第三冊：排水系統之後續維護管理 。經與國內雨洪專家學者討論其中第一冊及第二冊較適合訂爲相關法令、規範及手冊，依其項分如下表。

| 都市排水總體規劃設計規範 | | 台灣可參考制定之規範 |
|---|---|---|
| 第一冊 | 排水系統方針 | — |
| | 排水系統法規 | 下水道法 |
| | 排水系統規劃 | 內政部雨水下水道設計指南 |
| | 降雨 | 台北市雨水下水道規划手冊<br>水文設計應用手冊 |
| | 逕流 | 內政部雨水下水道設計指南<br>台北市雨水下水道規划手冊 |

| | | |
|---|---|---|
| | 街道/入流口/雨水下水道 | 內政部雨水下水道設計指南 |
| | 主幹道排水系統 | 內政部雨水下水道設計指南 |
| 第<br>第二冊 | 水工構造物 | 台北市雨水下水道規划手冊<br>水土保持手冊 |
| | 涵管 | 內政部雨水下水道設計指南 |
| | 蓄水 | 經濟部水利署之參考手冊 |
| | 防洪 | 經濟部水利署之參考手冊 |
| | 植生復育 | 經濟部水土保持手冊 |
| 第三冊 | 暴雨管理及規劃 | — |
| | 最佳管理作業選擇 | — |
| | 計算 WQCV 與減少的量體 | — |
| | 最佳管理作業的處理 | — |
| | 最佳管理作業源頭控制 | — |
| | 最佳管理作業維護 | — |
| | 最佳管理作業建設 | — |

# 附錄-1　2012 年 37 屆「國際災害研究與應用工作研討會」座談會摘要

37TH ANNUAL NATURAL HAZARDS


# RESEARCH AND APPLICATIONS WORKSHOP

JULY 14-17, 2012 ✦ OMNI INTERLOCKEN RESORT ✦ BROOMFIELD, COLORADO

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## Twittering from the Workshop?

Follow our Workshop Twitter feed at:

twitter.com/HazWS

Use the hashtag #Haz

# Guide to Using This Program

Our goals in creating this program for the 37th Annual Natural Hazards Research and Applications Workshop are the same as always—to help you get where you want to go and to encourage interactions among Workshop participants who might not otherwise connect.

Some specifics:

• The Workshop Web site, www.colorado.edu/hazards/workshop/2012/current12.html, complements this print program with the latest updates and individual Web pages containing in-depth background information about many of the moderators, panelists, and presenters. We have made wireless Internet available in all of the Workshop meeting areas in the hotel to encourage you to use these additional resources. The password to access individual speaker pages is printed at the bottom of your registration invoice or may be obtained from the registration desk.

• There are two ways to view the schedule of events. There is a color-coded foldout program just inside the front cover and there is a detailed Workshop program containing session descriptions beginning on page nine. The Workshop Details section includes supplemental information for navigating the Workshop, hotel, and surrounding areas.

• We have included abstracts in the print program in the hope they will connect you to the interesting people around you. The abstracts are organized behind three tabs: one for general abstracts submitted by Workshop participants; one for poster session abstracts; and one for abstracts being presented at the International Research Committee on Disasters Researchers Meeting following the Workshop.

# Program Structure

Workshop sessions are organized to encourage interaction. Panelists address topics by responding to questions prepared by moderators rather than by presenting papers.

The audience plays an important role as well. Initial panelist remarks are limited to 10 minutes each, leaving at least half of every session for give-and-take with the audience. The three-day Workshop is structured with plenary sessions, concurrent sessions, poster sessions, and extracurricular activities.

## Plenary Sessions

**Welcome and Self-Introductions:** On Sunday morning, Natural Hazards Center Director Kathleen Tierney will open the Workshop, instruct participants on how the Workshop operates, and moderate self-introductions.

**Keynote Addresses:** Immediately after the self-introductions, a keynote speaker will make a presentation followed by a question and answer session. This talk will provide the larger context for the Workshop. A second keynote address will follow Monday morning's plenary session.

**Plenary Sessions:** Plenary sessions on Sunday, Monday, and Tuesday will synthesize various topics. Each session will feature panelists representing different sectors of the hazards community.

**Wrap Up:** On Tuesday, Kathleen Tierney will close the Workshop with a summary of the highlights of the event and challenges for the future.

## Concurrent Sessions

There are 30 concurrent, 90-minute sessions organized into five tracks. Moderators will present a set of questions to which the panelists—who have received the questions in advance—will have about 10 minutes to respond. Time will be reserved for give-and-take between the audience and panelists.

**Research to Policy to Practice Sessions:** There are five concurrent, one-hour sessions featuring practitioners and researchers describing recent projects and studies.

## Twittering from the Workshop?

Follow our Workshop Twitter feed at:

twitter.com/HazWS

Use the hashtag #Haz

**Poster Sessions and Breaks:** Participants at the Workshop are invited to present posters of programs, new projects, or recent research. Posters will be available for viewing throughout the Workshop.

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## Special Thanks

The Natural Hazards Center staff relies on the generous support and hard work of many individuals, organizations, and sponsors. We would like to extend very special thanks to:

- The Center's National Advisory Committee for their suggestions and guidance.
- Student volunteers DeeDee Bennett, Elizabeth Bittel, Robyn Fennig, Hannah Gallagher, Nora Jagielo, and Amber Silver.
- The speakers, moderators, panelists, presenters, and recorders.

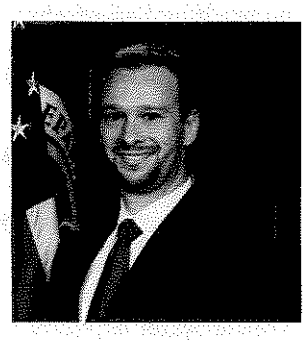
The Natural Hazards Center is funded through a National Science Foundation grant (CMMI-1030670) and supplemented by contributions from a consortium of federal agencies, corporations, and not-for-profit organizations.

We would like to thank our sponsors for their steadfast support of the center and its mission:

- National Science Foundation
- Federal Emergency Management Agency
- National Oceanic and Atmospheric Administration
- United States Geological Survey
- Centers for Disease Control and Prevention
- United States Army Corps of Engineers
- Oak Ridge National Laboratory

# Keynote Speakers

## DAVID KAUFMAN



DAVID J. KAUFMAN was appointed director of FEMA's Office of Policy and Program Analysis in September 2009. In this position he is responsible for providing leadership, analysis, coordination, and decision-making support to the FEMA Administrator on a wide range of Agency policies, plans, programs, and key initiatives.

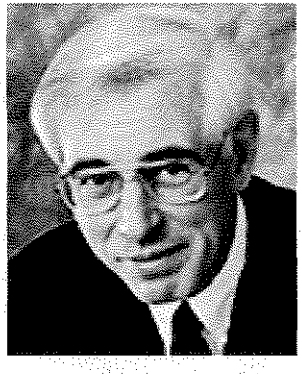
Kaufman has extensive experience with homeland security and disaster preparedness issues. He has been a member of the faculty at the Naval Postgraduate School's Center for Homeland Defense and Security, where he has taught in the center's graduate and executive level education programs, and has previously served in several senior positions in the U.S. Department of Homeland Security and in FEMA.

His previous service included establishing the Office of Preparedness Policy, Planning and Analysis in FEMA's National Preparedness Directorate, where as the director he led policy and planning efforts for national preparedness; and as acting director and deputy director of the Preparedness Programs Division in the Office for Domestic Preparedness, where he oversaw the day-to-day activities of DHS' $3 billion portfolio of state, local, and infrastructure preparedness assistance programs.

In 2008, Kaufman left government service to become safety and security director for CNA, a nonprofit think tank that provides analysis and solutions to challenging problems for all levels of government, where he worked on a range of homeland security issues including community engagement, risk management, and catastrophic planning, and supported the Quadrennial Homeland Security Review.

Kaufman holds a Master of Public Policy degree from the University of Michigan; a Bachelor of Arts degree in International Relations, Political Science, and History from the University of Wisconsin-Madison; and is a graduate of the Center for Homeland Defense and Security's Executive Leaders Program.

# THOMAS O'ROURKE



THOMAS O'ROURKE is a member of the teaching and research staffs at Cornell University and the University of Illinois at Urbana-Champaign. His teaching and professional practice include geotechnical engineering for earth retention systems, foundations, and soil–structure interaction; earthquake engineering; underground construction technology; and engineering of large geographically distributed systems (such as water supplies, gas and liquid fuel systems, electric power, and transportation facilities).

O'Rourke is an elected member of the U.S. National Academy of Engineering and a Fellow of the American Association for the Advancement of Science. In 1998, he was elected to the Earthquake Engineering Research Institute Board of Directors, serving as president from 2003-2004. He testified before the U.S. House of Representatives Science Committee in 1999 on engineering implications of the 1999 Turkey and Taiwan earthquakes and on the reauthorization of the National Earthquake Hazards Reduction Program in 2003 and 2009. He has served on numerous earthquake reconnaissance missions and was a member of the U.S. National Academies Committee on New Orleans Regional Hurricane Protection Projects. He is a member of the National Institute of Standards and Technology Advisory Committee for Earthquake Hazards Reduction, which serves as the national advisory committee for NEHRP.

O'Rourke has developed engineering solutions for problems concerning foundation performance, ground movement effects on structures, earth retaining structures, pipelines, earthquake engineering, tunneling, and infrastructure rehabilitation, both on a research and consulting basis. He has investigated and contributed to the mitigation of the effects of extreme events—including natural hazards and human threats—on civil infrastructure systems and has developed techniques for evaluating ground movement patterns and stability for a variety of excavation, tunneling, micro-tunneling, and mining conditions. Additionally, he developed geographical information systems and network analysis procedures for geographically distributed infrastructure systems in areas vulnerable to earthquakes and other natural disasters.

# Workshop Program

## Saturday, July 14

### Gender and Disasters Roundtable

Sat. 3:00-4:30 p.m., Interlocken A

The U.S. Gender and Disaster Resilience Alliance invites all Workshop participants to attend this meeting, which will offer the opportunity to network with others interested in gender issues in disaster.

**Convenor:** Jennifer Tobin-Gurley, Colorado State University

### Registration

Sat. 4:00-7:00 p.m., Interlocken D

### Poster Session with Cash Bar

Sat. 5:00-7:00 p.m., Interlocken and Centennial foyers and Interlocken B/C

### First-Timers' Orientation

Sat. 6:00-7:00 p.m., Centennial E

### Graduate/REU Student Orientation

Sat. 6:00-7:00 p.m., Centennial F

## Sunday, July 15

### Registration

Sun. 7:00 a.m.-5:30 p.m., Interlocken D

### Welcome and Self-Introductions

Sun. 8:00-9:15 a.m., Interlocken A/B

### KEYNOTE ADDRESS

**David Kaufman, Federal Emergency Management Agency**

Sun. 9:15-10:00 a.m., Interlocken A/B

### Break

Sun. 10:00-10:30 a.m.

## PLENARY

### Climate Change and Extreme Events: Science and Practice

Sun. 10:30 a.m.-noon, Interlocken A/B

In March of this year, the Intergovernmental Panel on Climate Change released "Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation," also known as the SREX Report. The report assesses the scientific literature on the relationship between climate change and extreme weather and climate events, as well as factors that contribute to the severity of the impacts of those events, such as social vulnerability. The report also outlines areas of scientific consensus and disagreement, identifies numerous knowledge gaps, and projects climate change impacts into the future, while emphasizing the importance of social and economic factors as drivers of disaster losses. In this session, a multidisciplinary panel will discuss highlights of the report and the implications of its findings for research, decision making, and practice.

**Moderator:** Kathleen Tierney, University of Colorado Natural Hazards Center

**Panelists:** Lisa Dilling, University of Colorado at Boulder; Bill Travis, University of Colorado at Boulder; Brad Udall, CU-NOAA Western Water Assessment

### Lunch

Sun. noon-1:30 p.m., Outdoor Pavilion

Track: Wet and Dry

### Emerging Critical Water Resource Issues

Sun. 1:30-3:00 p.m., Interlocken A

Communities worldwide are losing out on the significant benefits that would come from addressing water resource development and management at the river basin level. Basins have been historically multi-jurisdictional, but well-defined goals and coordinated policies have typically been lacking, both nationally and internationally. This panel will present the challenges facing river basins around the world in hopes of inspiring a continuing dialog.

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**Moderator:** Charles Howe, University of Colorado at Boulder

**Panelists:** Denise Fort, University of New Mexico; Gerald Galloway, University of Maryland; Marcus Moench, Institute for Social and Environmental Transition

**Organizer:** Charles Howe, University of Colorado at Boulder

Track: Community Planning

### Local Mitigation Planning: Better Plans, More Resilient Communities?

Sun. 1:30-3:00 p.m., Interlocken C

More than a decade ago Congress passed the Disaster Mitigation Act, which makes hazard mitigation plans a requirement to receive federal mitigation grant funds. Now, nearly 20,000 FEMA-approved local hazard mitigation plans later, it's important to examine their value in building more resilient communities. This session addresses four essential questions: How good are most local hazard mitigation plans? How well are they working? Are the right people involved in their preparation? Is federal guidance for plan content and quality clear and straightforward enough?

**Moderator:** Ken Topping, Cal Poly State University, San Luis Obispo

**Panelists:** Iain Hyde, Colorado Division of Emergency Management; Evelio Astray-Caneda III, Florida International University; Kathleen Smith, Federal Emergency Management Agency; Ken Worman, California Emergency Management Agency

**Organizer:** Ken Topping, Cal Poly State University, San Luis Obispo

Track: Risk Education

### U.S. Business Emergency Management Use of Weather Information

Sun. 1:30-3:00 p.m., Centennial E

The U.S. commercial sector (large supply stores, communication companies, etc.) is often a very sophisticated and demanding user of weather information when hazardous weather approaches. It uses these forecasts for preparedness activities, such as staging equipment and people or ordering additional stock. These preparations provide immediate response and often jumpstart long-term recovery. This session will discuss the weather information required by this sector, how it is used, and what information improvements could be of further

help. In addition, sector representatives will discuss how they work with customers, coordinate with other sectors and the public during disaster response and recovery, and whether the coordination works well or not.

**Moderator:** William Hooke, American Meteorological Society

**Panelists:** Lee Davis, Target; Hans Wagner, Early Alert; David Lusk, Fedex Express

**Organizer:** William Hooke, American Meteorological Society

Track: Addressing Vulnerabilities

### Lima-Callao, Peru: Assessing the Next Haiti

Sun. 1:30-3:00 p.m., Interlocken B

The metropolitan area of Lima-Callao, Peru, is at high risk for an earthquake-tsunami catastrophe because of an extreme convergence of people, economic assets, and poor land use planning in an area of high seismic activity. In addition to the direct impacts, a Lima-Callao catastrophe would likely cripple Peru's national economy. More than 10 million people and half the national economy, including the national capital, airport, and principal port, are vulnerable. Local experts will discuss the offshore tectonics and the likely tsunami warning time; the historic earthquake-tsunami combinations that have affected the area and the resulting loss patterns; the current human and economic assets exposed to the combination hazard; the vulnerability of the built environment with particular attention to the lack of building standards and enforcement, and comparing current land use to the historic loss patterns; and the resulting risk and its likely increase into the 21st century.

**Moderator:** Richard Olson, Florida International University

**Panelists:** Andrew Maskrey, UN International Strategy for Disaster Reduction; Juan Pablo Sarmiento, Florida International University; Hansjürgen Meyer, Observatorio Sismológico del Suroccidente; Sherry Johnson, Florida International University

**Organizers:** Juan Pablo Sarmiento, Florida International University and Richard Olson, Florida International University

Track: Recovery and Resilience

### Presidential Policy Directive 8

Sun. 1:30-3:00 p.m., Centennial F

On March 30, 2011, President Obama issued PPD-8, a policy directive that replaces Homeland Security Presidential Directive 8

in focusing on national preparedness. PPD-8 contains a number of requirements, including the development of a "national preparedness goal," and the development of an "integrated, all-of-nation, capabilities-based approach to preparedness." Panelists in this session will discuss the progress that has been made on PPD-8 tasks, as well as issues that have emerged in efforts to implement the directive. They will also explore why PPD-8 might be different, both in process and effect, than previous policy frameworks.

**Moderator:** David Kaufman, Federal Emergency Management Agency

**Panelists:** Roy Wright, Federal Emergency Management Agency; Donald Lumpkins, Federal Emergency Management Agency; Steve Moddemeyer, CollinsWoerman; Jared Brown, Congressional Research Service

**Organizer:** Roy Wright, Federal Emergency Management Agency

### Break

Sun. 3:00-3:30 p.m.

Track: Wet and Dry

### Wise and Unwise Floodplain Use: Reports on Policy Activities Regarding Use of the Floodplain

Sun. 3:30-5:00 p.m., Interlocken A

This session will outline several recent and ongoing activities by the federal government and others regarding the wise or unwise use of our nation's floodplains. The efforts have focused on federal guidance regarding the wise and unwise use of the floodplain, including an assessment of the federal role and programs in flood risk management; the resilience and sustainability of technologies used to manage the floodplain; and the need to revise the existing Unified National Program. Panelists will discuss what a renewed vision for floodplain management based on research findings might look like and seek input from participants.

**Moderator:** Peter Rabbon, U.S. Army Corps of Engineers

**Panelists:** Matt Kondolf, University of California, Berkeley; Gerald Galloway, University of Maryland; Laura Zepp, U.S. Army Corps of Engineers Institute for Water Resources

**Organizers:** Peter Rabbon, U.S. Army Corps of Engineers and Scott Nicholson, U.S. Army Corps of Engineers

Track: Community Planning

### The Future of Green Codes and Standards: Is There a Place for Disaster Resistance?

Sun. 3:30-5:00 p.m., Spruce

The ICC-700 Green Building Standard, ICC-International Green Construction Code (IgCC) and LEED are examples of green codes—standard and rating systems that will increasingly influence the way buildings are built. The term "green" is generally considered synonymous with improved performance, particularly in energy, resource, and water efficiency, indoor environmental quality, and site development. As the adoption of green building practices becomes more prevalent, so does the question of whether or not these metrics can provide greater natural hazard resistance. The panel will address key green codes, how codes address building service life, functional resilience, and the potential to incorporate disaster resistance to natural hazards as an essential component of sustainability.

**Moderator:** Erin Walsh, Federal Emergency Management Agency

**Panelists:** Erin Ashley, URS Corporation; Anthony Floyd, City of Scottsdale, Arizona; Jeremy Sigmon, United States Green Building Council; Gary Ehrlich, National Association of Home Builders

**Organizer:** Erin Ashley, URS Corporation

Track: Risk Education

### Weather Ready Nation

Sun. 3:30-5:00 p.m., Centennial E

Increased weather extremes are one of the most tangible manifestations of climate change. There is a growing consensus on the need for public education programs that communicate this message and encourage preparedness. Communities, states, and others, such as businesses, could be caught unaware by more extreme weather events, more frequent flooding, and other impacts associated with climate change. Panelists will discuss initiatives that focus on identifying indicators to make our nation "weather ready."

**Moderator:** Margaret Davidson, NOAA Coastal Services Center

**Panelists:** Amy Luers, Skoll Global Threats Fund; Carolyn Kousky, Resources for the Future; Karen Raucher, Stratus Consulting

**Organizer:** Jennifer Sprague, National Weather Service

Track: Addressing Vulnerabilities

### Children and Disasters

Sun. 3:30-5:00 p.m., Private Dining Room

Historically, child and youth needs have not been a priority in disaster management policies, activities, or research. Over the last several years, concerted efforts of various government agencies, nongovernmental organizations, and social science researchers have elevated the profile of young people. This session will identify research gaps and policy oversights that are keeping children and young people from being key players in disaster reduction and decision making. Areas for discussion will include school safety, child protection, education, and the requirements of children with special needs. These topics parallel the main points of the Children's Charter for Disaster Risk Reduction, a UN International Strategy for Disaster Reduction initiative that collected the insights of 600 children in 21 countries across Africa, Asia, and Latin America. By adopting the Children's Charter as its guide, this session will be addressing the issues that are of most concern to the world's most vulnerable children.

**Moderator:** Robin Cox, Royal Roads University

**Panelists:** Lori Peek, Colorado State University; Brandi Gilbert, University of Colorado Natural Hazards Center; Robert Kanter, SUNY Upstate Medical University; David Abramson, National Center for Disaster Preparedness; Briony Towers, RMIT University

**Organizer:** Briony Towers, RMIT University

Track: Recovery and Resilience

### National Disaster Recovery Framework

Sun. 3:30-5:00 p.m., Centennial F

The new National Disaster Recovery Framework is designed to encourage predisaster planning for postdisaster recovery and to provide recovery support to disaster-stricken communities, states, and tribal governments. The framework lays out core recovery principles and also identifies three new recovery-related roles: federal recovery coordinator, state or tribal recovery coordinator, and local disaster recovery manager. The framework also identifies six Recovery Support Functions managed by different federal agencies. They include community planning and capacity building (FEMA), economic recovery (Department of Commerce), health and social services (HHS), housing (HUD), infrastructure systems (USACE), and natural and cultural resources (Department of the Interior). Panelists will discuss progress that has been made in implementing the framework, as well as the challenges.

**Moderator:** Deborah Ingram, Federal Emergency Management Agency

**Panelists:** Bob Dixson, Greensburg, Kansas; Matthew Campbell, Federal Emergency Management Agency; James Schwab, American Planning Association; Patricia Skinner, LSU AgCenter—Extension Disaster Education Network

**Organizer:** Deborah Ingram, Federal Emergency Management Agency

### Poster Session with Hosted Bar

Sun. 5:30-7:00 p.m., Interlocken and Centennial foyers and Interlocken B/C

### Film: Contagion

Sun. 6:45-9:00 p.m., Interlocken A

Kimberly Shoaf of the UCLA Center for Public Health and Disasters will lead a discussion after the film.

# Monday, July 16

### Registration

Mon. 7:30 a.m.-5:30 p.m., Interlocken D

### GIS and Disasters Roundtable

Mon. 7:00-8:30 a.m., Centennial E

Join this informal meetng if you're interested in the use of geographic information systems for natural hazards management.

**Convenor:** Chris Badurek, Appalachian State University

### Healthcare Research and Disasters Roundtable

Mon. 7:00-8:30 a.m., Centennial F

Anyone interested in disasters and healthcare issues is welcome to join this informal meeting.

**Convenor:** Joanne McGlown, Sigma Theta Tau International, Invited

## PLENARY

### Disasters and Community Resilience: National Research Council Findings and Guidance

Mon. 8:30-10:00 a.m., Interlocken A/B

In 2010, the Committee on Science, Engineering, and Public Policy and the National Academies Disasters Roundtable initiated a study aimed at improving conceptualization and measurement of societal resilience to disasters. The study committee was asked to define "national resilience," frame the primary issues related to increasing national resilience to hazards and disasters in the United States, and provide goals, baseline conditions, or performance metrics for resilience at a national level. They were also to describe U.S. resilience knowledge, outline gaps and obstacles to increasing resilience, and present conclusions and recommendations about what approaches are needed to elevate national resilience. This plenary featuring committee members has been scheduled in anticipation of an early summer release of the report.

