



# Emergency preparedness and disaster recovery in the US post 9/11

Victoria Hardy

*Star Island Corporation, Portsmouth, New Hampshire, USA*

Kathy O. Roper

*Georgia Institute of Technology, Atlanta, Georgia, USA, and*

Suzanne Kennedy

*Wentworth Institute of Technology, Boston, Massachusetts, USA*

## Abstract

**Purpose** – The purpose of this paper is to determine how facility managers currently plan for emergencies and disaster recovery. Although preparation and drills have been demonstrated to improve lifesaving and business recovery capabilities, many organisations still do not have these plans. The scope of unpreparedness and reasons for lack of preparation were key issues, along with preferred methods to gain support for setting up plans.

**Design/methodology/approach** – Online surveys sent to members of facility management (FM) groups within the USA were utilised. Qualified FM professionals made them relevant survey groups.

**Findings** – With 78 percent of respondents responsible for their organisation's emergency preparedness planning, only 87 percent in 2007 and 92 percent in 2008 actually have these plans in place. Reasons for lack of plans included "other priorities taking precedence" and "lack of personnel to address the issue". Provision of sample or boilerplate templates could result in improved performance.

**Research limitations/implications** – US FM professionals were surveyed. Results in non-US locations may provide different information; locations with strong mandates for emergency/disaster plans would be expected to have better results. Industry types were not identified in this initial research data; however, future research could help to align specific industries' needs.

**Practical implications** – Despite 11 September and other tragedies, many organisations are still delaying or not understanding the importance of emergency/disaster recovery plans for their employees and business continuity.

**Originality/value** – Direct feedback from FM professionals was utilised to understand emergency preparedness/disaster recovery planning. This is the first survey to report details of the many organisations still lacking these critical plans.

**Keywords** Emergency measures, Disasters, Contingency planning

**Paper type** Research paper

## Introduction

More than 18,000 people evacuated safely from the World Trade Center (WTC) complex in the one hour, 42 minutes, and five seconds between the first jet to hit the towers, and the last building collapse. Those buildings that were destroyed not only included both of the Twin Towers, but also the Marriott Hotel, Six WTC and the 47-story Seven WTC. In the immediate two months, following the disaster, *USA Today's* (2001) investigative reporters documented the key elements in a special issue on 19 December, which profiled why so many were able to survive this event. These findings reinforce the



---

classic design of emergency planning and business continuity that facility executives inherently understand, and now have the ammunition to enforce. The findings were later validated in The 9/11 Commission Report (2004, pp. 28-323) which showed that the evacuation was a success. About 99 percent of the people above the floors struck by the jets died; 95 percent of the people below (and some on) those floors survived. More than 479 rescue workers also died in their attempts to fight the fires and evacuate building occupants. The commission's report is very specific:

At most, 2,152 individuals died at the WTC complex who were not (1) fire or police first responders, (2) security or fire safety personnel of the WTC or individual companies, (3) volunteer civilians who ran to the WTC after the planes' impact to help others, or (4) on the two planes that crashed into the Twin Towers. Out of this total number of fatalities, we can account for the workplace location of 2,052 individuals, or 95.3%. Of this number, 1,942 or 94.64 percent either worked or were supposed to attend a meeting at or above the respective impact zones of the Twin Towers; only 110, or 5.36 percent of those who died, worked below the impact zone. While a given person's office location at the WTC does not definitely indicate where that individual died that morning or whether he or she could have been evacuated, these data strongly suggest that the evacuation was a success for civilians below the impact zone.

This was not an accident; this expeditious evacuation happened because of significant changes made by the Port Authority in response to bombings in 1993, "and by the training of both Port Authority personnel and civilians after that time" (The 9/11 Commission Report, 2004, p. 316).

For example, emergency lighting in the stairwells and corridors was set-up on a back-up battery power source. In 1993, the failure of the emergency lighting had been a major problem in the evacuation. The lights in the stairwells were also re-designed in modular sections, like Christmas tree lights; if one section failed, the other sections remained lit. The lights were functioning on the lower levels of the towers, even as the top floors were collapsing.

Evacuation drills were held every six months, and each floor had "fire wardens", who were responsible for the organisation of evacuation plans for their floor. These wardens played a crucial role on 11 September, as they literally pushed and pulled people out of the buildings, and searched the floors to insure that everyone had evacuated. People knew where the stairs were located for their floors, and had already experienced what it is like to walk down 70 floors of stairs and knew how long it takes to reach the ground floor:

The general evacuation drill time for the towers dropped from more than four hours in 1993 to under one hour on September 11 for most civilians who were not trapped or physically incapable of enduring a long descent (The 9/11 Commission Report, 2004, p. 316).

This was a critical time difference as the South Tower only stood 56 minutes from impact to collapse.

The one serious flaw in the improved planning was the lack of a set of as-built drawings in each of the fire-command centers, and in a near-by off-site location. This made search and rescue operations very difficult initially (Leibowitz, 2001, p. 44) However, The 9/11 Commission Report (2004, p. 318) also noted that "individual citizens need to take responsibility for maximising the probability that they will survive, should disaster strike".