**Moderator:** Susan Cutter, University of South Carolina Hazards and Vulnerability Research Institute

**Panelists:** Monica Schoch-Spana, University of Pittsburgh Center for Biosecurity; Gerald Galloway, University of Maryland; Ellis

Stanley, Dewberry

**Organizers:** Lauren Alexander-Augustine, Disasters Roundtable of The National Academies and Susan Cutter, University of South Carolina Hazards and Vulnerability Research Institute

### Break
Mon. 10:00-10:30 a.m.

## KEYNOTE ADDRESS
### Thomas O'Rourke, Cornell University
Mon. 10:30-11:15 a.m., Interlocken A/B

### Break
Mon. 11:15-11:30 a.m.

## RESEARCH TO POLICY TO PRACTICE
### Presentations by New Researchers
Mon. 11:30 a.m. to 12:30 p.m., Interlocken A

**Moderator:** Dennis Wenger, National Science Foundation

**Presenters:** Ward Lyles, University of North Carolina at Chapel Hill, *Who's at the Table? Examining Factors Driving Incorporation of Land Use Approaches into Hazard Mitigation Plans*

Ryan Alaniz, Cal Poly State University, San Luis Obispo, *Unsupervised Recovery: Adaptation Strategies by Two NGOs in Post-Mitch Honduras*

Hlekiwe Kachali, University of Canterbury, *Recovery of Industry and Geographic Sectors after the 2010 and 2011 Canterbury Earthquakes*

### Planning for Postdisaster Recovery: A Review of the U.S. Disaster Assistance Framework
Mon. 11:30 a.m. to 12:30 p.m., Interlocken C

The failure to plan for disaster recovery often results in rebuilding that contributes to the next disaster and limits the ability to maximize resources at every level. Those struggling to recover from disasters are routinely beset by duplicated efforts, poor inter-organizational coordination, policies that aren't shaped by local needs, and misinformation. Yet pre-event planning for postdisaster recovery remains undervalued. The presenters will discuss the many problematic issues surrounding disaster recovery using the lens of U.S. recovery practice and the poli-

cy recommendations described in *Planning for Post-Disaster Recovery: A Review of the United States Disaster Assistance Framework.*

**Presenters:** Gavin Smith, University of North Carolina at Chapel Hill; Tom Birkland, North Carolina State University

### Japan Research Session: Early Recovery from the 2011 Tohoku Earthquake and Tsunami Disaster

Mon. 11:30 a.m. to 12:30 p.m., Centennial E

This session will overview the response and recovery timeline following the 2011 East Japan earthquake disaster. It will then discuss the implementation of the Emergency Mapping Team to facilitate a common operational picture in the national emergency and prefecture recovery management offices, and the implementation of the holistic life recovery assistance database system in Iwate Prefecture.

**Moderator:** Shigeo Tatsuki, Doshisha University

**Presenters:** Keiko Tamura, Niigata University; Munenori Inoguchi, Niigata University; Norio Maki, Kyoto University

**Organizers:** Haruo Hayashi, Kyoto University Disaster Prevention Research Institute and Shigeo Tatsuki, Doshisha University

### Community at Risk: Biodefense and Civic Action after the Anthrax Attacks

Mon. 11:30 a.m. to 12:30 p.m., Interlocken B

The anthrax attacks, which came on the heels of 9/11 and the successive menace of West Nile, SARS, and the avian flu, created a sense of urgency among U.S. security elites and prompted the federal government to spend $60 billion to shore up domestic biodefenses. The new risk management plans, however, would meet with public opposition. In this research, I compare public response to the ambitious federal biodefense agenda in three communities—Roxbury, Massachusetts; Davis, California; and Galveston, Texas—where local universities proposed to host National Biocontainment Laboratories, which are a cornerstone of the federal effort.

**Presenter:** Thomas Beamish, University of California, Davis

### Lessons of the Haiti and Japan Disasters

Mon. 11:30 a.m. to 12:30 p.m., Centennial F

While the exact death toll from the 2010 Haiti earthquake will never be known, it's clear the loss of life made that disaster the deadli-

est in the Western Hemisphere during modern times. The extensive destruction can be attributed to Haiti's extreme poverty and history of weak governance, and to the built environment's lack of earthquake resistance. Recovery is a continuing struggle for a nation that has also been forced to cope with flooding and a devastating cholera epidemic. The 2011 Japan earthquake-tsunami-nuclear disaster ranks as the most costly in history, and in the aftermath of these events Japan continues to wrestle with complex recovery challenges. In this session, three U.S. researchers will discuss their studies in Japan and Haiti, focusing on how those societies are recovering in the wake of catastrophe.

**Presenters:** James Kendra, University of Delaware Disaster Research Center; Deborah Thomas, University of Colorado Denver; Scott Miles, Western Washington University

### Lunch

Sun., 12:30-2:00 p.m., Outdoor Pavilion

Track: Wet and Dry

### Levees and Residual Risk

Mon. 2:00-3:30 p.m., Interlocken A

The United States has over 100,000 miles of levees. Communities and citizens living behind levees tend to think they provide total protection from flooding, despite yearly overtopping and scores of levee failures. The issues are many. How should FEMA map the residual risk areas? Who will assure the levee is adequate? Should flood insurance be required? What should development standards be in residual risk areas? All of these issues relate to how policies and programs influence development or lack of development of these areas—either reducing or creating tomorrow's disasters.

**Moderator:** Jim Murphy, URS Corporation

**Panelists:** Tammy Conforti, U.S. Army Corps of Engineers; Sam Riley-Medlock, Association of State Floodplain Managers; Bill Blanton, Federal Emergency Managment Agency

**Organizer:** Jim Murphy, URS Corporation

Track: Community Planning

### Taking Firewise Communities to the Next Level

Mon. 2:00-3:30 p.m., Centennial F

The Firewise Communities program is ten years old and grow-

ing rapidly. Recent additions of the International Association of Fire Chiefs READY! SET! GO! program and Fire Adapted Communities initiative have expanded Firewise tools that take a long-term approach to reducing loss of life, property, and natural resources in the wildland-urban interface. This panel will discuss the ongoing challenges of developing sustainable Firewise communities, changes in insurance practices and their implications, and models for awareness programs and partnerships that effect behavioral changes.

**Moderator:** David Nuss, National Fire Protection Association

**Panelists:** Keith Worley, National Fire Protection Association; Molly Mowery, National Fire Protection Association; Hannah Brenkert-Smith, University of Colorado at Boulder

**Organizer:** Keith Worley, National Fire Protection Association

Track: Risk Education

### The Role of Testing Centers in Educating the Public about Disaster Risk

Mon. 2:00-3:30 p.m., Centennial E

The Insurance Institute for Business and Home Safety's new research center provides unprecedented opportunities for laboratory testing of full-scale one- and two-story residential and commercial structures in conditions that mimic high winds, wind-driven rain, wildfire, and hailstorms. The results of this research can help improve building codes and voluntary standards to make buildings safer and stronger. But what is the best way to translate research findings into forms that let the public better understand disaster risk and mitigate it? This session features video footage from the IBHS research center, as well as discussion among engineering experts and social scientists aiming to identify meaningful paths of communication.

**Moderator:** Debra Ballen, Insurance Institute for Business and Home Safety

**Panelists:** Lori Peek, Colorado State University; Carole Walker, Rocky Mountain Insurance Information Association; Deborah Mills, Dewberry

**Organizer:** Debra Ballen, Insurance Institute for Business and Home Safety

Track: Addressing Vulnerabilities

### Evidence-Based Best Practices for Disability Issues

Mon. 2:00-3:30 p.m., Interlocken C

What is the state of research on disabilities and disasters? How is that evidence being translated—or not being translated—into best practices? What research needs to be undertaken to better inform policy and practice? In what ways are researchers, policy makers, and practitioners working together on these concerns?

**Moderator:** Laura Stough, Texas A&M University

**Panelists:** Brenda Phillips, Oklahoma State University; DeeDee Bennett, Oklahoma State University; Brett Bailey, Tulsa Police Department

**Organizer:** Brenda Phillips, Oklahoma State University

Track: Recovery and Resilience

### Recovery Best Practices

Mon. 2:00-3:30 p.m., Interlocken B

The Disaster Mitigation Act of 2000 formalized hazard mitigation as a necessary piece of emergency management. Similarly, the 2011 release of the National Disaster Recovery Framework is likely to increase the professionalization and formalization of recovery planning and management in the United States. The timing is fortuitous. As recent disasters show, the challenges faced by governments, communities, and victims are daunting. This panel will define and discuss emerging knowledge and best practices in disaster recovery in the context of recovery experiences from the United States, as well as Japan, New Zealand, Haiti, Chile, and China. Best practices will be examined at various levels of government and nongovernmental organizations, as well as from the perspective of affected residents and businesses.

**Moderator:** Laurie Johnson, Laurie Johnson Consulting

**Panelists:** David Abramson, National Center for Disaster Preparedness; Robert Olshansky, University of Illinois at Urbana-Champaign; Doug Ahlers, Harvard Kennedy School of Government; Kanako Iuchi, The World Bank

**Organizer:** Laurie Johnson, Laurie Johnson Consulting

### Break

Mon. 3:30-4:00 p.m.

Track: Wet and Dry

### Has the Time Come to End the NFIP?

Mon. 4:00-5:30 p.m., Interlocken A

Over the past several years, both the Federal Emergency Management Agency and the private sector have expressed interest in potential privatization of the debt-ridden National Flood Insurance Program. Skeptics, however, believe that politics and economics make this idea a non-starter. Panelists will discuss whether flood risk is different from other hazards, examine private sector capacity and risk appetite, and look at how Congress and the states could manage the transition.

**Moderator:** Debra Ballen, Insurance Institute for Business and Home Safety

**Panelists:** Franklin Nutter, Reinsurance Association of America; Carolyn Kousky, Resources for the Future; Patty Templeton-Jones, Fidelity National Indemnity Insurance; Jeremiah Konz, Aon Benfield Analytics

**Organizer:** Debra Ballen, Insurance Institute for Business and Home Safety

Track: Community Planning

### Integrated Research on Disaster Risk: Bridging Research, Policy, and Practice

Mon. 4:00-5:30 p.m., Centennial E

Integrated Research on Disaster Risk was developed to address research gaps, silos, and policy voids with a trans-disciplinary, global approach. Four initiatives—Assessment of Integrated Research on Disaster Risk, Disaster Losses Data, Forensic Investigations of Disasters, and Risk Interpretation and Action—address different aspects of disaster risk research. This session will explore how these initiatives and IRDR provide valuable inputs for the scientific community to explore natural hazards and disasters of all sizes.

**Moderator:** Jane Rovins, Integrated Research on Disaster Risk

**Panelists:** Anthony Oliver-Smith, University of Florida; Ian Burton, University of Toronto; Allan Lavell, Facultad Latinoamericana de Ciencias Sociales; Susan Cutter, University of South Carolina

**Organizer:** Susan Cutter, University of South Carolina

Track: Risk Education

### Bridging the Gap: What Does Industry Want from Hazard Science?

Mon. 4:00-5:30 p.m., Interlocken B

Many components of risk reduction and resilience hinge on business and industry disaster readiness and their responses to unfolding events. As the usefulness of public-private partnerships is increasingly recognized, social and natural scientists have new opportunities to engage in ongoing conversations with the business community. In this session, representatives from major corporations and industries will discuss what they now get from natural and social sciences related to natural hazards, as well as what they still need.

**Moderator:** John Bwarie, U.S. Geological Survey

**Panelists:** Lucy Jones, U.S. Geological Survey; Lee Davis, Target; David Krantz, Columbia University Center for Research on Environmental Decisions

**Organizer:** John Bwarie, U.S. Geological Survey

Track: Addressing Vulnerabilities

### "Whole of Community" Evacuation

Mon. 4:00-5:30 p.m., Centennial F

While the majority of evacuation assessments have focused on auto-based independent self-evacuees, recent emphasis has shifted toward providing evacuation transportation resources to transit-based assisted evacuees. However, evacuations are not limited to these processes. Aerial evacuations for tourists and populations with access and functional needs are used in the Florida Keys. Evacuation by air, rail, and buses are key elements of the New Orleans assisted evacuation plan. Maritime evacuations using ferries are planned for Washington and Alaska and were used during the 9/11 evacuation of lower Manhattan. Pedestrian-based evacuations have been critical in the past and are now being looked to for tsunami-related coastal evacuations, where people are urged simply to get to higher ground as quickly as possible. There is a plethora of emergency plans, but none are a template for "how to" specifically coordinate transportation efforts and resources in a variety of emergency situations, across multiple modes, for self-evacuees and assisted evacuees. This session will discuss research-based guidance and standards currently being developed. Come join the efforts.

**Moderator:** Stephan Parker, Transportation Research Board of The National Academies

**Panelists:** Richard Devylder, U.S. Department of Transportation; Deborah Matherly, The Louis Berger Group; John Porco, Michael Baker Corporation; David Henry, National Governors Association

**Organizer:** Stephan Parker, Transportation Research Board of The National Academies

Track: Recovery and Resilience

### Plans and Practices—Promoting Rural Community Resilience

Mon. 4:00-5:30 p.m., Interlocken C

Considerable funding has been dedicated to improving the resilience of urban areas. In rural communities, the extent of hazard mitigation, preparedness, emergency response, and disaster recovery is less understood. Recent work has focused on increasing awareness related to vulnerability and enhancing resilience in rural communities. This panel will discuss how hazard mitigation planning and practices vary, and present strategies to improve the capacity for community sustainability and management in natural hazard situations. Panelists will also highlight how access to online information affects perceptions of individual and collective resilience.

**Moderator:** Laurie Pearce, Royal Roads University

**Panelists:** Jennifer Horney, University of North Carolina at Chapel Hill; Jeanette Sutton, University of Colorado at Colorado Springs Trauma, Health, and Hazards Center; Robin Cox, Royal Roads University

**Organizers:** Jennifer Horney, University of North Carolina at Chapel Hill and Laurie Pearce, Royal Roads University

### Barbecue at NCAR Mesa Lab

Mon. 6:00-9:00 p.m.

University of Colorado buses will pick up participants going to the barbecue promptly at 6:00 pm in front of both the Renaissance and Omni hotels to go to NCAR. After the barbecue, buses will leave at intervals as demand calls for it. The last bus will leave NCAR for the hotels at 9:00 pm.

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# Tuesday, July 17

### Registration
Tue. 8:30 a.m.-3:00 p.m., Interlocken D

Track: Wet and Dry

### State and Local Drought Emergency Management
Tue. 9:00-10:30 a.m., Centennial E

The 2011 *Global Assessment Report on Disaster Risk Reduction* states, "In internationally reported droughts since 1900, more than 11 million people have died with over 2 billion affected, more than by any other single hazard. Facing a changing climate, the World Meteorological Organization's Secretary-General justifies his agency's new climate services framework as "an important tool in the struggle against drought and land degradation." But even scientifically defining drought is a sticky business. Is that a meteorological, agricultural, hydrological, or socioeconomic drought—how do we know? More to the point, with large portions of Colorado in a declared Drought Emergency for over a year, and Texas emergency managers considering whether some communities may soon have no real choice but to dry up and disappear, why do we care? Panelists in this session will discuss how drought might differ from other hazards in terms of scientific understanding, nature of the risk, and perception; how those differences impact scientists' ability to provide meaningful decision support to emergency managers; and what might be done to improve that support.

**Moderator:** Chad McNutt, National Integrated Drought Information System

**Panelists:** Mike Bewley, Texas Division of Emergency Management; Taryn Hutchins-Cabibi, Colorado Water Conservation Board; Nolan Doesken, Colorado Climate Center, Invited; Mark Svoboda, National Drought Mitigation Center, Invited

Track: Community Planning

### Focusing on the Environmental Effects of Natural Disasters
Tue. 9:00-10:30 a.m., Interlocken A

This session will focus on the environmental effects of natural disasters with an emphasis on land use, soil and water contamination, contamination from oil spills and the chemical dispersants used to address them, and health problems resulting from one's physical

presence in a disaster zone. Panelists will highlight environmental concerns following natural disasters and the ongoing environmental effects of disasters on the environment. The discussion will assert that local attention to environmental issues is a first line of response and such an approach will create a more local role in developing disaster resilient communities.

**Moderator:** Philip Berke, University of North Carolina at Chapel Hill

**Panelists:** Pamela Jenkins, University of New Orleans CHART; Tom Birkland, North Carolina State University; Dana Greene, University of North Carolina

**Organizer:** Dana Greene, University of North Carolina

Track: Risk Education

### Insurance and Public Policy

Tue. 9:00-10:30 a.m., Centennial F

This session will discuss how new insurance products can be a tool to promote public policies that help communities cope with the financial aspects of catastrophe, even as the catastrophe unfolds. Because the cost of insurance helps people understand the financial risk associated with building in hazardous areas, premiums that are truly risk based can discourage irresponsible practices and encourage better building and zoning. Models originally developed by the insurance industry are already used by many communities to help prepare for the possibility of a natural disaster. Where are they headed?

**Moderator:** Andy Castaldi, Swiss Re

**Panelists:** Franklin Nutter, Reinsurance Association of America; Alex Kaplan, Swiss Re; Patricia Grossi, Risk Management Solutions

**Organizer:** Andy Castaldi, Swiss Re

Track: Addressing Vulnerabilities

### What Keeps Me Up at Night: Senior Hazards Experts Reflect on Lessons (Not) Learned

Tue. 9:00-10:30 a.m., Interlocken B

What keeps long-time hazards researchers and practitioners up at night? It's the information and know-how that's *not* being transmitted to the younger generation. Join this group of panelists—all with at least 25 years of experience—as they share their concerns about issues in the hazards and emergency management field.

**Moderator:** Claire Rubin, Claire B. Rubin and Associates

**Panelists:** Dennis Mileti, University of Colorado Natural Hazards Center; Larry Larson, Association of State Floodplain Managers; Linda Bourque, UCLA

**Organizer:** Claire Rubin, Claire B. Rubin and Associates

Track: Recovery and Resilience

### Fostering Resilient Communities: From National Initiatives to the Grassroots and Back

Tue. 9:00-10:30 a.m., Interlocken C

This session will look at a several national pilot programs that seek to spark local resilience-building activities. The Natural Hazard Mitigation Association has embarked on a peer-to-peer community mentoring initiative to promote long-term local hazard mitigation planning and activities. The Federal Insurance and Mitigation Administration is engaged in pilot projects to assess the utility of creating additional incentives for community action. And the American Red Cross has pilot community engagement projects in several cities to test if local chapters can step out of their traditional role as emergency service providers and act as hub for building ongoing community resilience. These programs will be discussed both in terms of their grassroots successes, and how those local results might inform national policy.

**Moderator:** Ann Patton, Natural Hazard Mitigation Association

**Panelists:** Tim Lovell, Tulsa Partners; Darrin Punchard, AECOM; Russ Paulsen, American Red Cross; David Maurstad, Optimal Solutions and Technologies, Invited

**Organizer:** Alessandra Jerolleman, Natural Hazard Mitigation Association

### Break

Tue. 10:30-11:00 a.m.

Track: Wet and Dry

### Silver Jackets: Leveraging Resources for Integrated Flood Risk Management Solutions

Tue. 11:00 a.m.-12:30 p.m., Interlocken A

The U.S. Army Corps of Engineers Silver Jackets Program, begun in 2005, supports an ongoing effort to create a unified interagency approach to reducing flood risk and flood fight and recovery expenditures. Silver Jackets teams are different from prior approaches because they are state-led collaborations of USACE, FEMA, and other federal agencies, with some participation by local and tribal governments and

NGOs. There are now 33 Silver Jackets teams and most other states have ongoing efforts to develop a team. Recently, USACE solicited funding proposals from individual teams for projects to encourage integrated flood risk management solutions, with a strong emphasis on leveraging existing resources and demonstrating success in terms of enabling flood risk management actions by others. Concurrently, FEMA Risk MAP has progressed in developing its Action Metrics. This session will discuss the successes and ongoing challenges encountered in evaluating these projects across agencies and levels of government.

**Moderator:** Larry Larson, Association of State Floodplain Managers

**Panelists:** Jennifer Dunn, U.S. Army Corps of Engineers; Mike Anderson, Stantec; Mark Stephensen, Idaho Bureau of Homeland Security; Tom Morey, Kansas Department of Agriculture, Invited

**Organizer:** Edward Hecker, U.S. Army Corps of Engineers Institute for Water Resources

Track: Community Planning

### Postdisaster Toolkit: What Every State and Local Hazard Mitigator Needs to Know

Tue. 11:00 a.m.-12:30 p.m., Interlocken C

This panel will present ideas on how best to seize the opportunity presented by a flood or other presidentially declared disaster to use existing funding, technical assistance, and other tools to significantly reduce future losses. The panel will also identify gaps in policies or funding which impede hazard mitigation. Tools that have worked in the past to augment flood hazard mitigation will be discussed, and presenters and the audience will have an opportunity to suggest other concepts. These tools will be collected and used at presentations at both the NHMA Practitioners Meeting and the U.S. Army Corps of Engineers Flood Risk Management and Silver Jackets Workshop.

**Moderator:** Edward Thomas, Natural Hazard Mitigation Association

**Panelists:** Charles "Ray" Alexander, U.S. Army Corps of Engineers; Mike Kline, Vermont Department of Environmental Conservation; Deborah Ingram, Federal Emergency Management Agency; David Miller, Federal Emergency Management Agency

**Organizer:** Edward Thomas, Natural Hazard Mitigation Association

Track: Risk Education

### Case Comparison Studies in the Integrated Risk Governance Project

Tue. 11:00 a.m. to 12:30 p.m., Interlocken B

Case comparisons among Asia, North and South America, Europe, and Africa are one of six research themes for the International Human Dimensions Programme on Global Environmental Change's Integrated Risk Governance Project. In this session, the project's case comparison team will present recent research results from different countries and discuss new initiatives and future research activities.

**Moderator:** Mickey Glantz, University of Colorado at Boulder

**Panelists:** Qian Ye, Integrated Risk Governance Project; Saini Yang, Beijing Normal University; Adrian Gheorghe, Old Dominion University

**Organizer:** Qian Ye, Integrated Risk Governance Project

Track: Addressing Vulnerabilities

### Not Just Zombies: Increasing Public Health Preparedness and Response

Tue. 11:00 a.m. to 12:30 p.m., Centennial F

Sometimes it takes drastic measures to get the public engaged in preparedness. Enter the Zombies. What began as a tongue-in-cheek public health preparedness campaign by the U.S. Centers for Disease Control and Prevention has since turned into one of its most effective preparedness messages. But public health preparedness isn't just for zombies—it extends across all hazards, including hurricanes, pandemics, earthquakes, and terrorist attacks. Panelists will tackle topics such as how local health departments responded to the H1N1 threat, how partnerships, modeling, and metrics are being used to improve resiliency, and how one state health department is using social network analysis to improve public health surveillance.

**Moderator:** Mildred Williams-Johnson, Centers for Disease Control and Prevention

**Panelists:** Kim Shoaf, UCLA Center for Public Health and Disasters; Monica Schoch-Spana, University of Pittsburgh Center for Biosecurity; Eric Carbone, Centers for Disease Control and Prevention; Patricia Sweeney, University of Pittsburgh Graduate School of Public Health

**Organizer:** Christine Bevc, North Carolina Preparedness and Emergency Response Research Center

Track: Recovery and Resilience

### Knowledge Commons and Complex Networks in Disaster Resiliency

Tue. 11:00 a.m. to 12:30 p.m., Centennial E

Building communities that are resilient against natural threat is a widely discussed issue, but few studies address policy tools that could promote resiliency. Various dimensions of disaster resilience policies are available, including inter-organizational network management, community planning and development, community social capital, and networks. This panel uses a knowledge commons as a framework to organize complex issues in network formation, management and leadership, and sustainability.

**Moderator:** Dennis Wenger, National Science Foundation

**Panelists:** Louise Comfort, University of Pittsburgh Center for Disaster Management; David Johnson, Missouri State University; Naim Kapucu, University of Central Florida; Branda Nowell, North Carolina State University

**Organizer:** Naim Kapucu, University of Central Florida

### Lunch

Tue. 12:30-2:00 p.m., Outdoor Pavilion

## PLENARY

### Communities Experiencing Tornadoes and Their Recovery

Tue. 2:00-3:30 p.m., Interlocken A/B

The past five years have seen numerous tornado outbreaks and major tornado disasters. In 2007, an F5 tornado destroyed approximately 95 percent of the city of Greensburg, Kansas. Another F5 tornado struck Joplin, Missouri, in 2011, creating large-scale damage and killing over 160 people. Tornadoes also struck last year in Massachusetts, where Monson was the hardest-hit community with hundreds of homes and businesses lost. This plenary session features speakers from the three communities discussing, among other topics, how they met recovery challenges following these major disasters.

**Moderator:** Dennis Mileti, University of Colorado Natural Hazards Center

**Panelists:** Gretchen Neggers, Town of Monson, Massachusetts; Angie Besendorfer, Joplin Schools; Bob Dixson, City of Greensburg,

Kansas

**Organizers:** Kristina Peterson, University of New Orleans CHART; Edward Thomas, Natural Hazard Mitigation Association; and Shirley Laska, University of New Orleans

### Wrap Up and Adjourn

Tue. 3:30-3:45 p.m., Interlocken A/B

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# 附錄-2　2012 年國際防災研究人員委員會議論文報告摘要

**DAVID ABRAMSON,** COLUMBIA UNIVERSITY
**VIRGINIA RAUH,** COLUMBIA UNIVERSITY
**ROBIN WHYATT,** COLUMBIA UNIVERSITY
**LORI PEEK,** COLORADO STATE UNIVERSITY

## Child Impact Study: A Research Project of the Women and Their Children's Health (WATCH) Consortium

The Child Impact Study is part of a Gulf Coast Research Consortium being led by Louisiana State University's Health Sciences Center. This consortium is funded by a five-year grant from the National Institute of Environmental Health Sciences to study the long-term health effects of the Deepwater Horizon oil spill on women and children.

The overall goals of the Child Impact Study are: (1) to understand the short- and long-term impacts of the oil spill on children's development and well-being and (2) to examine how parental and social forces, and alternative treatment models, can mediate or modify the spill's effects on children. The study will employ longitudinal data from the 4,000 women and 1,000 adolescents enrolled in the larger Women and Their Children's Health survey cohort to achieve these goals. This data will be supplemented by a qualitative study of 20 families whose children are "outliers," surprisingly resilient (or vulnerable) given their circumstances or exposure to the oil spill.

This research will deepen scientific understanding of how childhood stress mediates behavioral and psychological dysfunction within the context of extreme economic disruption and collective uncertainty. Further, our research will develop an ecological bio-behavioral explanatory framework that more adequately describes the role of multi-level contextual and social factors on children's well being. By determining the pathways of harm to children, this study can assist the affected communities in understanding the potential oil spill-related impairment, and identify those factors which modify or buffer its effects.

**RYAN ALANIZ,** UNIVERSITY OF MINNESOTA

## Unsupervised Recovery: Adaptation Strategies by two NGOs in Post-Mitch Honduras

This paper investigates how the void left by the Honduran state enabled NGOs to implement their own disaster recovery and development agenda. NGOs founded new communities and resettled survivors without governmental oversight. I argue this lack of oversight permitted organizations to enact significantly different development agendas, which in turn led to stratification in long-term social health and community development. Lessons can be drawn from these experiences for future resettlements in fragile states.

**EMMA APATU,** EAST TENNESSEE STATE UNIVERSITY
**CHRIS GREGG,** EAST TENNESSEE STATE UNIVERSITY
**DAN AGA,** AMERICAN SAMOA COMMUNITY COLLEGE
**KASIE RICHARDS,** EAST TENNESSEE STATE UNIVERSITY

## Strengthening Public Health and Disaster Resilience in American Samoa: The use of the Precede-Proceed Model

American Samoa is a U.S. island territory located in the South Pacific Ocean. The group of islands is rich with breathtaking coastlines and culture filled with great tradition. Currently, local officials are actively working to combat one of the world's worst obesity-related syndemics. High prevalence of diabetes, sedentary behavior, movement away from traditional food practices and heavy reliance on imported goods, are just a few factors that exacerbate health outcomes in this resource poor island.

In addition to the health related problems, American Samoa is geographically located in a very seismically active region—the Tonga trench, which has the potential to produce large earthquakes. In 2009, the islands of America Samoa, along with Tonga, Fiji, and Samoa experienced devastating effects from a magnitude 8.1 earthquake that spawned a tsunami. Thirty-four people were killed in American Samoa and the local infrastructure was significantly damaged.

Building a healthier and disaster resilient community is cornerstone of the mission of the new Nutrition Exercise and Health and Wellness Research Center, housed at the American Samoa Community College. Major strides are being made by local and federal efforts in improving public health and disaster resilience. This study builds on previous and current work by applying an ecological planning model to identify prevention links between obesity-related syndemics that can improve disaster resilience. Specifically, findings related to the application of the Precede-Proceed Model using secondary data to visualize how public health and natural disaster resilience can be further improved in American Samoa are presented.

**SUDHA ARLIKATTI,** UNIVERSITY OF NORTH TEXAS

## Assessing Resiliency Among Rural, Suburban, and Urban Communities Following the 2011 Thailand Floods

On July 25, 2011, Tropical Storm Nock-ten made landfall on the coast of Thailand, causing severe inland flooding in many parts of the country. The floods of 2011-2012 were different from previous floods. Floodwater inundated communities for more than eight months (beginning July 25, 2011 and continuing through mid-March 2012) affecting more than 12.8 million people in 65 of the country's 75 provinces. The Thai government and multi-sector organizations are actively engaged in helping build community resiliency in preparation for the next heavy monsoons (July-October).

Faculty researchers from the University of North Texas received a National Science Foundation grant to study why some communities were more resilient than others following the 2011 Thailand floods. The dimensions of community resiliency in three types of Thai provinces—rural (Pathum Thani), suburban (Ayutthaya), and urban (Bangkok)—will be examined to understand the differences caused by various geographic and socio-economic indicators. The team traveled to Bangkok in late May 2012 to conduct field research using semi-structured interviews. Key respondents from public, private, non-governmental, and faith-based organizations were interviewed to document the earliest processes, programs, and policies used to address the immediate and short-term needs of the flood-affected communities.

Ephemeral data collected to document how decisions were initially made—and changed by organizations located in rural, suburban, and urban settings will be presented. These will help identify what types of ad hoc policies and fluid governance mechanisms are useful in explaining variations in community resiliency across jurisdictions and geographic units. These findings from a developing country add value to discussions on plans and practices to promote rural resiliency around the world.

**STACEY MENZEL BAKER,** UNIVERSITY OF WYOMING

## Negotiating Material Well-Being in Disaster Recovery

This work blends perspectives on community and consumer psychology. Community psychology devotes attention to person-environment relationships, with a goal of improving well being. While well-being is a multifaceted concept with a number of distinct meanings, it simply suggests living well and doing well. Two cornerstone concepts in community psychology and the study of well-being are a sense of community and diversity. Sense of community represents perceived strength of bonds among people, and diversity encompasses tolerance for differences in perspectives.

Consumer psychology has a rich history of the study of relations between people and material objects. Objects provide individuals with self-definitional and self-continuity value. The self-definitional properties of objects derive from their ability to help people tell life stories; whereas self-continuity properties of objects facilitate individual adaptation and self-preservation. Our work shows that objects provide similar value to collectives.

This paper explains how a community uses objects to negotiate tradeoffs between a sense of community (collective ethos) and community diversity (individual ethos). Our ethnographic work during natural disaster recovery illuminates collective negotiation of consumption needs and ownership responsibilities, related to damaged and donated goods that move from private to public ownership, and vice versa. We further show how goods, and performances related to their usage, are building blocks for reconstructing collective identity. As such, we contribute to the disaster literature by enhancing our understanding of object meanings, and by providing a substantive contribution for improving the human condition during times of deprivation.

**MIRIAM BELBLIDIA,** CITY OF NEW ORLEANS

## Hazard Mitigation Strategies in a Post-Disaster Environment

Following hurricanes Katrina and Rita, Louisiana was eligible for $1.47 billion through the Federal Emergency Management Agency's Hazard Mitigation Grant Program to reduce future loss of life and property from natural disasters. The state and local governments have directed millions in HMGP funds towards the elevation of houses to a height above the one percent annual chance flood level.

Using New Orleans as a case study, this research argues that local governments should use hazard mitigation funds to address repetitive flooding at the neighborhood level, rather than through costly elevations of individual properties. While home elevations are a standard way to mitigate damage to flood-prone structures, the scattershot approach to these mitigation projects raises questions about whether this is the most effective way to reduce risk at the community level.

This research examines how government agencies prioritize mitigation projects and the impact of HMGP funding on reducing exposure to flood risk. Analysis of repetitive loss and severe repetitive loss data from the National Flood Insurance Program suggests that recurring flood losses may be best handled at the local level through property buyouts, drainage infrastructure upgrades, improved stormwater management, and stricter building codes.

When coupled with state and federal efforts to reduce risk from the one percent annual chance floods, such an approach provides a more strategic path for local governments attempting to best use hazard mitigation grant funds to reduce future flood losses.

**ERIC BEST,** UNIVERSITY OF DELAWARE

## Using Mobile Phone and Internet Data to Improve Disaster Research

Location and behavior data offer exciting new possibilities to the field of disaster science. Smartphones continuously collect data about location, text, and e-mail content, call history, and Internet browsing history. Even though there is a growing legal precedent that detailed location and behavior data may be used for analyses, the academic community is lagging on using these data to improve disaster science research.

I propose an aggregate approach to mobile phone and Internet data collection and analysis for disaster science research that bypasses many of the privacy concerns about using location and behavioral data. Tracking communities instead of individuals removes these types of studies from the privacy debate and allows institutions to make decisions to maximize benefits based on data instead of anecdotal individual cases.

I present four proposed conceptual models, prototyped with volunteer location and behavioral data from mobile phones and networked devices, to improve disaster science research. The disaster community could improve response times, identify geographic areas of concern, improve survey methods, and conduct more efficient evacuations through institutional adoption of these models.

These models complement current best practices in disaster resilience, response, and recovery research. Adoption would allow disaster scientists to better test prevailing theories in disasters in real-time, allow responders to improve efficiency and ability to manage disasters, and confirm situational awareness. These prototype models are intended to stimulate the disaster science community to consider the vast possibilities of incorporating connected device data into current research projects using surveys or social network analysis.

**LISA BROWN,** UNIVERSITY OF SOUTH FLORIDA
**LORI PEEK,** COLORADO STATE UNIVERSITY

## Hurricane Preparedness and Sheltering Preferences of Muslims Living in Florida

Given the increasing diversity of the United States population and the continued threat of hurricane devastation in the heavily populated Gulf Coast region, the lack of research on preparedness and sheltering activities across religious or cultural groups represents a significant gap in the field of hazards and disaster research. To address this void, a survey questionnaire examining hurricane preparedness attitudes and sheltering preferences was administered to Muslims living in Tampa, Florida.

The final sample of 139 Muslim adults had a mean age of 36.37 (+/- 11.8) with males and females equally represented. Significant differences were found in disaster planning activities and confidence in hurricane preparedness. Of those who had a disaster plan, 85.4 percent felt confident in their preparedness, compared to 27.4 percent of those with no plan and 27.3 percent of those who were unsure as to whether they had a plan.

This exploratory study also revealed that safety, cleanliness, access to a prayer room, and privacy were concerns related to using a public shelter during hurricanes. Nearly half of the respondents (47.4 percent) noted that the events of 9/11 influenced their comfort level about staying in a public shelter during a hurricane disaster. Disaster planners should be aware of the religious practices of the Islamic community, encourage disaster planning among diverse groups, and address safety and privacy concerns associated with using public shelters.

**VALÉRIE CÉRÉ,** CANADIAN RISK AND HAZARDS NETWORK

## The Role of Anthropology in Disaster Preparedness

Disaster anthropology tries to understand the means used by a population to cope with and adapt to their perceptions of vulnerability and risk in these times of global climate change. In doing so, researchers in this field study local knowledge and the perception of risk in a population's everyday life.

Disaster anthropology can offer some answers to disaster preparedness practitioners and decision makers who struggle with cultural issues. It also studies the social transformations and the cultural changes in the post-disaster period. It is useful while planning for long-term reconstruction.

**ROBIN COX,** ROYAL ROADS UNIVERSITY
**LORI PEEK,** COLORADO STATE UNIVERSITY

## Youth-Centered Disaster Recovery: A Participatory Action Research Project

This abstract describes a recently funded Social Sciences and Humanities Research Council participatory action research project focused on the experiences and insights of disaster-affected youth. The research will engage young people from Slave Lake, Alberta and Joplin, Missouri as active partners to explore the following research questions: (1) How do disasters affect the daily lives of youth; (2) What assets and vulnerabilities do they identify as contributing to/or hindering their recovery; (3) What forms of support do youth need and how are those needs being met; (4) How do they actively contribute to their own and their communities' recovery; and (5) How might youth-centered recovery activities incorporate and contribute to the longer-term resilience of youth, their families, and their communities.

The study's participatory action research model will engage youth through cross-border research and contribute to the development of youth-inclusive theories of community-based disaster recovery and resilience. A workshop using participatory, creative exploration strategies (e.g., photography, participatory video, conversation circles, and focus groups) will engage participants collaboratively and creatively in an examination of the ways in which social, economic, and personal factors influence disaster vulnerability among youth and their capacity to recover and contribute to long-term resilience.

These processes will encourage individual and shared meaning making and empower participants as change agents in their communities. The innovative multi-media knowledge mobilization activities and products will increase awareness and inform recovery practice locally and internationally, contributing to a broad policy uptake.

**KAMER DAVIS,** FEMA FLOODSMART CAMPAIGN

## A Look at Encouraging Public and Business Engagement

For communities subject to flood, a knowledgeable public is an essential component of resilience. FloodSmart combines national outreach with development of shareable tools for local officials, floodplain managers, insurance professionals, and others. These tools help people understand their flood risk and the personal consequences of flooding. Sharing them widely multiplies the channels for effective communication.

In building the tools we've learned a number of valuable lessons regarding what will engage the public and keep them engaged over time. Questions include: How to sustain involvement? How to reach generations that communicate through different channels? How to "refresh" information to promote engagement?

**MARSHA DOWNSWELL,** MINES AND GEOLOGY DIVISION, HOPE GARDENS, JAMAICA
**BARBARA CARBY,** UNIVERSITY OF THE WEST INDIES

## The Impact of the Failure of Gully Walls on Two Communities in Kingston, Jamaica

Storm water runoff in Kingston, the capital of Jamaica, is managed by a system of waterways called gullies. Despite potential loss of life and property, illegal occupation of the banks of these gullies has become widespread.

In September 2010, Tropical Storm Nicole caused severe damage to infrastructure. There were several reports of failures of gully walls, including one incident in which a family of six died when a section of the gully wall failed, sending their house into the flooded waterway.

This study examines the reasons for the failure of the gully walls. It explores the impact of failures on two communities—one formal and one informal.

The study found that the failure of the walls is caused by several factors including breaching by residents and poor maintenance. The impact on the communities differs. Many houses in the informal settlement do not conform to setback requirements and are therefore susceptible to damage due to failure. Houses in the formal settlement adhere to setback requirements and are less exposed to damage from failure of the walls. It is suggested that adherence to setback requirements can reduce the vulnerability to flooding of residents along Kingston's waterways.

**ELAINE ENARSON,** INDEPENDENT SCHOLAR

## Disaster Risk Reduction and Climate Change Adaptation: Will Women Lead?

Two decades of research, organizing, and advocacy have advanced gender analysis with respect to disaster risk. One outcome has been the recognition of gender as a cross-cutting principle of disaster risk reduction. This policy position is not yet well established in climate work, although the convergences are significant and substantive. The facts on the ground, advocacy communities, research questions, and many of the policy issues inherent in successful risk reduction are closely interwoven. A more integrated approach is warranted.

This presentation will describe critical areas of overlap in the domains of gender, disaster, climate research, policy, and practice. The pitfalls of the current "two solitudes" approach and the merits of a more holistic approach ("many bridges, one tent") will be outlined.

To develop these ideas, specific research studies and promising practices will be shared, highlighting the contribution of gender-responsive approaches to increasing adaptive capacity and reducing the risk of climate-related disasters. Across the globe, in diverse nations very differently situated in environmental, economic, social, and political context, a more integrated approach to climate and disaster risk potentially positions women as critical leaders in furthering mitigation and adaptation at different levels. What barriers to women's leadership exist and how can these be reduced? How can women and men, respectively, be more effectively engaged in meeting the challenges of climate disasters?

**CHRISTINE ERIKSEN,** UNIVERSITY OF WOLLONGONG

## Gender and Wildfire at the Wildland-Urban Interface

In pursuit of lifestyle change, affordable property, and proximity to nature, people from all walks of life are moving to the wildland-urban interface. Tragic wildfires, a predicted increase in high fire-danger weather, and climate change have triggered concern for the safety of such amenity-led migrants in wildfire-prone landscapes.

This book—*Gender and Wildfire at the Wildland-Urban Interface* (available late 2012)—examines wildfire awareness and preparedness among women, men, households, communities, and agencies at the interface of the city and beyond. It is based on extensive qualitative (in situ interviews) and quantitative (postal and online surveys) research over the past five years in two regions where wildfires are common and disastrous: southeast Australia and the U.S. West Coast. It follows stories of surviving, fighting, evacuating, living, and working with wildfire to reveal the intimate inner workings of wildfire response—and especially the culturally and historically distinct gender relations that underpin wildfire resilience.

Wildfire is revealed as much more than a "natural" hazard—it is far from gender neutral. Rather, wildfire is an important means through which traditional gender roles and power relations are maintained despite changing social circumstances. The subjectivities of women and men are shaped by varying senses of inclusion, exclusion, engagement, and disengagement with wildfire management. This leads to the reproduction of gender identities with clear ramifications for if, how, and to what extent women and men prepare for wildfire at the wildland-urban interface.

**DEBORAH GLIK,** UCLA
**DAVID EISENMAN,** UCLA
**MICHAEL PRELIP,** UCLA
**ANDREA MARTEL,** UCLA
**MICHAEL STAJURA,** UCLA
**JITKA SAMMARTINOVA,** UCLA
**IAN DONATELLO,** UCLA

## Measuring Partnerships for Community Disaster Resilience Between Community-Based Organizations and Public Health Departments

*Background:* Public health departments receive $700 million annually for disaster planning from the U.S. Centers for Disease Control and Prevention (CDC) Public Health and Emergency Preparedness funding. Guiding this funding is the "Public Health Preparedness Capabilities: National Standards for State and Local Planning," which provides standards for public health preparedness planning. Under the community resilience standards, local health departments are recommended to engage with community-based organizations to improve community preparedness. However, there are no metrics to evaluate the level of engagement between the two types of organizations.

*Aims:* We developed a measure for assessing engagement between local health departments and community-based organizations.

*Methods:* First, we developed a hierarchical model of engagement between local health departments and community-based organizations based on a systematic literature review and interviews with key informants from 21 community organizations and 13 health departments. The resulting model posited four levels of engagement between local health departments and community-based organizations around resilience: community outreach, resource sharing, organizational capacity building, and partnership development.

Second, we developed questions for each level and conducted cognitive testing of candidate items. Third, we conducted a national survey of local health departments, stratified by the size of the population served (N=273 of 654 contacted; response rate=42 percent).

*Results:* The questions used to assess each of the four levels produced Chronbach's alpha scores ranging from 0.71 to 0.88. The total variance explained through factor analysis was 54 percent.

*Conclusions:* Our measure can be used by the CDC and local health departments to assess their engagement with community-based organizations around community resilience.

**ALEX GREER,** UNIVERSITY OF DELAWARE

## Oil Spill Events: Prominent Frames and Policy Implications

The purposes of this thesis are twofold. First, to gain insight as to how the framing of an oil spill influences policy change and to discern how competing frames affect policy. The second purpose is to offer new recommendations to help bridge the safety gap the industry currently experiences, exposed by three spills.

For this study, three oil spills were chosen because of the policy changes they inspired, the media attention they garnered, and their size. They are the 1969 Union Oil Platform A blowout in Santa Barbara, California; the wreck of the *Exxon Valdez* in 1989; and the Deepwater Horizon blowout in 2010.

A content analysis was performed on scholarly articles, media articles, after action reports, court records, policy, and policy recommendations. This study also drew on in-depth interviews with key informants who were involved in at least one of the three spills. The study findings suggest that framing significantly affects the policy that results.

In Union Oil's Platform A, the framing was of an environmental and ecological tragedy that could not happen again. The *Exxon Valdez* is essentially the story of three competing frameworks, eventually giving way to a regulatory framing. The Deepwater Horizon also experienced three competing frames—a slow-onset environmental catastrophe, which coincided with framing that focused on the economic losses, and eventually the framing of the spill as failure in the regulatory structure. The implications of competing frameworks on policy in these spills are also discussed.

**SARAH HENLY-SHEPARD,** UNIVERSITY OF HAWAII AT MANOA
**CHERYL ANDERSON,** UNIVERSITY OF HAWAII AT MANOA
**LINDA COX,** UNIVERSITY OF HAWAII AT MANOA
**STEVEN GRAY,** UNIVERSITY OF HAWAII AT MANOA
**MAKA'ALA KA'AUMOANA,** HANALEI WATERSHED HUI
**ANTYA MILLER,** NORTH SHORE CHAMBER OF COMMERCE

## Climate Change, Disasters and Human Rights—Community-Based Socio-Ecological Resilience Research and Planning in Hawaii

In an era of ecological degradation, global climate change, geographic isolation, demographic shifts, and increasing intensity and frequency of natural hazards, the Pacific Islands and the state of Hawaii face heightened risk. Because of the inextricable link between human and environmental security, it is critical to employ rights-based, socio-ecological resilience frameworks and strategies to guide disaster risk reduction.

Social cohesion is also required for island communities to develop responsive and adaptive community resilience plans by incorporating stakeholder knowledge into the research and planning processes. Tools that facilitate resilience planning and support social cohesion, however, are lacking.

This research engages a community-based participatory learning approach to resilience planning in two at-risk coastal communities in Hawaii. Employing mixed methods—including a novel decision-support software tool that facilitates disaster risk reduction planning and incorporates diverse types of stakeholder knowledge, beliefs and perceptions—this research will facilitate collaborative decision-making processes for diverse communities dealing with natural hazard threats. In addition, this research will review relevant human rights frameworks, policies and institutions, analyze key gaps, and explore opportunities for an integrative rights-based, socio-ecological resilience framework for community-based research and planning in at-risk coastal and island communities.

**STEPHANIE HODGE,** UNICEF

## Education and Learning for Sustainable Development

Universal access to quality education—a precondition for sustainable development—must be complemented by a comprehensive reorientation of existing learning to include the understanding of and specific responses to the challenges of sustainable development, such as climate change. From the earliest age, investments in quality education should not simply be a means to fulfilling the right to education and progressing towards development goals, but as medium- and longer-term strategies for sustainable development, resilience, and equity. But education is often overlooked in debates and national action plans, despite its value in advancing sustainable development and in creating communities aware of their environment and resilient in the face of climate-related events.

This session will explore the role of quality education, knowledge management and learning systems in promoting sustainable human development through the pillars of economic growth, social development and environmental protection. It will bring together the various education agendas on ecologically sustainable development, education for all, technical and vocation education and training, disaster risk reduction, life skills, gender, health, environmental and climate change education, quality learning, and the promotion of green economies and societies to develop a common understanding of a coherent approach to leveraging education to combat climate change and build the resilience of children and communities.

It will also present findings of a UNICEF/UNESCO Mapping of Global DRR Integration into Education Curricula—capturing key national experiences from 30 case studies in the integration of DRR in school curriculum, identifying good practices, reviewing learning outcomes, and addressing gaps.

**LI-JU JANG,** NATIONAL PINGTUNG UNIVERSITY OF SCIENCE AND TECHNOLOGY

## Disaster Prevention: A Developmental Perspective

It is believed that developing knowledge and ability in children can carry forward into their adult life. This study intends to examine how the age of a child influences their perception and knowledge of disaster and mitigation strategies.

*Methodology:* Participants were sampled to represent the major developmental stages from school age onward (ages 7-9, 10-12, and 13-15). A total of eight focus groups were held: four in Tung Shih Elementary, two in Tung Shih Junior High, and two in Shih Chiao Elementary. Participants included 31 males and 34 females. All interviews were video recorded, allowing for the analysis of both verbal and non-verbal data. Questions about hazard characteristics, personal consequences from associated hazard activities, strategies used to mitigate disaster consequences, and children's perceived capacity to adopt these strategies were asked.

*Findings:* The study results indicate that participants from Tung Shih Elementary have better accessibility to disaster information and resources compared to their counterparts. Parents, natural science courses, and drills are the main sources of information about disaster characteristics and mitigation strategies. The results suggest that not only age, but also an urban-rural gap and resource availability have great impacts on participant knowledge of hazard characteristics, personal consequences from associated hazard activities, strategies to mitigate the consequences, and the perception of personal capacity to adopt these strategies.

**HAN JIARUI,** CHINA METEOROLOGICAL ADMINISTRATION

## The Study of Interactive User-Oriented Forecasting System

The risks of climate change are some of the major issues facing the world. In coping with climate risk, forecasts help users make risk-related decisions. But because of the inherent uncertainty in forecasting a chaotic weather and climate system, all forecasts are uncertain regardless of how much the physical forecast system has improved. Even a perfect forecast isn't useful without considering user decision making.

Hence, the greatest potential of improvement of forecasts should arise from the end user, which implies that the forecasting system would incorporate end user information. On the other hand, in economic terms, risk presents not only serious challenges, but also opportunities. Without integration of forecasting and end-user information, it is difficult to figure out the opportunities behind the risks.

In this study, we develop an interactive user-oriented forecasting system based on the combination of feedback from users' information and weather and climate forecasting information. It will not only help users make better risk decisions, but also improve weather and climate forecasts.

**ALICIA JOHNSON,** SAN FRANCISCO DEPARTMENT OF EMERGENCY MANAGEMENT
**KRISTIN HOGAN,** SAN FRANCISCO DEPARTMENT OF EMERGENCY MANAGEMENT

## Using Social Communications and Gamification to Promote an Ethos of Preparedness and Resilience

Promoting preparedness and resilience has challenged emergency managers because we often conduct outreach before understanding the dynamic of engagement that already exists. As a result, preparedness and resilience campaigns may not resonate.

Social communications is the methodology of engagement that begins with understanding the unique nuances of the community and how to integrate the existing, trusted social networks of the community into outreach strategies. Social communications leverages a variety of approaches including online social networking, in-person social networking, and gamification—the use of gaming techniques and mechanics—to cultivate preparedness and resilience behavior.

**ELIZABETH JORDAN,** UNIVERSITY OF COLORADO AT BOULDER
**AMY JAVERNICK-WILL,** UNIVERSITY OF COLORADO AT BOULDER
**BERNARD AMADEI,** UNIVERSITY OF COLORADO AT BOULDER

## Pathways to Community Recovery and Resilience

Understanding the causal conditions that lead to recovery is fundamental to improving a community's ability to recover after a disaster. Unfortunately, because of the depth of knowledge required for qualitative disaster recovery studies, there have been few broad cross-case comparative studies in which researchers link causal conditions to post-disaster recovery.

This research transforms our understanding of recovery by analyzing comparative cases using a multi-method approach, including Ragin's Qualitative Comparative Analysis, to determine what pre-disaster factors and recovery strategies (combined or in isolation) lead to successful post-disaster recovery.

Specifically, this research will: (1) identify recovery indicators and important causal conditions for community recovery across multiple disciplinary perspectives; (2) measure causal conditions and recovery indicators for villages in India impacted by the 2004 Indian Ocean tsunami; and (3) analyze the pathways of causal conditions that led to recovery in the case study communities.

Causal conditions and indicators of recovery have been identified through content analysis and a set of Delphi surveys. These then inform the data collection efforts and cross-case comparison for villages in Tamil Nadu, India. This research will result in a comprehensive theory of pathways to recovery following a disaster that links pre-disaster measures of causal conditions to recovery outcomes. The results of this study will allow community planners to prioritize and focus their efforts on the causal factors that best strengthen the community's ability to recover from a disaster.

**HLEKIWE KACHALI,** UNIVERSITY OF CANTERBURY
**ERICA SEVILLE,** UNIVERSITY OF CANTERBURY
**JOHN VARGO,** UNIVERSITY OF CANTERBURY

# Recovery of Industry and Geographic Sectors after the 2010 and 2011 Canterbury Earthquakes

Canterbury, New Zealand, experienced four earthquakes of greater than magnitude 6.0 between September 2010 and December 2011. This study employs system dynamics to bring together data collected via surveys, case studies, and interviews with organizations affected by the earthquakes. It shows how systemic interactions and interdependencies within and between industry and geographic sectors affect their post-disaster recovery.

The industry sectors in the study are: construction for its role in the rebuild: information and communication technology, which is a regional high-growth industry; trucking for logistics; critical infrastructure and fast moving consumer goods (e.g., supermarkets); and hospitality. Recovery is tracked through non-discretionary and discretionary spending, respectively. Also included the study are three urban centers, one of which is the region's largest central business district, an area which has been inaccessible since the earthquake of February 22, 2011.

Organizations report that some of the most disruptive effects of the earthquakes were staff well-being and customer issues, which are not direct physical impacts. However, key to recovery was the pivotal role staff played in the response and recovery phases. Findings also show that organizational pre-disaster preparedness is not the major factor in recovery after a regional disaster.

This work highlights how earthquake effects propagated among sectors and how sectors collaborated to mitigate difficulties such as product demand instability. Other interacting factors that influence the recovery trajectories of the different industry sectors are also identified. These are resource availability, insurance payments, aid from central government, and timely, reliable recovery information.

**A.K. KASTHURBA,** NATIONAL INSTITUTE OF TECHNOLOGY CALICUT
**SUDHA ARLIKATTI,** UNIVERSITY OF NORTH TEXAS

## Retrofitting Historic Structures Against Natural Hazards in India

The Indian subcontinent is one of the most disaster-prone regions of the world. The hazard profile of India suggests that because of its unique geoclimatic conditions, the country is vulnerable to recurrent natural hazards such as earthquakes, cyclones, and floods. With its rich and ancient cultural heritage, India is also home to numerous historic structures that merit protection from these hazards. Unique scientific techniques of retrofitting are now available and are practiced by Archaeological Survey of India (ASI), which has been empowered to protect the historic monuments of national importance.

India has numerous forts and temples, which assume importance by virtue of their history, architecture, and construction techniques. Most of the forts located in the western coastal region of India stand as a testimony to the European invasion in the pre-independence era (1500-1900s) of Indian history. This paper includes an overview of the natural hazard threats faced by these valuable heritages and the strategies adopted by ASI to mitigate against adverse impacts. Specifically, through a case study analysis, the process of investigating and scientifically retrofitting the ancient sea-facing wall of Fort St. Angelo, Kannur, against coastal erosion is illustrated.

The paper summarizes the efforts spearheaded by ASI to protect and conserve India's vast natural, built, and cultural heritage against natural hazards. The challenges faced by ASI in advocating that preservation, reuse, and conservation as disaster mitigation strategies in India—instead of demolition of ancient historic structures—will be of value to the Natural Hazards Workshop audience.

**YOUNHEE KIM,** NATIONAL DISASTER MANAGEMENT INSTITUTE
**YOUNGJU KIM,** NATIONAL DISASTER MANAGEMENT INSTITUTE

## Developing Appropriate Disaster Preparedness Materials for Foreigners in Korea

When it comes to public policies for foreigners in Korea, most focus on labor and health with a view of multiculturalism. Currently the disaster and safety field is not considered in public policies for foreigners in Korea.

This study examines suitable disaster preparedness materials for foreigners who live in Korea and the most effective method to disseminate the information to them.

In-depth interviews were conducted to assess the disaster preparedness needs of foreigners. Interviewees were from 14 countries and had lived in Korea more than 10 years. This study also included interviewees who escaped from North Korea and are now are living in South Korea.

Based on the interviews, the most appropriate materials were defined. These are: (1) action procedures for frequently occurring disasters; (2) disaster preparedness exercise information; and (3) disaster recovery assistance information.

The requested information was compiled and a multi-language Web site was developed to disseminate the preparedness material. The site is called the Multilingual Disaster Information Web. Material was translated into 14 languages using Google translation script. The Web site address is www.safefirst.kr.

Banners linking the 14 embassies and multi-cultural support centers in Korea were also added. Video clips were posted on the Web site as well.

Future research needs to develop the material in detail by using culture and behavior study theories. We are planning to use concepts from MINDSPACE, which was developed by a UK cabinet office. The Web site will also be updated to have a more user-friendly design and navigation.

**SOPHIA LIU,** U.S. GEOLOGICAL SURVEY
**PAUL EARLE,** U.S. GEOLOGICAL SURVEY
**BARBARA POORE,** U.S. GEOLOGICAL SURVEY

## A New Age of Crowdsourcing and Crisis Mapping

New opportunities and challenges are arising as the public uses pervasive information and communication technology, including social media, to help in the immediate aftermath of major disasters. At the 2010 International Conference on Crisis Mapping, Patrick Meier, director of crisis mapping at Ushahidi, said, "The Crisis Mappers Google Group played a pivotal role in the hours, days, and weeks following the earthquake in Haiti." Members of this virtual network shared time-sensitive geographic information, such as post-impact satellite imagery and locations of health care facilities, using open-source mapping and collaborative networking technologies.

Approximately 2,000 volunteers—including people from the Haitian diaspora—worked with the Crisis Mappers Network to geocode crisis reports coming out of Haiti. But in what ways did these new social networking technologies and emerging volunteer technical communities (VTCs) play a pivotal role in mapping Haiti to better manage the disaster?

As we have increasingly easy access to the ever-flowing streams of content online, how can crisis data from government agencies, satellite imagery companies, volunteer technical communities, disaster-affected populations, and the general public be integrated to better facilitate emergency preparedness, response, recovery, and mitigation efforts? At the same time, how can we strengthen cross-agency collaborations between official emergency management stakeholders and the VTCs to address geospatial data sharing challenges at the social, technological, organizational, and political interfaces?

**AMY MARTINI,** UNIVERSITY OF NORTH TEXAS
**SUDHA ARLIKATTI,** UNIVERSITY OF NORTH TEXAS

## The Past, Present, and Future of Women as Emergency Managers

Recent disasters have continued to illustrate the special vulnerabilities faced by women in the different phases of the disaster cycle, as well as the lack of an integrated emergency preparedness system that fully engages women's services as emergency managers. The earliest study of emergency managers was limited because of the low number of women emergency managers in the sampled population. This trend is changing. There is a significant increase in the number of women joining the profession.

Traditionally emergency management education was available through the military, which, being gender segregated, denied women access to this training. Since 9/11, numerous emergency management, homeland security, public health, medical, and related programs have become available to women. These programs and the passage of national equal opportunity laws have helped professionalize the field. However, there has been limited research on these changing trends and the possible constraints and challenges faced by women in their roles as emergency managers in the public and private sectors.

A snowball sampling technique was adopted and 50 female emergency managers from the North Texas region were interviewed by phone, face-to-face, and by email. This study elaborates upon the challenges faced, leadership styles preferred, strength in networks and family ties, work environment, and education that have helped or challenged them daily. This research has practical implications about ways to better empower and integrate women in emergency management decision making in multiple sectors.

**WARD LYLES,** UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL
**PHILIP BERKE,** UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL
**GAVIN SMITH,** UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL

## Who's at the Table? Examining Factors Driving Incorporation of Land Use Approaches in Hazard Mitigation Plans

Climate change is expected to exacerbate long-term hazard risks. Creating resilient communities requires reductions in hazard risks. National consensus studies identify land use as a highly effective approach for risk reduction. Passage of the Disaster Mitigation Act (DMA) of 2000 created an inter-governmental policy framework requiring state and local governments to adopt hazard mitigation plans to be eligible for certain federal disaster funds.

Networks of stakeholders develop mitigation plans through planning processes led by emergency managers, sometimes with planners.

This framework offers an outstanding opportunity to examine factors leading to greater incorporation of land use approaches into mitigation plans. Recent work finds DMA mitigation plan quality is mediocre in general, but variable.

Three main types of factors drive mitigation plan quality: state planning policy context, local community characteristics, and planning process features. This paper's central research question is: Does inclusion of local planners in mitigation planning networks lead to incorporation of more land use approaches in mitigation plans, controlling for these three types of factors? Ordinary least squares and Poisson regression models predict incorporation of land use approaches using data from content analysis of 175 local mitigation plans, the Institute of Business and Home Safety, the Public Entity Research Institute Presidential Declaration database, and the U.S. Census.

Preliminary findings indicate local planners are positively associated with incorporation of more land use approaches into mitigation plans, but the association varies across three principles of plan quality (i.e., fact base, policies, and implementation). Planners appear to be most important for the future-oriented policies and implementation principles. The findings suggest federal and state mitigation officials should foster greater linkages between local emergency managers and planners to promote long-term risk reduction. These results could be relevant to emerging climate adaptation planning efforts.

**SEAN MCGOWAN,** U.S. GEOLOGICAL SURVEY
**NICOLAS LUCO,** U.S. GEOLOGICAL SURVEY

## Will My Building be Damaged by an Earthquake? USGS Risk Mapping Web Application for Assessing Earthquake Damage Likelihoods

The U.S. Geological Survey receives many inquiries regarding the likelihood of earthquake-induced damage—or seismic risk—to buildings. USGS scientists are known for producing seismic hazard curves and derivative maps quantifying the probabilities of potential earthquake ground motion levels being exceeded during a given timeframe. To extend this ground motion hazard information, USGS engineers have developed fragility curves for generic building types that quantify "what-if" probabilities of damage for the potential earthquake ground motions. By combining hazard and fragility curves in its Risk Mapping Web Application, the USGS seeks to address the aforementioned requests from the public.

The Risk Mapping Web Application is designed for expert, as well as non-technical, users. Advanced users can upload lists of building locations and types and their fragility curves. The risk output computed by combining this information with USGS hazard curves can be used to guide prioritization of retrofits to buildings in a community, for example. Novice users are able to select a building type (pertaining to a single-family home, for example) by using a series of drop-down menus, and receive a map of their risk relative to other building locations. By also selecting other building types, non-technical users can get another sense of their relative risk. The Risk Mapping Web Application provides web-based, CSV, and KML output.

**BRIAN MILLER,** UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL

## Coping with Natural Hazards in a Conservation Context: Resource Use Decisions of Maasai Households During Recent and Historical Droughts

During droughts, herders typically move their livestock to areas that maintain water and grazing such as rivers, swamps, and forests. But pastoralist access to these drought resource areas (DRAs) can be inhibited by cultivation and conservation. Loss of access to DRAs may be influencing the resource use decisions of pastoralists living adjacent to protected areas that are experiencing considerable anthropogenic environmental changes.

The objective of this study is to better understand how these challenges are interrelated. I evaluated the spatial distribution of DRAs in the Kenya/Tanzania border region using satellite imagery. I then analyzed interviews and retrospective survey data from households that vary in proximity to Tarangire National Park to elucidate factors that influenced Maasai resource use decisions during recent and historical droughts.

Geospatial analysis indicates that cultivated and protected areas contain disproportionately high percentages of DRAs. Tarangire encompasses two prominent DRAs. Interviews suggest that before Tarangire was established, Maasai used these DRAs less than previously thought because of resource availability in other areas and concerns about livestock disease. Preliminary decision modeling indicates that the selection of livestock watering sites consists of two choices that are influenced by different factors: (1) labor and grazing availability that affect the choice between local and distant sites; and (2) herd size, social capital, location, and cost that influence the choice of a particular water source. Small rivers and ephemeral streams are critical DRAs, but broader land use changes appear to be impacting these waterways through alterations in sediment and water supply.

**DANIELLE NAGELE,** UNIVERSITY OF DELAWARE
**JOSEPH TRAINOR,** UNIVERSITY OF DELAWARE

## Geographic Specificity, Tornadoes, and Protective Action

In 2007, the National Weather Service began using storm-based, rather than countywide, warnings. Some analysts have examined the effects of this change, but little empirical research has focused on public response.

Using a random digit dial sample and a computer-assisted telephone interview system, we collected data focused on protective action decision making in counties that were affected by a severe storm or tornado warning. Our paper examines the influence of these new storm-based warnings on protective action decision making by the public.

While we did not find a significant relationship between being inside the warning polygon and taking protective action, we were able to conclude that polygon size is an important factor. Given these mixed results, we suggest future work on storm-based warnings focus on their dissemination and reception, as well as the optimization of the polygons themselves. We suggest that the complexities associated with communicating these risk areas complicates the dissemination process and creates difficulties in the public understanding the warning.

The possible need for optimization is reinforced by the significance of the track proximity and polygon size variables. In addition, a smaller polygon resulted in protective action, especially sheltering. With regards to the preparedness and socio-demographics variables, our results agreed with previous findings on the importance of a family emergency plan. Unlike earlier research, we did not find past experience or education level significant within our regression model and showed mixed results of gender.

**WILLIAM NICHOLSON,** EMERGENCY LAW CONSULTANTS
**NANCY SCHWEDA NICHOLSON,** UNIVERSITY OF DELAWARE

## Language Services to Ensure "Whole of Community" Evacuation: Legal Issues and Interpreting and Translation Assistance for Limited English Proficient (LEP) Populations

This work takes a practical, hands-on approach to language services for limited English proficient communities in need of evacuation. It offers a "toolbox" perspective to find qualified, competent providers within the community, ensuring that a network of individuals is available and in place before a disaster strikes. The services that interpreters provide are vital. They deliver timely information on evacuation means and routes so all members of every community participate fully when the decision is made to relocate.

Now more than ever, as our linguistic and cultural diversity continues to grow, the provision of professional language services should be an important component of all phases of emergency management: mitigation, preparedness, response and recovery. Specific legal enactments require that language services be furnished to the general public. All community members must be able to understand every relevant aspect of emergency management.

As with any other human resource, interpreters and translators vary greatly in their background, training, and skills. The prudent emergency manager is well advised to address this matter during the planning process to ensure language services providers are competent and aware of jurisdiction-specific requirements.

This work explores how to incorporate language services so that all LEP individuals affected by a "whole community" evacuation order during an emergency or disaster will have the most basic of their needs fulfilled—information that allows them to act to ensure their safety.

**PONMILE OLONILUA,** TEXAS SOUTHERN UNIVERSITY

## Involving Minorities in Issues of Emergency Management—A Public Enlightenment Program

Public participation in hazard mitigation provides avenues for citizens to be informed and educated. It also allows the decision makers to gather input from the public to enhance the decision making process, gaining support for the implementation of the subsequent decisions.

However, past research has found public participation in formulating hazard mitigation policies remains low despite hazard losses. Consistent with past literature on methods and importance of public participation in issues of emergency management, this exploratory study reports findings and experience from a workshop conducted at Texas Southern University in Houston.

With 76 people in attendance, participants were presented with why they should be involved in hazard mitigation. Feedback from the questions asked and from the survey questionnaires show that approximately 90 percent of participants did not know where to find shelter information. Over 90 percent were not aware of Houston's hazard mitigation plan. About 100 percent of participants indicated their willingness to be involved in emergency management if they were notified.

Although the study was exploratory, these results show the need for more public information and awareness programs at the local level to promote the involvement of minorities in issues of emergency management.

**LORI PEEK,** COLORADO STATE UNIVERSITY
**SARA GILL,** COLORADO STATE UNIVERSITY

## Childcare Centers and Disaster Preparedness in Colorado

Childcare providers are vital members of many children's adult network. Yet information about how childcare centers prepare for disasters is sparse. This two-year study, funded by the Federal Emergency Management Agency, will begin to fill this gap.

We will conduct a pilot study of disaster preparedness among childcare centers in Windsor and Fort Collins, Colorado. Both cities are at risk of flooding, severe winter storms, wild fires, and tornadoes. In 2008, Windsor was devastated by a powerful tornado. In 1997, Fort Collins experienced severe flash flooding that caused widespread damage. The research questions to be explored include: (1) Do childcare centers in these counties have disaster preparedness plans? (2) If they have a plan, what does it include? (3) If they do not have a plan, why is that? and (4) What support do childcare centers need in terms of developing and implementing plans, training their staff, educating the children who attend the centers, and communicating with parents?

We will organize a one-day disaster preparedness workshop for childcare providers in Colorado. Upon completion of the pilot study, FEMA and the research team will host a disaster preparedness workshop for childcare providers where research results and best practices will be shared.

The findings from the pilot study and the input gathered from the childcare provider workshop will be used to initiate a statewide survey of disaster preparedness among all childcare centers in Colorado. This project will culminate in a statewide survey of disaster preparedness plans and actions among childcare providers.

**LORI PEEK,** COLORADO STATE UNIVERSITY
**BRIDGET MORRISSEY,** COLORADO STATE UNIVERSITY
**HOLLY MARLATT,** COLORADO STATE UNIVERSITY

## Disaster Hits Home: A Model of Displaced Family Adjustment After Hurricane Katrina

This work explores individual and family adjustment processes among parents (n = 30) and children (n = 55) who were displaced to Colorado after Hurricane Katrina. Drawing on in-depth interviews with 23 families, this research culminated in an inductive model of displaced family adjustment.

Four stages of family adjustment are presented in the model: (1) family unity stage, (2) prioritizing safety stage (parents) and missing home stage (children), (3) confronting reality stage (parents) and feeling settled stage (children), and (4) reaching resolution.

This research illustrates that parental and child adjustment trajectories are dynamic and may vary over time, underscoring the importance of considering the perspectives of both adults and children in research and disaster policy interventions.

**NANCY QUIRK,** CITY OF CHARLOTTESVILLE, VIRGINIA

## Learning from Green

Numerous policy tools are being created and implemented to encourage greener—and especially more energy efficient—buildings. Can policy tools developed to incentivize green building also encourage resilient building practices? Green policies include requiring benchmarking or labeling the building's energy efficiency. Could benchmarking be established to demonstrate resilience (wind, water, earthquake, etc)?

Another policy tool is "green leasing," in which the building owner takes on the cost of investing in energy efficiency and shares the cost with current and future tenants via the green lease. Many cities are requiring energy audits of buildings at point of sale. These policies encourage building owners to retrofit buildings and provide information to eventual buyers of the building. Could such policies as reviewing a building's energy efficiency and green features be used to inform current and prospective building owners of hazard-resistance features?

On the national level, there might be lessons from the Partnership for Sustainable Communities, a joint grant program of the U.S. Department of Housing and Urban Development, the Department of Transportation, and the Environmental Protection Agency. Could the EPA, Federal Emergency Management Agency, and the Department of Energy collaborate on a similar program for more green and resilient communities?

Such collaborations could take into account hazard resilience features such as floodplain management and zoning regulations on a communitywide level, just as the HUD-DOT-EPA Sustainable Communities program did for the green aspects of communitywide transportation planning and development. Joint efforts with the International Council for Local Environmental Initiatives Resiliency Program and the U.S. Green Building Council's LEED for Neighborhood Development guidelines to develop such a federal "green and resilient communities" initiative could incorporate the experience and expertise of these national organizations.

**BILL ROBINSON,** TRAIN2BUILD

## Training for Success in Implementing Green Codes and Standards

If training is important to successful implementation of green codes and standards what does that training look like? Can lessons from current green building training efforts be used to inform training for hazard resilience?

There are several steps necessary to bring hazard resistance into the green building initiative. This begins at the design and planning stage, but it isn't complete until the work is done and verified in the field. In the middle is effective training of the workforce. While training workforce is often a component of workflow, the effectiveness of training is typically not included in evaluation of the training itself. Has the training provided the skills and understanding that will enable each construction worker to effectively implement the appropriate methods of construction to achieve the specified quality indicated in the design?

What training techniques and practices can help ensure that workforce training attains the level of proficiency required for effective performance of green and hazard resilient building features? Training designers are typically far removed from the job site and may not speak the same language as the labor force. Practitioners should be included in training development. Adult learning techniques combined with hands-on training include learners in the training. Such active learning techniques invite participation of the learners contributing to internalization of understanding principles of green—and resilient—building with the practical application skills that lead to higher quality outcomes on the job site.

**AMBER SILVER,** UNIVERSITY OF WATERLOO
**JEAN ANDREY,** UNIVERSITY OF WATERLOO

## The Influence of Previous Disaster Experience on Protective Action Decision-Making: The Case Study of the Goderich, Ontario, Tornado

The influence of previous disaster experience on decision making during subsequent events is still a matter of considerable discussion in hazards literature. Recent research has found that previous experience with disaster does not always translate into improved self-protective behaviors during subsequent events.

This paper examines two events that occurred in August 2011 in Goderich, Ontario—an F-3 tornado that struck the community on August 21 and a tornado warning that was posted for the region three days later on August 24. Semi-structured interviews (n=35) and close-ended questionnaires (n=268) were conducted to learn about the ways that people obtained and understood risk information, and to explore whether and how such information guided protective-action decisions during the two events.

We found that a sizable portion of the sample population took protective actions on August 24 in ways that were inconsistent with their actions on August 21. We also found that a significant portion of respondents chose not to take any form of protective action on August 24 despite having previously experienced a damaging tornado. The findings of this research suggest that the significance of previous disaster experience in the decision making process is highly variable and context dependent. Some implications of these findings are discussed in the context of risk communication and emergency management.

**JERRY SKALAK,** U.S. ARMY CORPS OF ENGINEERS

## Green Island Levee and Drainage District, Jackson County, Iowa: An Interagency Approach to Implementing a Non-Structural Alternative Project

The Green Island Levee experienced two significant breaches during the July 2010 flood of the Maquoketa River. At the time of breaching, the levee was active in the Corps P.L. 84-99 program. The estimated cost to repair the levee exceeded the estimated benefits, resulting in a benefit-to-cost ratio of less than one. As a result of this determination the levee sponsor, the Jackson County Board of Commissioners, expressed interest in a non-structural alternative project.

After more than two years of County Board indecision on locally funding the repair (mainly in response to the position of one landowner) they finally voted against it. During this time the Natural Resources Conservation Service (NRCS) initiated a project to acquire permanent wetland easements on most of the lands within the previously protected area.

The Corps' participation in the non-structural alternative project (NSAP) was contingent on a decision to not repair the levee. Although possible NSAP components were identified early on, further action was placed on hold pending this decision. The Corps is now moving forward with developing agreements with the NRCS and the Iowa Department of Natural Resources to jointly implement additional NSAP components that could include: acquisition of the levee right-of-way, additional degrading of the remaining levee structure, modification of culverts to address potential impacts of future floods on a state highway embankment, and mitigating three to five residential structures that once had minimal flood protection by the levee.

**MARUŠA ŠPITALAR,** UNIVERSITY OF LJUBLJANA
**MITJA BRILLY,** UNIVERSITY OF LJUBLJANA
**DRAGO KOS,** UNIVERSITY OF LJUBLJANA

## Sociological Perspective of Understanding an Interrelation Between Loss of Life in Flood Events and Cultural Components

Natural disasters have a negative connotation. They are destructive to material elements and to nature itself. They represent a threat to people's lives and health.

Floods, especially flash floods, cause extensive damage. They are hard to predict and are characterized with violent movement. Many lives are lost. As Ruin argued, "They are being particularly difficult to forecast accurately and leave very little lead time for warnings." They tend to surprise people, making them more vulnerable than in other cases of flood events.

This paper emphasizes the social aspects of floods. It consists of three parts. The first is human vulnerability, risk perception, and risk-taking behavior when it comes to danger caused by rising waters. How does culture influence response and reaction to floods? The second part focuses on loss of life in floods and analyzing the circumstances of death. This consists of reviewing existing literature. The third part is also related to flood fatalities and circumstances supported by empirical data.

**MICHAEL STAJURA,** UCLA SCHOOL OF PUBLIC HEALTH
**GRACIE HUERTA,** LISTOS

## Listos: A Grassroots, Culturally Relevant Community Disaster Preparedness Program for Socioeconomically Marginalized Latinos

This case study explores how a local community member without higher education has established an effective community disaster education program for a marginalized population in her county. Such programs in the United States are often translated into other languages, but they make little or no effort to make culturally tailored or culturally relevant adaptation.

Listos, developed in Santa Barbara County, California, is the first program of its kind. It specifically targets Latinos with limited English proficiency, most of whom are linguistically and socially isolated from mainstream society. They are the dishwashers, agricultural workers, maids, and day laborers that are ignored or hard to reach as a target population for community disaster education.

Listos now has two years of summary data from 554 individuals reached through 26 workshops. Each workshop has four sessions that use a *promotora* model to teach basic disaster preparedness. They have also just completed their first train-the-trainer class for a group of *promotoras* in one city in Santa Barbara County where 70 percent of the population speaks Spanish as their first or only language. The local fire department supports this program because they recognize their lack of access in the Latino population (and fewer than 10 percent of firefighters speak Spanish proficiently).

The data available so far does not lend itself well to statistical analysis, but the summary statistics demonstrate a substantial change in knowledge. Even more meaningful is evidence that this program has empowered individuals to make changes in other aspects of their lives.

**ERIC STERN,** UNIVERSITY OF VIRGINIA
**GREGORY SAATHOFF,** UNIVERSITY OF VIRGINIA
**BRAD KIESERMAN,** FEDERAL EMERGENCY MANAGEMENT AGENCY

## Advice in Crisis: Leaders, Lawyers, and the Challenge of Disaster Management

Major disasters, like other forms of crisis, place difficult demands on leaders and their organizations. With lives and livelihoods hanging in the balance, leaders must make some of the most critical choices of their careers under imaginably difficult circumstances. Many of these decisions raise profound legal and ethical questions. They impact heavily on disaster and post-disaster outcomes for survivors and government agencies.

Yet the relationship between leaders and lawyers in disasters has received little systematic attention. Since September of 2010, a multidisciplinary team of researchers has worked closely with senior leaders and lawyers from the Federal Emergency Management Agency to explore effective—and less effective—forms of collaboration between leaders and lawyers in crisis situations. In this paper, three central questions are posed:

- What do leaders need from their lawyers in disasters?
- How can lawyers most effectively advise their leaders in disasters?
- How can leaders get the most out of their lawyers in such situations?

Building upon more than 60 Advice in Crises interviews with senior leaders and lawyers, as well as numerous group discussions, a number of key findings and proposed best practices are presented.

**JOANNE STEVENSON,** UNIVERSITY OF CANTERBURY

## Context and Networks in Organizational Resilience: Lessons from the Canterbury, New Zealand, Earthquake Series

Between September 2010 and February 2012 the Canterbury region of New Zealand experienced more than 10,000 earthquakes, including several over magnitude 6.0. In Christchurch, Canterbury's economic hub, the central business district has been partially cordoned off for more than 14 months. Economic activity within the cordoned CBD, which previously contained 6,000 businesses and more than 51,000 workers, has been significantly diminished. Organizations have been forced to find new ways of operating.

Organizations shape and are shaped by the built, economic, and social contexts in which they operate. This research examines the way organizations relate to their local contexts, how a disaster alters these contexts, and the effect on organizational resilience and recovery outcomes. The results of three surveys conducted over a period of 18 months are summarized, covering the broad impacts of the Canterbury earthquakes on CBD organizations, the challenges they face, and factors that mitigated the effects of the earthquakes.

In addition, the presentation examines three in-depth case studies of CBD organizations that experienced different recovery trajectories. The case studies illustrate the ways organizations are embedded in their local context and how they adapt to changes in that context. The study also includes an assessment of each organization's post-disaster support network and how social capital exchanges in this network shaped post-disaster outcomes. The results suggest that strong connections to a local context are both an asset and a liability and that networked supporters in different geographic locations are valuable at different stages of the response and recovery process.

**KEVIN STEWART,** URBAN DRAINAGE AND FLOOD CONTROL DISTRICT, DENVER, COLORADO

## When Flood Threat is Imminent—in the Aftermath of the Fourmile Canyon Fire

The 2010 Fourmile Canyon Fire in Boulder County has been labeled Colorado's most destructive wildfire, not because the burn area was so large, but because of the number of homes that were destroyed. As bad as this fire was for homeowners, the increased flood threat may yet prove be the fire's most serious consequence.

This work shares some personal and professional insights that started with an initial and somewhat controversial flood threat assessment followed by the development of real-time hydrologic models focused primarily on the burn area's runoff potential and downstream impacts. In adjusting to the increased flood threat, decision makers increasingly relied on real-time radar, rainfall, and stream level data to develop a common operating picture.

Human relationships were vital, including interactions between meteorologists and hydrologists from the National Weather Service, the Urban Drainage and Flood Control District, and local government engineers. Enhancement of early notification and emergency response procedures, combined with a well-targeted public education effort, paid dividends when the system was tested by a dangerous flash flood resulting from a relatively small rainstorm on July 13, 2011.

With this increased flood threat expected to continue unabated for years to come, subsequent planning activities remain underway to further improve services and maintain high levels of trust among all parties.

**YULIA TYSHCHUK,** RENSSELAER POLYTECHNIC INSTITUTE
**WILLIAM WALLACE,** RENSSELAER POLYTECHNIC INSTITUTE

## Tracing Human Behavior on Twitter During Naturally Occurring Emergency Events

Social media is quickly becoming an integral part of modern society. People use it as an important channel of communication.

Social media has also become more important in emergency management. It is used by governmental and nongovernmental organizations to disseminate educational materials to the public on various types of emergencies, as well as relevant information during the emergencies.

There is still no clear consensus among emergency management organizations about how social media can provide warnings to the public. The first step is to understand people's use of social media during emergencies. This will evaluate the best practices for social media integration in emergency management.

We must understand the content of messages and how the messages travel. This poster presentation focuses on past research in a small-scale, naturally occurring experiment. It will describe the current work on the 2011 Japan Earthquake event. It will identify hidden key actors using advanced social network analysis techniques. The poster will also address the formation of the cohesive groups in the network and the role of the key actors in those groups during the emergency events.

**MOHAMMED SALIM UDDIN,** UNIVERSITY OF MANITOBA
**C. EMAD HAQUE,** UNIVERSITY OF MANITOBA

## Vulnerability Reduction Through Better Preparedness and Adaptation: Lessons Learnt from Cyclone Sidr by Coastal Plain Residents of Bangladesh

The people of the Bangladesh coastal plains are extremely vulnerable to natural hazards because of their social, economic, and environmental attributes. They inhabit extreme dynamic estuarine environments. We investigated people's perceptions, cyclone vulnerability and preparedness, and mitigation options based on their experience with Cyclone Sidr, which struck the coast of Bangladesh on November 15, 2007.

The research attempted to answer a key question: Can cyclone shelter alone prevent deaths from cyclones? We followed a qualitative case study method research approach. Participatory Rural Appraisal tools, such as focus group discussions, household interviews (N=162), and key informant interviews were applied in two severely affected Bangladesh coastal districts—Patuakhali and Barguna. The field survey was carried out during August-October 2009.

The findings of the study revealed that livelihoods, location, and pattern of settlement are the most important factors in making people vulnerable to a cyclone. Better cyclone preparedness, improved early warning system, and massive awareness before and during cyclone Sidr landfall saved lives and reduced death toll more than in previous cyclones. However, an insufficient number of cyclone shelters and lack of proper maintenance resulted in deaths, hindering the progress of complete cyclonic disaster management in coastal Bangladesh.

**BAXTER VIEUX,** UNIVERSITY OF OKLAHOMA
**MARK MEO,** UNIVERSITY OF OKLAHOMA
**P. CARTER,** UNIVERSITY OF OKLAHOMA
**SCOTT GREENE,** UNIVERSITY OF OKLAHOMA
**YANG HONG,** UNIVERSITY OF OKLAHOMA

## Watershed Modeling and Visualization for Climate Planning and Adaptation: An Analysis of Five Cities

Efforts are underway to evaluate societal impacts and adaptation strategies associated with projected flood hazards in five cities under present and projected climate scenarios. Given precipitation modeled by global climate models (GCM) under three assumed emission scenarios, the results of watershed model simulations will be presented to urban planners and decision makers. Their response and possible strategies for adapting urban flood planning and policy in the face of climate change will be evaluated.

Urban watershed flood simulations performed for the five urban basins range in location from the Texas Gulf Coast to the Hill Country (three basins in Texas), and inland to the Southern Great Plains (two basins in Oklahoma). Geospatial data defining soils, topography, land use and cover, and imperviousness have been assembled into a distributed hydrologic model, and sensitivity testing performed under current and future climate scenarios.

Global climate studies usually rely on global climate models, which simulate past climate and project future climate. Through downscaling, GCM outputs are used to complete watershed simulations. The resulting flood depths will be visualized and presented to each of the five city contact/liaison people to determine their response and to guide planning and decision-making that could be used to adapt. Through surveys conducted before and after presentation of the simulated flood hazards under future climate scenarios, adaptation strategies and perceived risk posed by future climate change scenarios will be evaluated. The presentation will provide an update on initial simulation results, modeling of present and future climate scenarios, and planned societal impact assessments.

**LYNN WEBER,** UNIVERSITY OF SOUTH CAROLINA
**LORI PEEK,** COLORADO STATE UNIVERSITY

## *Displaced: Life in the Katrina Diaspora*

Hurricane Katrina forced the largest and most abrupt displacement in U.S. history. About 1.5 million people evacuated from the Gulf Coast preceding Katrina's landfall. New Orleans, a city of 500,000, was nearly emptied of life after the flooding. Katrina survivors eventually scattered across all 50 states. Tens of thousands remain displaced. Some are desperate to return to the Gulf Coast but cannot find the means. Others have chosen to make their homes elsewhere. Still others found a way to return home but were unable to stay due to the limited availability of social services, educational opportunities, health care options, and affordable housing.

The contributors to this edited volume, *Displaced: Life in the Katrina Diaspora*, began following Katrina evacuees soon after the storm in 2005. This book offers the first comprehensive analysis of the experiences of the displaced. Drawing on research in 13 communities in seven states across the country, the contributors describe the struggles that evacuees faced in securing life-sustaining resources and rebuilding their lives. They also recount the impact that the displaced have had on communities that initially welcomed them and then later experienced "Katrina fatigue" as the ongoing needs of evacuees strained local resources.

Displaced reveals that Katrina took a particularly heavy toll on households headed by low-income African American women who lost the support provided by local networks of family and friends. It also shows the resilience and resourcefulness of Katrina evacuees who built new networks and partnered with community organizations to create new lives in the diaspora. See: https://www.utexas.edu/utpress/books/webdis.html.

**JOHN WIENER,** UNIVERSITY OF COLORADO

## It All Comes Back to Land Use

From a hazards perspective, a series of projects has circled back to the need for good land use planning to protect the public in the long term. Projects on climate impacts and information for water management led to work on agriculture-to-urban water transfers, state processes, and legal institutions. That in turn led to concerns over impacts of water transfers, including problems for communities and the hybrid riparian ecology that has displaced "natural" pre-development conditions. This too is now at risk. All of this leads to concern for conservation and transition to more sustainability on landscape and regional scales.

Current work with David Yates at the National Center for Atmospheric Research and a pending proposal with 15 scientists and agency personnel and the Ditch and Reservoir Company Alliance focuses on pursuit of W-FIRM—water-focused integrated resource management—and the C2P2 principle—collaborative community-based participatory planning.

Adaptation to one problem alone may be unfortunate, even if implemented. We need to look at all of the pieces together—including hazards, inextricable now from climate change. My work not formally published is available on http://www.colorado.edu/ibs/eb/wiener/.

**R. SAMUEL WINNINGHAM,** INDEPENDENT SCHOLAR

## Urban Risks and Disaster Planning: A Different Perspective

For the first time in history, half of the world population lives in urban areas. By 2030, at least 61 percent of the global population will live in cities. Over two billion of these people will be living in slums. The expansion of cities to accommodate such rapid population growth requires appropriate land use planning, updated regulation of building standards, and improved disaster risk management.

Urban disaster risks from extreme natural hazards are compounded by both technological hazards and everyday urban risks. These everyday risks include, but are not limited to, populations switching en masse from living off wages to living off capital and an increased number of children being raised by a single parent or grandparent. These activities engender a process of "risk accumulation" that amplifies the disaster risks specific to urban areas.

The growing body of research on urban risks and disaster planning delineates the increased exposure of people and economic assets to natural and technological hazards as attributable to urbanization. Additionally, risk accumulation creates new patterns of risk, making the management of disasters in urban areas particularly complex.

The challenge is to raise the issues of urban disaster risk to a new level of significance for local governments by integrating the substantial public and private urban disaster risk research. The present investigation explores the disconnections between urban disaster risk research and the actual application and implementation of research findings.

# International Research Committee on Disasters Researchers Meeting

Tuesday, July 17 through Wednesday, July 18, 2012

Omni Interlocken Resort
Broomfield, Colorado

The IRCD RESEARCHERS MEETING is a continuing partnership between the International Sociological Association's International Research Committee on Disasters and the Natural Hazards Center. The Meeting kicks off with a welcoming reception at 6:00 p.m. on Tuesday, July 17th.

*—Joseph Trainor and Bill Lovekamp, 2012 co-organizers*

## TUESDAY, JULY 17

### ■ Registration

Interlocken D, 6:00 to 7:00 p.m.

### ■ Reception and Cash Bar

Lobby Court and Terrace, 6:00 to 7:30 p.m.

## WEDNESDAY, JULY 17

### ■ Continental Breakfast

Centennial Foyer, 7:30 to 10:00 a.m.

### ■ Registration

Centennial Foyer, 8:00 a.m. to 3:00 p.m.

### ■ Housing Recovery

Centennial F, 8:30 to 10:00 a.m.

**The Neighborhood Housing Recovery Gap after Natural Disasters**
Tamiyo Kondo, Kobe University

**Applying the Concept of People-Centered Housing Recovery: Focus on Transition**

Liz Maly, Disaster Reduction and Human Renovation Institute

**Federal Assistance and Post-Disaster Housing Recovery: Limitations and Opportunities for Large-Scale Disasters in Metropolitan Areas**

Nabil Kamel, Arizona State University

**Tracking Housing Recovery in Galveston after Hurricane Ike**

Sara Hamideh, Texas A&M University
Shannon Van Zandt, Texas A&M University
Walter Gillis Peacock, Texas A&M University

## ■ Preparedness and Veterans

Interlocken C, 8:30 to 10:00 a.m.

**A Multidimensional Examination of Hurricane Preparedness and Evacuation Intention**

Craig Trumbo, Colorado State University
Lori Peek, Colorado State University
Brian McNoldy, Colorado State University
Wayne Schubert, Colorado State University
Eve Gruntfest, University of Colorado Colorado Springs
Holly Marlatt, Colorado State University
Michelle Meyer Lueck, Colorado State University

**Preparedness for Catastrophes: The Constitutive Dynamism of Plans and Improvisation**

Natalie Baker, University of California, Irvine

**Using Disasters to Help Veterans: Team Rubicon Reports from the Field**

Kevin Heslin, U.S. Veterans Administration Emergency Management Evaluation Center
Brinda Venkatesh, U.S. Veterans Administration Emergency Management Evaluation Center

**A Safety Net for Homeless Veterans: Disaster Preparedness in**

**Homeless Housing Providers**
June Gin, U.S. Veterans Administration Emergency Management Evaluation Center
Angela Cohen, U.S. Veterans Administration Emergency Management Evaluation Center
Diana Naranjo, U.S. Veterans Administration Emergency Management Evaluation Center

## ■ Warnings and Protective Action Decision Making

Interlocken D, 8:30 to 10:00 a.m.

**Modeling the Real-Time Decision to Evacuate from a Hurricane**
Earl Baker, Florida State University
Jeffrey Czajkowski, University of Pennsylvania
Robert Meyer, University of Pennsylvania

**Understanding Tornado Warning and Watch**
Lucia Velotti, University of Delaware
Andrea Fendt, University of Delaware
Joseph Trainor, University of Delaware

**The Effects of Flood Warning in Household Adoption of Protective Actions—A Southern Taiwan Case Study**
Jy-Pyng Sah, Chang Jung Christian University

**Effects of Hurricane Track and Threat Information on Judgments of Strike Probability**
Hao-Che Wu, Texas A&M University
Michael Lindell, Texas A&M University
Carla Prater, Texas A&M University
Charles Samuelson, Texas A&M University

## ■ Break

10:00 to 10:15 a.m.

## ■ Technology and Climate Change

Centennial F, 10:15 to 11:45 a.m.

**User Acceptance of Technology: An Empirical Examination of Factors Leading to Adoption of Decision Support Technologies for Disaster Management**
Eliot Jennings, University of North Texas

**Challenges with Integrating Official and Crowdsourced Crisis Information**
Sophia Liu, U.S. Geological Survey

**Adaptive Capacity to Climate Hazards on the Southwest Coast of Taiwan: The Potential Role of Social Capital and Participation**
Hung-Chih Hung , National Taipei University
Yu-Ting Lu, National Taipei University

**From Natural Hazards to Gradual Environmental Change: Climate Change Adaptation in Forestry**
Fenn Faber, Albert-Ludwig University of Freiburg

**Organizational and Community Transformations after a Catastrophic Event**
Shuli Goodman, Transformation Institute

## ■ Age and Gender

Interlocken C, 10:15 to 11:45 a.m.

**Hurricanes and the Elderly: The Role of Social Networks in Age-Related Vulnerability**
Michelle Meyer Lueck, Colorado State University
Calvin Whitman, Colorado State University

**Aging Populations and Anticipated Compliance with Hurricane Evacuation Warnings**
Maggie Nelan, University of Delaware
Tricia Wachtendorf, University of Delaware

**Gender Perspective and Evacuation Center Management after the Great East Japan Earthquake**
Yoko Saito, Disaster Reduction and Human Renovation Institution

**When There is Fear of the Shelter from the Storm: Gender, Fear of Crime, and Hurricane Shelter Decision Making**
Lee Zelewicz, University of Delaware
Richard Stansfield, University of Delaware
Tricia Wachtendorf, University of Delaware

## ■ Resiliency

Interlocken D 10:15 to 11:45 a.m.

**Building Community Resiliency: Spatial Links between Households and Businesses in Post-Disaster Recovery**
Yu Xiao, Texas A&M University
Shannon Van Zandt, Texas A&M University

**Community Disaster Resilience Planning**
Robin Cox, Royal Roads University

**How Not to Learn: Resilience in the Study of Disaster**
Benigno Aguirre, University of Delaware
Eric Best, University of Delaware

**Assessing Resilience Among Rural, Suburban, and Urban Communities Following the Thailand Floods**
Laura Siebeneck, University of North Texas
Sudha Arlikatti, University of North Texas
Simon Andrew, University of North Texas
Kraiwuth Jaikampan, University of North Texas

## ■ Lunch

Noon to 1:30 p.m., Outdoor Pavilion

## ■ Policy and Framing

Centennial F, 1:30 to 3:00 p.m.

**States and Issues for Post-Disaster Relocating Reconstruction: The Case of the Morakot Typhoon in 2009**
Pei-Chun Shao, Chang Jung Christian University

**All Oil Spills are Local: Severity, Framing, Legislation, and GDP Change in States and the Nation**
Eric Best, University of Delaware
Alex Greer, University of Delaware

**Who's at the Table? Examining Factors Driving Incorporation of Land Use Approaches in Hazard Mitigation Plans**
Ward Lyles, University of North Carolina at Chapel Hill
Philip Berke, University of North Carolina at Chapel Hill
Gavin Smith, University of North Carolina at Chapel Hill

**Investigation Analysis on Local Level Administration Personnel's Cognition to Hydro-Meteorological Disaster Adaptation Strategies**
Liang-Chun Chen, National Taiwan University

**Where Did Federal Pre-Disaster Natural Hazard Mitigation Go? An Analysis of Changes in Hazard Mitigation Since September 11, 2001, from a Local Government Perspective**
Joan Rennhack, Charleston County Building Services
Carl Simmons, Charleston County Building Services

## ■ Multi-Actor Relationships

Interlocken C, 1:30 to 3:00 p.m.

**Managing Personnel and Resources in Disaster Scenes**
Hsien-Ho Chang, University of Delaware

**Strategic Interactions in Disaster Preparedness and Relief in the Face of Man-Made and Natural Disasters**
Jun Zhuang, State University of New York at Buffalo
John Coles, State University of New York at Buffalo
Peiqiu Guan, State University of New York at Buffalo
Fei He, State University of New York at Buffalo
Xiaojun Shan, State University of New York at Buffalo

**Modeling the Dynamics of Agency-Agency Partnerships Before and Following Extreme Events**
John Coles, State University of New York at Buffalo
Jun Zhuang, State University of New York at Buffalo

**Performance Measurement and Collaborative Responses to Natural Disasters**
Daniel Nohrstedt, Uppsala University

## ■ Special Needs

Interlocken D, 1:30 to 3:00 p.m.

***¿Se Habla Español?* High Impact Weather Warnings and the Hispanic/Latino Population in the United States: A Neglected but Important Vulnerable Population**

Dana Greene, University of North Carolina at Chapel Hill

**Developing a Registry to Assist Special Needs Populations: Lessons Learned from Anniston Alabama**

Lauren Barsky, Argonne National Laboratory
Paul Hewett, Argonne National Laboratory

**Hidden in the Numbers: Anticipated Disaster Shelter Use for People with Health and Access Concerns**

Rochelle Brittingham, University of Delaware
Tricia Wachtendorf, University of Delaware

## ■ Break

3:00 to 3:15 p.m.

## ■ Mental Health

Centennial F, 3:15 to 4:45 p.m.

**Water and Ice: Using Natural Disasters to Study Prenatal Maternal Stress**

Suzanne King, McGill University
David Laplante, McGill University

**Simulation Training and Exercise Collaboratory (SIMTEC): Enhancing CBRNE Psychosocial Capacity and Capability Management**

Laurie Pearce, Royal Roads University

**The Experience of Role Strain Among Police Officers During a Disaster**

Terri Adams, Howard University
Mila Turner, Howard University

## ■ Community

Interlocken C, 3:15 to 4:45 p.m.

**Disaster Cultures in the Netherlands: Borgharen and Itteren**
Karen Engel, Wageningen University
Georg Frerks, Wageningen University
Lucia Velotti, University of Delaware
Jeroen Warner, Wageningen University
Bart Weijs, Wageningen University

**A Countrywide Local Emergency: Canadian Communities Tackle the Spanish Flu**
Joe Scanlon, Carleton University

**Post-Disaster Population Estimates**
Shannon Van Zandt, Texas A&M University
Walter Gillis Peacock, Texas A&M University
Dustin Henry, Texas A&M University
Sonja Willems, Texas A&M University

**A Managerial Perspective on Long-Term Housing of Disaster IDPs: The Experience of Houston, Texas, after Hurricane Katrina**
Divya Chandrasekhar, Texas Southern University

## ■ Vulnerability

Interlocken D, 3:15 to 4:45 p.m.

**Determinants and Characteristics of Damage in Single-Family Island Households from Hurricane Ike**
Wesley Highfield, Texas A&M University
Walter Gillis Peacock, Texas A&M University
Shannon Van Zandt , Texas A&M University

**Mapping Social Vulnerability to Enhance Housing and Neighborhood Resilience**
Shannon Van Zandt, Texas A&M University
Walter Gillis Peacock, Texas A&M University
Dustin Henry, Texas A&M University
Wesley Highfield, Texas A&M University
Himanshu Grover, Texas A&M University

**Social Vulnerability Indices: A Comparative Assessment Using Uncertainty and Sensitivity Analysis**
Eric Tate, University of Iowa

## ■ Closing Remarks

Centennial F, 4:45 to 5:00 p.m.
**Walter Gillis Peacock, Bill Lovekamp, and Joe Trainor**

**TERRI ADAMS,** HOWARD UNIVERSITY
**MILA S. TURNER,** HOWARD UNIVERSITY

## The Experience of Role Strain Among Police Officers During a Disaster

The ability of police departments to provide adequate services in man-made or natural disasters is contingent upon critical response personnel working and functioning in an efficient manner. Currently, it is assumed that police officers will fulfill their professional duties in the event of a disaster, even if they are personally impacted by the disaster to which they are expected to respond. However, the media reported abandonment of duty among the New Orleans Police Department during Hurricane Katrina suggests that the response of personnel may be contingent upon the confluence of a variety of factors.

This exploratory study examined the situational factors that influenced feelings of role strain among police officers that served as first responders during Hurricane Katrina. To gain insight into the experiences and activities of responders during the most stressful parts of the event, face-to-face interviews were conducted with officers (N=37) of varying ranks in a Gulf Coast police department. The data demonstrate the diverse rationale for actions taken or neglected during and after the disaster, as well as the varied priorities and concerns of first responders in crisis situations.

**B.E. AGUIRRE,** UNIVERSITY OF DELAWARE
**ERIC BEST,** UNIVERSITY OF DELAWARE

# How Not to Learn: Resilience in the Study of Disaster

The use of resilience in disaster sciences provides us with the opportunity to consider instances in which it is best "not to learn," since segments of the actual academic discourse remain on a fad level. At times they discuss important research questions by using new vocabularies that do not add any new knowledge, even as they command important resources. We present some evidence for the fad of resilience and examine the two most common approaches to its study, the normative and indicator approaches, as well as an alternative reliability approach.

The word "resilience" has gained some popularity in recent years and such use is unobjectionable. Nevertheless the popularity of the concept of resilience in social science is redundant when applied to research and management of disasters since the goals typically associated with social resilience—that of identifying effective strategies for strengthening the institutions of society faced with disasters—have for half a century or more informed emergency management, federal policy making, and the scientific study of the impact of disasters on social organizations.

Instead of resilience, high reliability organizations and networks, two well-known concepts that preceded the current resilience fad, are proposed in this paper

**EARL BAKER,** FLORIDA STATE UNIVERSITY
**JEFFREY CZAJKOWSKI,** UNIVERSITY OF PENNSYLVANIA
**ROBERT MEYER,** UNIVERSITY OF PENNSYLVANIA

# Modeling the Real-Time Decision to Evacuate from a Hurricane

While there has been a significant amount of research dedicated to better understanding a household's decision to evacuate from a hurricane, these studies are routinely conducted in a post-storm environment months, or even years, after the event. Unfortunately, this post-storm research is subject to the significant survey issue of recall, where the appropriate recollections of facts surrounding one's decision to evacuate are likely suspect stemming from the passage of time.

In order to remedy the recall issue, we have collected survey information on a household's decision to evacuate while a hurricane was actually threatening. We present an analysis of this intended household evacuation decision for two hurricanes that impacted both the mid-Atlantic and northeastern regions of the United States—Hurricane Earl in 2010 and Hurricane Irene in 2011. Significantly, our survey covers varied geographic areas—North Carolina, Massachusetts, and New York—allowing for the evacuation decision analysis of different types of hurricane-experienced residents from a general perspective. Moreover, the survey instrument specificity allows for the analysis of the evacuation decision accounting for a multitude of relevant factors not traditionally analyzed, including storm and forecast awareness, perceived vulnerability and concern, preparation, and sources of forecast information.

The results from our study allow for a better understanding of the actual factors that various types of households consider as they make their evacuation decision in varied geographic areas as the storm threatens and evolves. Understanding this is critical in moving forward on the construction of forecast information that households can and actually do use to make better evacuation decisions.

**NATALIE BAKER,** UNIVERSITY OF CALIFORNIA, IRVINE

# Preparedness for Catastrophes: The Constitutive Dynamism of Plans and Improvisation

A major earthquake in Southern California could cause profound, long-term disruptions to daily life for people in the region. One only need look at Hurricane Katrina in New Orleans or the 2011 Japan earthquake and tsunami to grasp the level of potential destruction. In general, preparedness practices, while designed to educate and empower residents to be prepared, do little to ensure successful responses in catastrophic events.

This paper addresses how people in at-risk contexts enact preparedness for a major earthquake using grounded theory-based inductive research methods to explore the question. My study site is a large organization and community located in Orange County, California, an area at great risk for a potentially devastating seismic event. Data collection efforts consisted of in-depth interviews with staff and community members, archival analysis of disaster planning materials, and observation of earthquake preparedness activities.

I find preparedness is carried out through the enactment of two sets of practices in this environment. Explicit practices are planning oriented actions people engaged in accordance with official recommendations. In contrast, implicit practices are those activities, resources, and technologies people enacted in everyday life with the potential for improvisation in post-disaster contexts.

Disaster preparedness can be thought of as a structurated phenomenon and is carried out through a constitutive relationship between structure and action. A structuration model of preparedness moves away from the primacy of plans dictating action into understanding the process as a dynamic relationship between structure and action. Preparedness is also reconstituted in different forms, or moderated, when new courses of action are necessary to adapt to constraining and enabling aspects of the dynamic conditions of context. I discuss the model's implications for disaster preparedness and new ways in which these processes can be carried out in at-risk communities

**LAUREN BARSKY,** ARGONNE NATIONAL LABS
**PAUL HEWETT,** ARGONNE NATIONAL LABS

# Developing a Registry to Assist Special Needs Populations: Lessons Learned from Anniston, Alabama

Within the general population affected by any disaster is a group with even greater vulnerabilities and risks—individuals with special needs. The special needs population can generally be described as those who are cognitively and/or physically disabled or frail to the point that they require routine, professional help to complete daily-life tasks. This group can include patients and residents of hospitals, nursing homes, and mental health facilities that need additional specialized care during a disaster or evacuation activity. Much of this group is made up of the elderly who need assistance in daily living activities in addition to medical care.

The special needs group is particularly vulnerable during a disaster and special plans and resources must be in place to address this at risk population. More and more states, counties, and municipalities are placing emphasis on the use of registries to assist special needs populations in the aftermath of extreme events. Additionally, the U.S. Department of Justice has published guidance that suggests that communities should establish voluntary, confidential registries for persons with disabilities in order to comply with Americans with Disability Act of 1990 requirements.

As part of a research effort with the Federal Emergency Management Agency, Argonne National Laboratory conducted a study into how the Alabama Chemical Stockpile Emergency Preparedness Program administered and maintained one such special needs registry over an extended period of time. Through in-depth qualitative interviews with a number of key personnel involved in creating and maintaining the registry, this study examines processes for establishing and maintaining registries that were effective, reasons people chose to participate in a registry, and the importance of balancing perceptions with realistic expectations when it comes to implementing a special needs registry.

**ERIC BEST,** UNIVERSITY OF DELAWARE
**ALEX GREER,** UNIVERSITY OF DELAWARE

# All Oil Spills are Local: Severity, Framing, Legislation, and GDP Change in States and the Nation

While there is a large body of disaster literature concerning offshore oil spills, much of the research focuses on the national response and psychological impacts of these disasters. To determine if the effects of oil spills are localized, we reexamine major offshore oil spills in the United States using a combined approach. Merging qualitative and quantitative concepts, we examine environmental impact of oil spills, spatial and temporal aspects of the spills, issue framing in local and national news at the time of the spills, legislation resulting from each spill, and the gross domestic product (GDP) change over time for states with spills and the United States as a whole.

Using this combined approach, we find correlations between issue framing in domestic oil spills and declines in oil and gas extraction GDP relative to the rest of the United States in states with negative framing of offshore spills. We find few correlations between GDP declines and offshore spills for state economies where spills are framed in a less negative manner. These findings suggest that the localized oil and gas extraction industry is sensitive to issue framing in times of disaster, and that media and popular portrayals of oil spills are correlated with industry growth on a state level. Interestingly, we find no correlation between oil spills and national oil and gas extraction industry trends.

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# Hidden in the Numbers: Anticipated Disaster Shelter Use for People with Health and Access Concerns

Emergency managers contend with the challenge of how best to provide public shelter during times of a disaster. Although only 13 to 16 percent of the population—depending on the study—seeks shelter in these facilities, ensuring the safety of those in public shelters is paramount.

Recently attention has turned to how best to address the needs of individuals with health concerns or functional access needs. This study, with funding from the National Science Foundation, explores the likelihood of accessing public shelters. A telephone survey of North Carolina households was conducted in 2011, focusing on the broad topic of evacuation and sheltering decision making. Independent chi-squared and cross tabs were conducted.

Results showed that approximately 14 percent of households would seek public shelter if a hurricane were to strike. This finding is consistent with the literature. Interestingly, however, of those respondents who stated someone in their household had a health or access consideration that may influence public shelter use, 25 percent anticipated using a disaster public shelter. Of those would did not identify with this description—in other words, no health or access concern—only 10 percent anticipated using a public shelter.

Our findings suggest that not only did more respondents with a health concern anticipate using a public shelter, compared to those without a health or access concern, but also that a greater percentage of households with health or access concerns anticipate relying on such facilities compared to the general population. These finding suggest that public shelters must better consider the range of functional needs its occupants will have during a large-scale evacuation. We discuss how these findings fit into the social empowerment model and potential implications for future policy.

**DIVYA CHANDRASEKHAR,** TEXAS SOUTHERN UNIVERSITY

# A Managerial Perspective on Long-Term Housing of Disaster IDPs: The Experience of Houston, Texas, after Hurricane Katrina

Existing research on environmentally induced displacement is heavily focused on the motivations, experiences and outcomes for the internally displaced populations (IDPs) and not enough on the communities that accommodate them. Existing studies mostly focus on either the environmental impact of the IDPs on host communities or on their short-term responses to displacement. But these are not adequate to address the management of the prolonged (and regional scale) displacement experienced in recent catastrophic disasters. Moreover, decision making after disasters is conducted urgently and can yield results different from "normal" circumstances. Therefore, there is a need for research that examines host community responses to prolonged disaster-induced displacement and the factors that affect them.

This study uses the case of Houston, Texas, after Hurricane Katrina in 2005 to examine the process by which policies for long-term housing of IDPs are created and implemented, the factors that affect this process, and the challenges faced by public officials to implement it.

Data was collected through key informant interviews of public officials and planning consultants, primary (pilot) surveys, and secondary document review. Data was analyzed using content analysis techniques and descriptive statistics. Study findings include a programmatic timeline of decisions made by Houston public officials leading up to the creation of the Disaster Housing Assistance Program.

The study concludes that: (1) coordination between multiple recovery actors can be greatly aided by new institutions created specifically for recovery purposes; (2) the urgency of the situation can lead to the creation of new policies in partnership with actors not usually associated with recovery; (3) urgency can lead to the use of existing policies as blue prints for new ones, which possibly replicates existing inequities; and (4) public officials often have difficulty balancing the urgent (and changing) needs of the IDPs with the requirements and constraints of state and federal policy.

**HSIEN-HO CHANG,** UNIVERSITY OF DELAWARE

## Managing Personnel and Resources in Disaster Scenes

The Incident Command System (ICS) was designed to have: (1) hierarchy of authority; (2) division of labor; and (3) formal rules and procedures. It is regarded as a hierarchical disaster response system. According to organizational theory, hierarchical structures have difficulty dealing with high levels of uncertainty or interdependence. Formalized rules and procedures also reduce communication within organizations, impeding professionals in performing well.

Unexpected catastrophes, such as the Japanese earthquake in 2011, are occurring with greater frequency around the world. These catastrophes involve high levels of uncertainty and complexity, making it harder for personnel working within normal response systems—such as the ICS—to deal with them. This paper will discuss possible alternative systems for responding to disasters with high levels of uncertainty.

The researcher focuses on the following two research questions: (1) what are the limitations of using a hierarchical disaster response system; and (2) what kind of organizational structure would be more suitable for responding to disasters with high amounts of uncertainty?

To answer these questions, the researcher has reviewed a number of ICS-related research papers and technical reports, along with organizational theories to better understand the differences between hierarchical versus non-hierarchical structures. In this paper, the researcher will present his major findings and will provide some possible suggestions for redesigning disaster response systems in the future.

LIANG-CHUN CHEN

# Investigation Analysis on Local Level Administration Personnel's Cognition to Hydro-Meteorological Disaster Adaptation Strategies

Extreme weather has become frequent in recent years, causing extreme hydro-meteorological disasters. Typhoon Morakot, for example, hit Taiwan and caused 700 deaths in August 2009. Such a trend means working out appropriate and feasible disaster adaptation strategies will be important topics for the future response to climate change. Furthermore, these disaster adaptation strategies must have close connections to local administrative personnel who actually execute strategies, since their cognition to adaptation strategies is a key to whether these strategies will succeed.

This report covers in-depth interviews about relevant issues of cognition disaster adaptation strategies. Interviews were conducted with local-level administrative personnel (including township and Li level) who dealt with disaster prevention and rescue work in areas affected by Typhoon Morakot in southern Taiwan.

The survey results showed that awareness for disasters response strategies is higher than the awareness for disaster reduction strategies. This could be affected by the existing administrative operation system, interviewees' administrative operations type, length of working in the administrative unit, and their experiences in participating disaster reduction and prevention work. Furthermore, these survey results can be used as a reference for improvement of future large-scale disaster reduction and prevention operations in local government.

**JOHN COLES,** STATE UNIVERSITY OF NEW YORK AT BUFFALO
**JUN ZHUANG,** STATE UNIVERSITY OF NEW YORK AT BUFFALO

# Modeling the Dynamics of Agency-Agency Partnerships Before and Following Extreme Events

The recent earthquakes in Japan, Chile, China, and Haiti, as well as the ongoing preparation for similar quakes in the New Madrid Seismic Zone in the United States, demonstrate the importance of understanding the dynamics that govern networks of relief agencies. The objective of our research is to model and analyze the process of partnership creation, length of partnership efficacy, and timing of partnership conclusion in networks of agencies responding to crises.

We plan to create models using game theory and simulation to explore how characteristics of partnerships could be used to predict dynamics in agency investment, commitment length, partnership selection, and exit timing from a crisis. We propose to use data about the relief efforts following the Haitian earthquake and flooding in the United States from Hurricane Irene and Tropical Storm Lee to accomplish the above objectives using dynamic network models and simulation. Information collected previously about the networks that existed in Haiti before and after the 2010 earthquake provide an initial data set for this project that will be augmented with additional data collected from agencies working in the United States.

This research will build on previous work in emergency management to provide a comprehensive analysis of organizational posturing following an extreme event. By documenting the dynamical flow of roles and resources following extreme events, we will provide a testing ground for hypotheses regarding agencies and how they are impacted by partnerships, goals, roles, and prior involvement. We will develop and study a mathematical model for agency-agency interactions, using game theory and stochastic processes. This project will provide a new perspective on how agencies interact during disaster relief and recovery operations so that emergency managers can improve the impact of their agency during a disaster relief operation (i.e., saving lives and property).

**ROBIN COX,** ROYAL ROADS UNIVERSITY

## Community Disaster Resilience Planning

The Rural Disaster Resilience Project was a community-based action research project funded by the Center for Security Science in partnership with the Justice Institute of British Columbia, Royal Roads University and Public Health Agency of Canada. In this presentation, participants will be introduced to the Disaster Resilience Planning Framework—a comprehensive risk and resilience management framework designed to support the ability of rural, remote, and small coastal communities to assess risk and resilience and develop plans and community-driven initiatives to extend and enhance their resilience.

The framework outlines a flexible, four-step planning process supported with user-friendly disaster resilience assessment and hazard risk reduction planning tools. Primary amongst these tools are the Rural Resilience Index (RRI) and the Hazard Resilience Index (HRI). The RRI includes an array of community resilience indicators associated with social, human (knowledge and skills), built, natural, economic capital, governance issues, and disaster and emergency planning processes and plans. The HRI provides a comprehensive list of resilience indicators associated with natural, human-caused, technological, disease, and chemical, biological, radiological, nuclear, and explosive (CBRNE) hazards.

Combined they allow communities to undertake a comprehensive assessment of their resilience and develop an action plan that makes sense in their context and is driven by their local priorities. Participants will also be introduced to the Disaster Risk Resilience Planning Network, an interactive virtual forum that provides interactive, web-based versions of the DRP, RRI, HRI and other related tools and resources. It is designed to provide a virtual space for any community or group to engage in the resilience planning process and harness the collective expertise and knowledge of network members.

**KAREN ENGEL,** WAGENINGEN UNIVERSITY
**GEORG FRERKS,** WAGENINGEN UNIVERSITY
**LUCIA VELOTTI,** UNIVERSITY OF DELAWARE
**JEROEN WARNER,** WAGENINGEN UNIVERSITY
**BART WEIJS,** WAGENINGEN UNIVERSITY

# Disaster Cultures in the Netherlands: Borgharen and Itteren

The Netherlands faces a permanent threat of flooding. To take advantage of the opportunities their dangerous habitat offers, the Dutch have developed ways to deal with this recurrent hazard varying from physical to cultural mechanisms, encompassing what disaster research literature has labeled a "disaster culture."

Even though Dutch engineering works have decreased floods to what some consider negligible levels, the threat nevertheless persists and is entrenched in Dutch culture. Yet, there are few studies that actually look into disaster culture in the Netherlands. This article presents the findings of explorative Dutch-American research (2011-2012) into the existence and attributes of local disaster cultures in two hamlets in the province of Limburg—Borgharen and Itteren, which experience a systematic threat of flooding.

Data collection relied on: (1) document analysis; (2) participant observation; (3) focus groups; and (4) in-depth interviews. The study demonstrated that despite the proximity of Borgharen and Itteren (only three kilometers apart) the two communities are characterized by distinct disaster cultures. While their disaster cultures show some similarities, they also manifest clear differences. Some salient differences concerned the local patterns for response, knowledge, symbols, and built environment.

Furthermore, the research revealed that current flood safety interventions could engender significant changes in the identified disaster cultures. Higher safety standards accompanied with the message that flood risk will be lowered to insignificant levels could affect the way these communities will perceive flooding as a threat—changing the way they integrate it into their public space through architecture or the presence of symbols, for instance. In our attempts at explaining the findings, we refer largely to concepts and ideas derived from disaster culture and technological culture conceptualizations

**FENN FABER,** ALBERT-LUDWIG UNIVERSITY OF FREIBURG

# From Natural Hazards to Gradual Environmental Change: Climate Change Adaptation in Forestry

There are three issues with the organizational response of state forest administrations concerning climate change impacts. First, the goal of long-term sustainable forest management and the irreducible complexity and unpredictability of ecosystems leads to a fundamental uncertainty. Second, the anticipation of natural hazards (e.g., storms, pests, and forest fires) and gradual environmental change (future growth conditions for trees) represents a challenge for forest managers. Third, forest administrations are socially embedded in the sense that they are confronted with heterogeneous expectations from dynamic environments.

Hence, despite a growing scientific consensus concerning long-term climate change scenarios, forest administrations seem overburdened with the complexity and uncertainty concerning climate change adaptation measures. The main interest of my research project lies at the interface between ambiguous organizational practices and contradictory, complex, and uncertain knowledge concerning climate change adaptation at the regional level.

In my case study of German state forest administrations, I focus on social practices of problem-solving performances and processes. Along with DiMaggio and Powell, I assume that regional forest administrations absorb uncertainty by adopting solutions (e.g., working tools such as risk maps) from other forest administrations whose response, when faced with the same problem, is considered legitimate within the forestry community (institutional isomorphism).

Based on qualitative (32 expert interviews with directors and heads of departments) and quantitative (national online survey among 1,019 district foresters) data, I argue that—instead of being considered an obstacle to long-term planning—the acceptance of uncertainty leads to the understanding of planning as a creative process, enabling a variety of solutions. To avoid maladaptation, forest administrations should facilitate more and better organizational dialogue regarding the development of adaptive capacity. Climate change adaptation strategies and decision support tools should thus be understood as starting points rather than conclusions.

**JUNE GIN,** VA EMERGENCY MANAGEMENT EVALUATION CENTER
**ANGELA COHEN,** VA EMERGENCY MANAGEMENT EVALUATION CENTER
**DIANA NARANJO,** VA EMERGENCY MANAGEMENT EVALUATION CENTER

## A Safety Net for Homeless Veterans: Disaster Preparedness in Homeless Housing Providers

Homelessness is particularly endemic among veterans, who comprise one in six of all homeless individuals in the United States. Mental illness, substance use disorders, PTSD, and medical issues are particularly prevalent among homeless veterans. Such conditions are likely to exacerbate the disruptive effects of a disaster, which can trigger symptoms or disrupt efforts toward recovery, particularly if trusted support systems are not available afterwards.

Transitional housing programs constitute a safety net for homeless veterans, who often have limited resources to undertake preparedness actions themselves. These programs are likely to play an essential role in providing for the mental health and support, sheltering and evacuation, and disaster information needs of clients during a disaster. However, little prior work (Ritchie et al. 2008 is an exception) has been done on the preparedness of human service providers and the disaster resilience of homeless housing services is unknown.

This pilot study documents disaster preparedness activities in non-profit organizations that provide transitional housing for homeless veterans. Preliminary data will be presented from interviews with leadership and staff of six non-profit housing providers in Los Angeles County, focusing on concerns about providing services during disaster. The data will also include an analysis of organization emergency plans.

The study identifies disaster vulnerabilities in safety net housing and support services for homeless veteran clients. The study examines three components of preparedness: (1) organizations' ability to protect staff and client life safety; (2) their ability to restore key services and continue housing residents; and (3) their connectedness to partners and viability as a community disaster resource. It will also identify ways that the VA, as a partner and funder, can develop policies to support disaster preparedness, continued operations, and collaboration for organizations housing homeless veterans.

**SHULI GOODMAN,** TRANSFORMATION INSTITUTE

## Organizational and Community Transformations after a Catastrophic Event

The purpose of this study was to understand the phenomena of how the future emerged for systems that underwent deep structure dissolution. The research brought to light what lessons and opportunities crises might offer in the journey to create a more sustainable world.

Due to extreme climate variability, toxins, and the depletion of natural resources, the lives of a growing number of people are being affected by planetary disaster. These incidents force a departure from what is known and taken for granted, and require us to make our way to a substantively different future. The study provided a platform to explore evolutionary change theory as well as a way to view the role of innovation as a herald of the future during social, economic, and cultural upheaval.

Using transcendental phenomenology, the inquiry's research design engaged participants in retelling their organization's or community's story about meeting transformative crises caused by floods and tornadoes. Five organizations and communities were interviewed. Through the voice of one or two representative leaders from each group, the study explored the nature and meaning of these occurrences.

The outcome of the study supported previous research findings that crisis and uncertainty can provide the energy and urgency necessary to dissolve old, dominant ways of being and simultaneously allow new ways of organizing life to emerge. Key findings demonstrate that crisis drives increased, multi-directional information flow, thus creating more permeable communication boundaries. As a system goes in search of information to support decision making, it considers the value of various innovations to meet its goals. Innovation adoption, whether in beliefs, practices, or technologies, serves as a natural selection mechanism that defines and helps to steer systems toward the future. Conversely, outcomes indicated that when a dominant paradigm is sufficiently strong it will reassert itself, thus inhibiting innovation and transformation.

**DANA GREENE,** UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL

# *¿Se Habla Español?* High Impact Weather Warnings and the Hispanic/Latino Population in the United States: A Neglected but Important Vulnerable Population

Presently, the U.S. National Weather Service and National Oceanic and Atmospheric Administration issue severe weather watches and warnings for designated areas within a polygon of risk (for tornadoes, etc.), and sends out alerts using the national emergency broadcast system. While these alerts are extremely important when received, they must be both received and understood.

Given these concerns, this paper seeks to evaluate the effectiveness of high-impact weather warnings for tornadoes in the demographically diverse eight-county Research Triangle region in North Carolina. More specifically, this paper evaluates the impact of severe weather warning reception, understandability (risk perception), and response among the Spanish-speaking Hispanic and Latino population—a unique demographic, given that warnings are presently only issued in English.

Because of this unique language barrier in our national weather warning alert system, Spanish-speaking populations remain more vulnerable than other populations because of their location in the region, the type of work that they do (largely agricultural), and their lack of knowledge about imminent severe weather threats. Given that many in this demographic do not speak English fluently and thus might not understand that a tornado has been spotted, may not own weather radios or be within range of a television on which an English language alert is being sounded, and may not perceive themselves to be at risk because their specific community is not included or named in the forecast polygon, the Spanish-speaking population in the Research Triangle region of North Carolina remains a significantly vulnerable population.

NOAA's Weather Ready Nation Web site provides user-friendly information for individuals in the United States to better understand high-impact weather forecasts and warnings. While advanced Doppler radar technology works well to predict the storms, what cannot be predicted is the social response to the information and to the storms or adverse weather conditions.

**SARA HAMIDEH,** TEXAS A&M UNIVERSITY
**SHANNON VAN ZANDT,** TEXAS A&M UNIVERSITY
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# Tracking Housing Recovery in Galveston after Hurricane Ike

As the impact of natural hazards increases, particularly in coastal areas experiencing rapid urbanization, it is critical to understand how coastal communities recover after disasters. Hurricane Ike made landfall in September 2008 near Galveston, Texas. It is one of the most costly hurricanes to strike the United States. Since then, housing recovery has started in different forms.

The goal of this paper is to display the geographic pattern of housing recovery in Galveston and examine the relationship of this pattern with location and socio-economic attributes of the households and the pre-disaster condition of the structures.

Some of the main concerns include:

- How has the recovery proceeded in respect to changes in overall damage to structures and state of repair?
- How is the spatial distribution of recovery proceeding?
- How has spatial distribution of households and land and improvement values changed during the recovery period?
- Is there spatial continuity in household income and land and improvement values in the Ike-hit area?
- How has the housing recovery process affected housing development patterns in Galveston?

The main strategy used to answer these questions is GIS analysis, which provides a set of tools that includ spatial join, raster analysis, geostatistical analysis, and interpolation. These enabled researchers to join the survey data on Galveston housing recovery and damage assessments since 2008 with updated maps of the area and look for patterns in a longitudinal and spatial comparison.

Findings from this analysis indicate there is more continuity in median income spatial distribution in the study area than in land and improvement values. The most severe damage in 2008 occurred in relatively low-income areas and lowest damage in various ranges of income areas. While the most damaged homes were located in Bolivar Peninsula, in 2008 majority of the parcels with ongoing repair were located in Galveston Island, but in 2010 and 2011 there is a balance between Galveston and Bolivar Peninsula.

**KEVIN HESLIN,** VA EMERGENCY MANAGEMENT EVALUATION CENTER
**BRINDA VENKATESH,** VA EMERGENCY MANAGEMENT EVALUATION CENTER

# Using Disasters to Help Veterans: Team Rubicon Reports from the Field

Military personnel are often trained to provide first aid and frontline trauma care in combat. This expertise can be useful for responding to disasters in civilian settings. This type of service could also provide a sense of purpose and camaraderie to veterans, many of whom reportedly feel uprooted and alienated after returning to civilian society.

Team Rubicon is a 501(c)(3) organization that provides a unique opportunity to describe the impact of disaster response work on veteran morale and reintegration. The organization deploys response teams, consisting largely of veterans, to areas that are acutely affected by disasters, warfare, and other extreme events. The aim for this formative study was to describe how veterans perceive the possible therapeutic benefit of disaster and emergency response work.

We conducted a content analysis of approximately 350 pages of field notes submitted to TR headquarters by volunteers deployed on any of eight missions, using a combination of inductive and a priori themes identified in discussions with TR staff.

Results suggest that veterans derive a great deal of personal satisfaction from humanitarian aid work. In a representative quote, one veteran wrote in the aftermath of the Haiti earthquake, "I found a renewed sense of purpose for myself that had been missing since I separated from the [U.S. Marine Corps]."

Writing from Pakistan, another veteran described the "sense of community" he felt providing aid alongside local medical students, prompting him to comment critically on the more individualistic aspects of U.S. culture, and to conclude that he was "going to miss this type of life." Appreciation for opportunities to practice and refine emergency management skills originally acquired in the military was also a highly prevalent theme in the notes. The benefits of deploying recently returned veterans in disaster and emergency response should be explored in future work.

**WESLEY HIGHFIELD,** TEXAS A&M UNIVERSITY
**WALTER GILLIS PEACOCK,** TEXAS A&M UNIVERSITY
**SHANNON VAN ZANDT,** TEXAS A&M UNIVERSITY

# Determinants and Characteristics of Damage in Single-Family Island Households from Hurricane Ike

Hurricane Ike made landfall at Galveston Island on September 13, 2008. Characterized more by storm surge than wind, its impact caused severe damage to homes located on Galveston Island and Bolivar Peninsula. Because of its diverse built, natural, and social environment, the island and peninsular study area are ideal sites to determine not only initial hurricane damage, but to examine the interactions of structural, geographic, and social characteristics.

Damage assessments are frequently employed following natural hazards and are an important tool in determining the physical effects of a hazard event to a community's housing stock. However, the results of these assessments tend to be descriptive in nature and exclude hazard exposures, structural, and socioeconomic components. We focus on this shortcoming by analyzing damage assessment data with a host of additional variables in a multivariate statistical framework. Using a random sample of 1,500 single-family homes that were assessed for damage in December 2008, we address the following research question: What structural, socioeconomic, and spatial characteristics were the primary determinants of initial hurricane damage severity?

Notable results indicate the importance of structure elevation, a non-linear relationship with respect to the age of the structure, and social inequalities in the pattern of damage. This research highlights the critical importance of building codes, the consequences of changing development patterns, and the presence of inequitable housing impacts.

**HUNG-CHIH HUNG,** NATIONAL TAIPEI UNIVERSITY
**YU-TING LU,** NATIONAL TAIPEI UNIVERSITY

# Adaptive Capacity to Climate Hazards on the Southwest Coast of Taiwan: The Potential Role of Social Capital and Participation

Climate change is expected to increase in frequency and in the intensity of climatic variability and extremes. Particularly, extreme weather events like severe typhoons and storms can have a heavy impact on life, property, and the livelihoods of communities in East Asia and Taiwan. Enhancing adaptive capacity to climate hazards is essential to guide the selection of mitigation policies and to reduce the vulnerability and losses to the impacts of climate change. There are several studies contributing to the identification of the determinants of adaptation, but little attention is paid to studies of social capital and participation dimensions of adaptation. This article develops a community-based adaptation model to examine the role of social capital and public participation factors in determining adaptation. Finally, we discuss the implication of our findings on adaptive capacity assessment and on efforts to promote adaptation through governmental intervention.

We developed a socio-cognitive model of household proactive adaptation to climate hazards that considers the psychological, social capital, and public participation aspects of adaptation. To illustrate the proposed methodology, a case study on the southwest coast of Taiwan is presented to identify the factors that affect the adaptation to climatic hazards. This study used a structured random sampling procedure to select respondents, and a total of 381 respondents were interviewed face-to-face. Moreover, we employed a Logit model to test the marginal effects of social capital and public participation factors on the probability of adopting adaptations.

Results support social capital and participation factors as key determinants of adaptation. The case study showed that social capital and participation factors improve the statistical power of the model of household adaptive behavior. Our findings suggest a well-defined model of residential decision making on adaptation, which has important implications for the assessment of vulnerability, resilience, and adaptive capacity, as well as on policies to enhance household adaptive capacity to climate change.

**ELIOT JENNINGS,** UNIVERSITY OF NORTH TEXAS

# User Acceptance of Technology: An Empirical Examination of Factors Leading to Adoption of Decision Support Technologies for Disaster Management

The primary objective of this research is to advance our understanding of technology acceptance and adoption in disaster response management. While numerous models of technology acceptance have been empirically tested in the information sciences literature, the studies have primarily focused on the private or for-profit sector. This study aims at filling this gap by advancing the field of technology acceptance and by focusing on public sector use of decision support technologies.

Specifically, this research asks what factors lead to the acceptance and adoption of decision support software (e.g., WebEOC and E-team) for disaster response management by emergency managers. Using the Venkatesh et al. (2003) unified theory of acceptance and use of technology (UTAUT) model as a framework, the study will examine how performance expectancy, effort expectancy, social influence, and facilitating conditions influence the intent to use technology in a disaster management setting by surveying city and county emergency managers in Texas.

An important contribution of this study draws upon public administration literature on collaboration and form of government to examine the influence of these factors on technology acceptance. Another contribution draws upon the disaster literature to understand how hazard threats and disaster history influence the acceptance of technology. In addition, the moderating influences of key demographic variables such as gender, age, and education will also be examined.

**NABIL KAMEL,** ARIZONA STATE UNIVERSITY

# Federal Assistance and Post-Disaster Housing Recovery: Limitations and Opportunities for Large-Scale Disasters in Metropolitan Areas

Long-term assessments of post-disaster housing recovery show that U.S. federal assistance programs have produced mixed results. This is especially true in major disasters affecting large metropolitan areas where these programs have consistently disadvantaged low-income, minority, multi-family, and renter communities.

This paper identifies structural factors in disaster recovery policies and planning that contribute to uneven housing recovery outcomes. Evidence is distilled from long-term monitoring of the last two major disasters in U.S. metropolitan areas: the 2005 Hurricane Katrina in New Orleans and the 1994 Northridge earthquake in Los Angeles. Study findings indicate that federal programs are designed to rely on market mechanisms as the primary drivers of housing recovery. This market approach has led to net losses in affordable and low-income housing. Also, programs are designed to provide the minimal federal assistance necessary to maintain social order and restore pre-disaster conditions.

Long-term developmental opportunities in marginalized communities tend to be missed as program design and eligibility criteria are modified in ad hoc and reactive ways when crises emerge and additional needs are identified. Similarly, programs are not scalable and losses from large-scale disasters in metropolitan regions usually exceed budgeted amounts. Supplemental appropriations require congressional approval and usually become entangled in politics. These budget constraints result in underfunded programs and delays that put households with limited resources at a disadvantage.

Finally, assistance eligibility criteria favor single-family homeowners. Amounts disbursed are based on home value and property loss rather than on need or effect on recovery. As a result, low-income households, renters, and owners of rental units are left with limited assistance options. Despite such limitations, and under specific circumstances, marginalized communities are able to circumvent obstacles and produce positive transformative outcomes. The paper draws recommendations from these findings to improve post-disaster housing recovery programs.

**SUZANNE KING,** MCGILL UNIVERSITY
**DAVID LAPLANTE,** MCGILL UNIVERSITY

# Water and Ice: Using Natural Disasters to Study Prenatal Maternal Stress

Well controlled animal experiments suggest that maternal stress during pregnancy programs the fetus for a variety of developmental delays and illnesses. Little is known about the effects of prenatal maternal stress in humans, however. Because it would be unethical to randomly assign pregnant women to stress conditions, studying prenatal maternal stress in humans presents challenges to the researcher.

These can be overcome by taking advantage of naturally occurring stressors that distribute hardship in quasi-random fashion. Our research program addresses these research questions: (1) to what extent do objective hardship and subjective distress during pregnancy influence the cognitive, behavioral, physical and motor development of the unborn child; (2) are these effects moderated by the timing in pregnancy and the child's sex; (3) what are the mechanisms of these effects; and (4) will more intensive prenatal care buffer these effects.

We are running three studies of pregnant women exposed to natural disasters. In each, we identified pregnant women within weeks of the disaster onset and assessed objective exposure and subjective distress (PTSD symptoms). We then evaluated pregnancy outcomes, and the cognitive, behavioral, motor, and physical development of the children. We began Project Ice Storm in Quebec in 1998. The Iowa Flood Study began in 2008 and added pre-disaster data from an ongoing study of pregnant women. The QF2011 Queensland Flood Study in Australia began last year and included pre-trauma data on pregnant women, a pre-existing randomized controlled trial of two prenatal care programs, plus birth biological specimens that will reveal the mechanisms of action of prenatal stress in humans.

We will give the background rationale for the research program, the methods of the three studies, and a sampling of results. Our studies demonstrate strong and long-lasting effects of prenatal stress on outcomes such as IQ, language, memory, anxiety, coordination, and risk for obesity in children.

**TAMIYO KONDO,** KOBE UNIVERSITY

## The Neighborhood Housing Recovery Gap after Natural Disasters

This paper shows the housing recovery gap among three New Orleans neighborhoods—Holy Cross, Gentilly Woods, and Lakeview—after Hurricane Katrina. The research question is: What are the factors that form neighborhood housing recovery gaps, speed, and property sales at the neighborhood level after natural disaster?

The goal of the research is to clarify the mechanism for housing recovery. Hurricane Katrina in 2005 and the Great East Japan Earthquake of 2011 have similarities—including long-lasting flooding, extensively affected areas, long-term survivor evacuation, and extensive destruction of the built environment—so there are similar challenges for post-disaster recovery planning and housing recovery. These similarities mean that Japan can learn from the response to Hurricane Katrina.

The author conducted household rebuilding survey for approximately 1,500 properties in three neighborhoods in September 2009 and September 2010. The housing recovery situation is classified as rebuild, under-construction, abandoned, and vacant lot. The most distinctive trend is that the percentage of the rebuild category in all neighborhoods was almost the same at 50 percent, but that there were significant differences in the percentage of abandoned and vacant lots in 2009.

The author points out several factors implicated in neighborhood housing rebuilding status gap, such as property values, the lack of options for selling property, individual income, home ownership, and so on. The percentage of annual change is low, however, and there is a wide gap in terms of progress of housing rebuilding and home sales. The latter indicates turnover in residents. Neighborhoods without declining numbers of blighted properties and with more vacant lots were found to indicate a future widening disparity among neighborhoods.

**SOPHIA LIU,** U.S. GEOLOGICAL SURVEY

# Challenges with Integrating Official and Crowdsourced Crisis Information

New opportunities and challenges are arising as members of the public use pervasive information and communication technologies (ICTs), including social media and networking platforms, to help in the immediate aftermath of major disasters. ICT-enabled citizens are increasingly becoming voluntary sensors who can contribute valuable geographic information to the scientific documentation of disasters as well as directly influence emergency management operations.

As we have increasingly easy access to the ever flowing streams of content online, how can crisis data from government agencies, satellite imagery companies, volunteer technical communities, disaster-affected populations, and the general public be integrated to better facilitate emergency response, recovery, and mitigation efforts?

This paper presents the opportunities and challenges with integrating official and crowdsourced crisis information based on the response to the 2010 Haiti earthquake—the tipping point for crowdsourcing and social media use in the crisis domain. The initial exploratory phase of this research employs ethnographic methods of interviewing different stakeholders, as well as observing and participating in multi-stakeholder meetings (e.g., disaster exercises, trainings, and experiments). Approximately 80 informal interviews have already been conducted.

The next phase of this research employs other human-computer interaction design methods that involve data mining, visualizing, and prototyping to develop proof-of-concepts of how to best integrate official and crowdsourced geographic information to provide timely and accurate maps for different stakeholders. The primary intent of this research is to strengthen cross-agency collaborations between official emergency management stakeholders and the volunteer technical communities by addressing the geospatial data sharing challenges at the social, technological, organizational, and political interfaces.

**MICHELLE MEYER LUECK,** COLORADO STATE UNIVERSITY
**CALVIN WHITMAN,** COLORADO STATE UNIVERSITY

# Hurricanes and the Elderly: The Role of Social Networks in Age-Related Vulnerability

Elderly individuals are widely considered at elevated risk in disaster because of increased health concerns, fewer economic resources, and reduced social capital. Social capital resources can be especially important in counteracting health and economic vulnerability to disaster impacts by increasing the likelihood of learning of disaster warning information, assisting with preparation and evacuation, and recovering after an event by providing financial or nonfinancial assistance.

Based on analyses of the first two years of a three-year panel study of residents along the Atlantic and Gulf coasts of the United States, this paper addresses the relationship between age and indicators of disaster vulnerability with specific attention to social capital. Specifically, we developed indicators of disaster-specific social capital and describe how elderly and non-elderly respondents compare and contrast on these indicators and then discuss the effect of social capital and elderly status on preparedness and perceived barriers to evacuation.

Our results indicate that elderly respondents have different forms of social capital and that these resources affect preparedness activities undertaken, as well as the self-reported barriers to hurricane evacuation. We conclude that our results further illustrate that the effect of age on disaster risk and recovery is about more than age itself. Instead vulnerability relates to the social and economic circumstances that commonly correspond with age.

**WARD LYLES,** UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL
**PHILIP BERKE,** UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL
**GAVIN SMITH,** UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL

# Who's at the Table? Examining Factors Driving Incorporation of Land Use Approaches in Hazard Mitigation Plans

Climate change is expected to exacerbate long-term hazard risks. Creating resilient communities requires reductions in hazard risks. National consensus studies identify land use as a highly effective approach for risk reduction. Passage of the Disaster Mitigation Act (DMA) of 2000 created an inter-governmental policy framework requiring state and local governments to adopt hazard mitigation plans to be eligible for certain federal disaster funds.

Networks of stakeholders develop mitigation plans through planning processes led by emergency managers, sometimes with planners.

This framework offers an outstanding opportunity to examine factors leading to greater incorporation of land use approaches into mitigation plans. Recent work finds DMA mitigation plan quality is mediocre in general, but variable.

Three main types of factors drive mitigation plan quality: state planning policy context, local community characteristics, and planning process features. This paper's central research question is: Does inclusion of local planners in mitigation planning networks lead to incorporation of more land use approaches in mitigation plans, controlling for these three types of factors? Ordinary least squares and Poisson regression models predict incorporation of land use approaches using data from content analysis of 175 local mitigation plans, the Institute of Business and Home Safety, the Public Entity Research Institute Presidential Declaration database, and the U.S. Census.

Preliminary findings indicate local planners are positively associated with incorporation of more land use approaches into mitigation plans, but the association varies across three principles of plan quality (i.e., fact base, policies, and implementation). Planners appear to be most important for the future-oriented policies and implementation principles. The findings suggest federal and state mitigation officials should foster greater linkages between local emergency managers and planners to promote long-term risk reduction. These results could be relevant to emerging climate adaptation planning efforts.

**LIZ MALY,** DISASTER REDUCTION AND HUMAN RENOVATION INSTITUTE

# Applying the Concept of People-Centered Housing Recovery: Focus on Transition

Post-disaster housing reconstruction has a significant impact on the ability of survivors to regain stability in their lives, which is the ultimate goal of disaster recovery. The concept of people-centered housing recovery combines factors of housing forms, policy, and process toward general principles of housing reconstruction that are accountable to residents and matches their living environment needs.

As defined in this paper, people-centered housing recovery has many similarities and overlaps with other concepts applied in housing reconstruction, including owner-driven reconstruction and resident participation. It also shares the goals of transitional housing. Within the housing recovery process, the transition between phases of temporary to permanent housing plays a crucial role, and the form and design of the housing itself contributes to the success or failure of the rehousing process.

This paper discusses several recovery projects that incorporate an aspect of transitional housing along with a focus on the design of the housing form itself. One is an expandable core house used in rural areas of Yogyakarta after the Central Java Earthquake in 2006. Another is the temporary-to-permanent Mississippi Cottage used several years after the 2005 Hurricane Katrina in the United States. These two examples are very different in terms of form and process, and are situated within completely different cultural and recovery contexts.

Currently, Japan is facing a reconstruction project on a massive scale in the Tohoku region after the earthquake and tsunami of March 11, 2011. Core houses or Mississippi Cottages might not be appropriate models to replicate in Japan, which has a firmly established policy of two-step temporary housing. However, by considering these international reconstruction approaches within the larger concept of people-centered recovery, it is possible that relevant comparisons or useful directions in housing recovery may emerge

**MAGGIE NELAN,** UNIVERSITY OF DELAWARE
**TRICIA WACHTENDORF,** UNIVERSITY OF DELAWARE

# Aging Populations and Anticipated Compliance with Hurricane Evacuation Warnings

Previous research has shown elderly or aging populations are vulnerable in disasters. It is important to understand the views and predicted practices of this population in a hurricane. A telephone survey of 278 North Carolina residents was conducted by the Disaster Research Center at the University of Delaware to research evacuation and sheltering practices in the event of a tropical storm or hurricane.

The survey was conducted from February 23 to July 26, 2011. The population surveyed was comprised primarily of females and the mean age of the population was 57 years. Focusing on the aging population (i.e., over 60 years of age), we analyzed the relationship between predicted evacuation behaviors in different categories of storms and hurricanes, while controlling for their previous hurricane experience, gender, income, and education level. Preliminary findings show that there is a negative relationship between age and predicted compliance with a mandatory evacuation. The outcome of this study will contribute to a better understanding of the evacuation behaviors of the aging population.

**DANIEL NOHRSTEDT,** UPPSALA UNIVERSITY

# Performance Measurement and Collaborative Responses to Natural Disasters

Various literature has confirmed the profound importance of collaborative management as a means to ensure effective societal responses to natural hazards and disasters. In practice, few empirical studies investigate outcomes of collaborative governance in this domain. This lack of research can be partially attributed to multiple theoretical and methodological challenges that need to be addressed to enable evaluation and improvement of collaborative responses to natural hazards and disasters.

Taking on these challenges, this paper asks what empirical indicators can be used to evaluate the performance of collaborations in natural disaster management? The paper answers this question in three steps. First, it conducts a review of relevant literature—including public administration, crisis and disaster management, and collaborative public management—to identify current strands of theory and practice relevant to the evaluation of collaborative emergency management. The literature review explores prior empirical research of collaborative management in relation to natural hazards and disasters.

Second, the paper builds from the review to develop an integrated analytical framework for performance measurement in this specific context. The framework acknowledges the importance of including network and client-level outcomes and usage of subjective and objective measures. Third, the paper assesses comparative strengths and weaknesses of the framework using data from local-level collaborations in Sweden. The concluding section discusses how evaluation of collaborative responses might improve hazards and disaster management more generally through processes of learning and change.

**LAURIE PEARCE,** ROYAL ROADS UNIVERSITY

## Simulation Training and Exercise Collaboratory (SIMTEC): Enhancing CBRNE Psychosocial Capacity and Capability Management

Unaddressed, the psychosocial consequences of working in crisis situations can increase the risk of adverse health outcomes, post-traumatic stress, and exacerbate economic and social disruption. Despite potential costs, psychosocial consequence management is rarely systematically or comprehensively addressed in exercise training or acknowledged as a critical component of effective disaster leadership and decision making.

This research project is multi-faceted and includes: the development of a series of tabletop exercises including multi-media injects; psychosocial protocols for decontamination; a guide for family physicians for treating traumatized victims of mass casualty incidents (MCI); provision of forensic psychosocial interventions at the scene of MCIs; and an assessment and guide for the provision of psychosocial interventions in an emergency operation center (EOC) over a four-year time frame. All EOC exercises are taped and the research methodology involves using NVivo 9 to thematically code the transcripts and record the visual analyses (e.g., body language) from these exercises. Coding was carried out for a number of decision making possibilities and for recognition of psychosocial considerations.

This presentation will present the preliminary findings based on the running of a pilot and test exercise involving seven community EOC teams. It also includes results from five focus group sessions that were held following the exercise and individual interviews conducted with EOC participants from two communities.

The project is funded by the CBRNE Research and Technology Initiative led by Defence Research and Development Canada's Centre for Security Science and our project champion is Health Canada's Employee Assistance Services.

**JOAN RENNHACK,** CHARLESTON COUNTY BUILDING SERVICES
**CARL SIMMONS,** CHARLESTON COUNTY BUILDING SERVICES

# Where Did Federal Pre-Disaster Natural Hazard Mitigation Go? An Analysis of Changes in Hazard Mitigation Since September 11, 2001, from a Local Government Perspective

Since the Clinton administration left office, pre-disaster hazard mitigation at the federal level has changed from high-profile to low-priority initiatives. Despite research from the Multihazard Mitigation Council, which determined that for each dollar spent before a disaster on mitigation activities there are $4 saved after a disaster, there has been a decreasing emphasis at the federal level on promoting pre-disaster hazard mitigation activities. This presentation will examine the history leading up to and the decline of federal pre-disaster hazard mitigation activities since the September 11, 2001, terrorist attack on the United States and evaluate the effects of these changes on disaster mitigation from a local government perspective.

This presentation will also provide recommendations as to how to increase hazard mitigation activities to reduce post-event expenditures funded by taxpayer dollars. This presentation will draw from research performed by students from the University of Charleston Master of Public Administration Capstone Course, as well as research and observations from local government administrators with a combined 68 years of experience in hazard mitigation-related fields

**JY-PYNG SAH,** CHANG JUNG CHRISTIAN UNIVERSITY

# The Effects of Flood Warning in Household Adoption of Protective Actions—A Southern Taiwan Case Study

Typhoons are a major threat to Taiwan. Every year, heavy rain, along with typhoons cause considerable financial losses, but loss of human lives is rarely critical. Typhoons Morakot and Fanapi flooded southern Taiwan in 2009 and 2010, respectively. The 2009 event caused 677 casualties, partially because of unwillingness to evacuate. The year after the catastrophe, emergency managers issued extensive warnings and evacuation orders before typhoon strikes. Nevertheless, very limited local actions were taken. This research examines how risk communication affects household adoption of protective actions, specifically evacuation, during floods.

This study surveyed 12 communities affected in both events. Among 2,034 randomly selected households, 561 samples completed the written questionnaires. The analysis adopts structural equation modeling in constructing a causal model.

The findings reveal that wealthier households feel less threatened. However, they also devoted more resources to hazard preparedness. Household hazard experiences from previous events are negatively associated with their perceived risks. The findings showed that people realized flooding generally causes limited damages and is seldom a major threat. If a household has spare resources, it carried out more hazard preparedness activities, although still less than ideal.

Overall, past experience is the best predictor for adopting adjustment activities. The experiences from previous events could translate into future adoption of protective action. Risk communication ranks second. If warning and hazard information are disseminated through multiple sources and channels, and if households trust these sources before impacts, they are more likely to take safety measures. Local emergency managers should introduce potential information sources to local households and construct social linkage between residents and information sources before flooding events.

**YOKO SAITO,** DISASTER REDUCTION AND HUMAN RENOVATION INSTITUTION

# Gender Perspective and Evacuation Center Management after the Great East Japan Earthquake

The Great East Japan Earthquake, which hit a wide area of northeast Japan on March 11, 2011, was unprecedented in scale and in nature. A subsequent tsunami hit the Tohoku region along the pacific coast of Japan and washed away many towns and communities, resulting in a massive loss of life and property. Immediately after the disaster, massive efforts were made to get basic needs to the affected people in the area. There were hundreds of thousands of evacuation centers. Although the Bureau of Gender Equality Cabinet Office issued an ordinance on "disaster response based on the needs of women and women with children" to related agencies on March 16, 2011, a gender perspective was not sufficiently considered at evacuation centers.

The concept of a gender perspective in disaster varies from immediate to longer term. Since the rehabilitation process is still going on in the affected area, this research focuses on a gender perspective in emergency evacuation center management. The author reviewed materials on the emergency response for gender issues at different levels, interviewed several women who were accommodated in evacuation shelters, and also interviewed organizations that supported management of evacuation centers to evaluate how and why a gender perspective was overlooked.

The author found that privacy for evacuated women was rarely secured at many evacuation shelters. It was uncomfortable for women to stay at evacuation centers that had only low partitions made of cardboard. Fixed gender-specific roles in society were reinforced after the disaster. This placed too much of a burden on women at the evacuation centers. Lastly, this paper recommends that a gender perspective in disaster must be discussed during non-disaster times. It is too late to start advocating a gender perspective in times of emergency.

**JOE SCANLON,** CARLETON UNIVERSITY

## A Countrywide Local Emergency: Canadian Communities Tackle the Spanish Flu

In the autumn of 1918, a second deadly wave of pandemic influenza came to Canada from the United States. In 1918 and 1919, there was no federal health department in Canada and only one province—New Brunswick—had a minister of health. In addition, the flu moved from east to west so quickly that it struck most communities at the same time. As a result mutual aid became almost impossible. Local communities had to cope on their own. The flu, in other words, became a countrywide local emergency.

In 1918 there was no emergency planning of any kind for a disease outbreak. That is no longer true, but a review of what happened in 1918 suggests that some of the solutions that worked then may not work today.

**LAURA SIEBENECK,** UNIVERSITY OF NORTH TEXAS
**SUDHA ARLIKATTI,** UNIVERSITY OF NORTH TEXAS
**SIMON ANDREW,** UNIVERSITY OF NORTH TEXAS
**KRAIWUTH JAIKAMPAN,** UNIVERSITY OF NORTH TEXAS

# Assessing Resilience Among Rural, Suburban, and Urban Communities Following the Thailand Floods

The focus of this Rapid Response Research is to examine differences in community resilience among rural, suburban, and urban communities in Thailand following the 2011 flood. Community resilience, or the ability of a community to recover from a disaster event, has garnered widespread attention by scholars and community leaders alike. Guided by Cutter's Disaster of Place model, we examine disparities in community resilience in the provinces of Pathum Thani (rural), Ayutthaya (suburban), and Bangkok (urban).

This research emphasizes multi-sector organization attributes and relationships that aid in building community capacities during the transition from short-term to long-term recovery. Our presentation highlights preliminary results of semi-structured interviews of key public, private, and nonprofit organizations in these three provinces. We examine how this information provides insights into economic, social, and institutional capacities before, during, and after the flood.

**CRAIG TRUMBO,** COLORADO STATE UNIVERSITY
**LORI PEEK,** COLORADO STATE UNIVERSITY
**BRIAN MCNOLDY,** COLORADO STATE UNIVERSITY
**WAYNE SCHUBERT,** COLORADO STATE UNIVERSITY
**EVE GRUNTFEST,** UNIVERSITY OF COLORADO AT COLORADO SPRINGS
**HOLLY MARLATT,** COLORADO STATE UNIVERSITY
**MICHELLE MEYER LUECK,** COLORADO STATE UNIVERSITY

# A Multidimensional Examination of Hurricane Preparedness and Evacuation Intention

This study provides a multidimensional look at the conditions that affect preparedness for hurricanes and behavioral intention to evacuate from a major storm. First, we are examining how social factors such as community resilience, vulnerability, evacuation barriers, socio-economics, and disabilities affect orientation toward hurricane preparedness and intention to evacuate.

We are also examining how hurricane risk perception and optimistic bias affect intention to evacuate from a major storm. The first two of three waves of data collection for this project were accomplished via mail surveys. The study participants were sampled from within a 10-mile coastal buffer running from Wilmington, North Carolina, to Brownsville, Texas. The first wave of data collection was conducted in July 2010 (n=653, 56 percent adjusted rate). The second panel wave was conducted in June 2011 (n=450, 72 percent adjusted rate for panelist retention).

Findings indicate that risk perception can be seen as both an affective and cognitive orientation of the individual. We also examine optimistic bias for hurricane preparedness and evacuation and find that it is a related but independent factor. Also, we find that households whose members have disabilities, are female, or that have limited confidence in community resilience are associated with greater levels of hurricane risk perception. Disabilities in the household, less hurricane experience, and fewer evacuation barriers (e.g., work- or family-related, transportation) are associated with a greater intention to evacuate from a major storm. Preparedness is moderately predicted by a number of variables including risk perception.

**SHANNON VAN ZANDT,** TEXAS A&M UNIVERSITY
**WALTER GILLIS PEACOCK,** TEXAS A&M UNIVERSITY
**DUSTIN HENRY,** TEXAS A&M UNIVERSITY
**WESLEY HIGHFIELD,** TEXAS A&M UNIVERSITY
**HIMANSHU GROVER,** TEXAS A&M UNIVERSITY

# Mapping Social Vulnerability to Enhance Housing and Neighborhood Resilience

Social factors influence the ability of coastal communities and their populations to anticipate, respond, resist, and recover from disasters. Galveston, Texas, offers a unique opportunity to test the efficacy of social vulnerability mapping to identify inequalities in the ways that different parts of the community might react to a disaster. We describe spatial patterns of social vulnerability before Hurricane Ike in 2008 and compare them to outcomes related to response, impact, recovery resources, and early stages of the rebuilding.

Households and neighborhoods identified using vulnerability mapping experienced negative outcomes: later evacuation, a greater degree of damage sustained, fewer private and public resources for recovery, and slower and lower volumes of repair and rebuilding activity. Findings support using community vulnerability mapping as a tool for emergency management, hazard mitigation, and disaster recovery planning to help communities reduce losses and enhance response and recovery, thereby strengthening community resilience and reducing inequalities.

**SHANNON VAN ZANDT,** TEXAS A&M UNIVERSITY
**WALTER GILLIS PEACOCK,** TEXAS A&M UNIVERSITY
**DUSTIN HENRY,** TEXAS A&M UNIVERSITY
**SONJA WILLEMS,** TEXAS A&M UNIVERSITY

## Post-Disaster Population Estimates

By disrupting "normal" forces of population change, natural disasters complicate the process used to develop population estimates for cities and counties. Accurate population estimates are critical for establishing a strong fact base by which sound plans can be made. These estimates are the basis for a multitude of planning and decision-making activities, including regulating water usage, creating land use plans, establishing market areas, generating health care plans, etc. However, no commonly available approach exists for making post-disaster population estimates. Most appropriate is the housing unit method, but it relies on high quality local data sources, which can be difficult to find in the aftermath of a major disaster. For example, pre-existing data related to occupancy rates, average household sizes, and even the number of dwelling units are severely compromised.

Using Galveston, Texas, as a living laboratory, we develop a rigorous method sensitive to the unique development patterns of the city. We assess available data sources, including American Community Survey data, U.S. Postal Service data, and city data in terms of validity and reliability to determine the most accurate approach for creating a population estimate. Where secondary data sources were found to be lacking, we identify primary data sources and develop strategies for data collection. The resulting estimate produced the most accurate and reliable post-disaster picture of the Galveston population available at that time.

**YU XIAO,** TEXAS A&M UNIVERSITY
**SHANNON VAN ZANDT,** TEXAS A&M UNIVERSITY

# Building Community Resiliency: Spatial Links between Households and Businesses in Post-Disaster Recovery

Rapid urbanization along the world's coasts is exposing greater numbers of households to more frequent and severe natural and man-made disasters. Rather than being an exception, disasters often magnify or accelerate pre-existing relationships acting within our urban areas. Knowledge gained from disaster situations can provide insight into larger urban forces and play a role in developing and prescribing policies that influence the creation of more resilient communities.

We explore the interdependency of households and businesses in post-disaster recovery following Hurricane Ike in Galveston, Texas, in 2008. Households provide labor to businesses and consume goods and services from businesses. Interruption to one will affect the other. Geocoded data from 980 households and 145 businesses collected in the months after the storm allowed us to spatially correlate household and business dislocation, controlling for damage. Findings suggest that the reopening of businesses can influence household decisions to return to their homes.

**LEE ZELEWICZ,** UNIVERSITY OF DELAWARE
**RICHARD STANSFIELD,** UNIVERSITY OF DELAWARE
**TRICIA WACHTENDORF,** UNIVERSITY OF DELAWARE

# When There is Fear of the Shelter from the Storm: Gender, Fear of Crime, and Hurricane Shelter Decision Making

Concepts generated by the criminological study of fear of crime, though not heavily used in previous research on public evacuation shelters, could offer insight into the use of these facilities. In this study, we focus on the fear of victimization, its relationship with gender, and its potential to impact the anticipated use of public shelters during hurricane events.

From a survey of 278 North Carolina residents, 116 of the respondents described some safety concerns with respect to staying in a public shelter. The interview responses suggest that concern of victimization is the most commonly identified safety concern influencing anticipated shelter use, significantly more so than concerns related to sanitation or structural integrity. While issues related to lack of trust are the most commonly cited reason for people feeling unsafe in a public shelter, 13 percent of all women respondents described fear of violent and sexual crimes in public shelters. Importantly, these women represent 95 percent of respondents who expressed fear of violent and sexual crimes in public shelters.

We draw into our analysis literature examining the relationship between fear of crime and gender as we explore the implications of the results on planning for disaster events. Past disaster research has suggested that females experience a higher level of fear for personal safety in disaster scenarios. Gender is a fundamental organizing principal in disasters, with differing social vulnerabilities for women and men. By directly addressing public evacuation shelters we hope to expand our understanding of an important U.S. disaster setting by bridging research of fear of crime and gender within the context of disasters.

**JUN ZHUANG,** STATE UNIVERSITY OF NEW YORK AT BUFFALO
**JOHN COLES,** STATE UNIVERSITY OF NEW YORK AT BUFFALO
**PEIQIU GUAN,** STATE UNIVERSITY OF NEW YORK AT BUFFALO
**FEI HE,** STATE UNIVERSITY OF NEW YORK AT BUFFALO
**XIAOJUN SHAN,** STATE UNIVERSITY OF NEW YORK AT BUFFALO

# Strategic Interactions in Disaster Preparedness and Relief in the Face of Man-Made and Natural Disasters

Society is faced with a growing amount of property damage and casualties from man-made and natural disasters. Developing societal resilience to those disasters is critical but challenging. In particular, societal resilience is jointly determined by federal and local governments, private and non-profit sectors, and private citizens.

We will present a sequence of games among players such as federal, local, and foreign governments, private citizens, and adaptive adversaries. In particular, the governments and private citizens seek to protect lives, property, and critical infrastructure from both adaptive terrorists and non-adaptive natural disasters. The federal government can provide grants to local governments and foreign aid to foreign governments to protect against both natural and man-made disasters. All levels of government can provide pre-disaster preparation and post-disaster relief to private citizens. Private citizens can also, of course, make their own investments.

The tradeoffs between protecting against man-made and natural disasters, specifically between preparedness and relief, efficiency and equity, and between private and public investment, will be discussed.