Thus, it is clear that both good design and emergency planning made an enormous difference on 11 September. Facility executives have long understood this critical relationship. The principles of the emergency plan are the same irrespective of the organisation or location. "Planning is the key to reducing vulnerability, loss of life, injuries, and damage," say Look and Spennemann (2001) for the US National Parks Service. The best emergency plan is one that is comprehensive and understandable. It must involve the personnel of the company at all levels, and be easily understood by all employees, even those who have been with the company just a short time. It must consider the full range of potential disasters at all company locations, even if the probabilities of particular disasters such as earthquakes in London or tornadoes in Northern Australia are fairly low. Last, but certainly not least, the emergency plan must be maintained, updated, and changed as necessary.

Disaster recovery is essential for an organisation to remain viable in the face of disasters. As seen after 11 September, Hurricane Katrina and other world disasters, a company that does not have recovery plans in place often becomes the victim of the disaster and never fully recovers. Many companies go bankrupt or close within the first year following a disaster. Internationally, this impact persists. In the UK, a 2005 study found that 36 percent of technology businesses did not have recovery plans in place (Equinix, Inc., 2005).

Understanding the importance of planning, drilling and educating occupants, the researchers undertook a survey of facility management (FM) professionals to determine the impact and possible improvements in emergency preparedness and disaster recovery for their organisations since the 11 September tragedies. This paper is structured to provide the chronological sequence of 2007 study and its findings, then the 2008 study and its findings with comparisons to the 2007 and 2008 similar questions; then recommendations are provided.

### **Study**

In spring 2007, 102 FM professionals were surveyed from four US locations, Atlanta, Boston, Central Pennsylvania, and West Michigan utilising SurveyMonkey® online survey tool. These locations were chosen due to several factors including the researchers' familiarity with these markets, International Facility Management Association (IFMA) chapter affiliations and the proximity to 11 September terrorism incidents with all four airplanes leaving from Boston and the crash of the fourth plane in Central Pennsylvania. Atlanta, a large, urban, inland city and West Michigan, a smaller, less urban region provided alternative viewpoints for consideration. A cover letter was included with the survey link to explain the purpose of the survey and assure confidentiality of responses. About 14 questions were asked, along with optional profile information. A four-week response window was open in May 2007, resulting in 102 completed surveys. A confidence level of 86 and 6-7 percent margin of error was established (Answers Research, Inc., 2008). Just over half of the respondents identified themselves in order to receive a copy of the completed survey results. Of those 57 or 26 percent were certified facility managers or carried other built environment designations. This level of experience and qualifications by respondents provided a high level of assurance that these FM professionals could be expected to set policy and implement procedures to prepare for and respond to emergency situations.

One of the benefits of utilising the online survey tool, was its reporting capabilities. After completion of the survey, complete reports of all responses, including comments were made available to the researchers. The findings from the 2007 survey were of concern, with 13 percent of respondents indicating they had no emergency preparedness plans in place, six years following the tragedies of New York, Washington, DC and Pennsylvania on 11 September 2001.

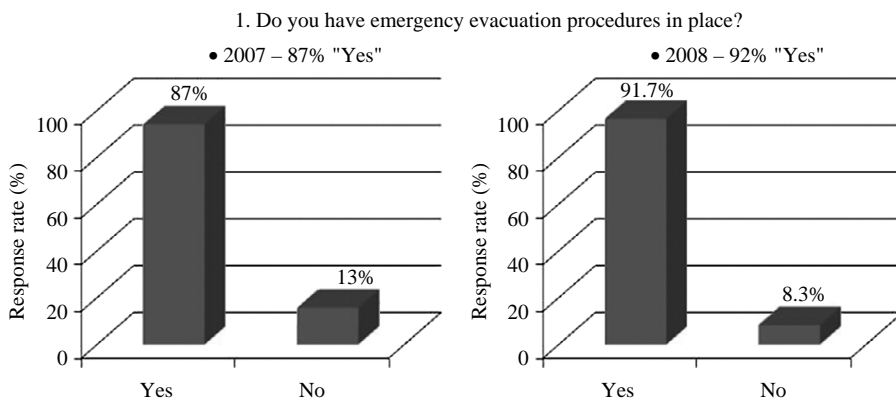
To further analyse emergency preparedness issues, in spring 2008, a follow-up survey was structured in a similar manner and again distributed to the same four locations. The 2008 survey comprised only seven questions and again requested basic information on emergency plans and preparedness, but further asked for feedback on barriers to preparation or implementation of emergency plans. This survey resulted in 84 facility executives and managers completing the survey, deemed valid for this analysis. Reports from the survey tool were again utilised and for the repeated questions concerning existence of emergency and disaster recovery plans, these questions were then compared to 2007 results, with minor improvements noted (Figures 1 and 2). New questions in 2008 concerning reasons for lack of plans and initiatives to aid in plan development are graphed for visual presentation (Figures 3-5).

### Findings

The 2007 results, especially in light of the findings of The 9/11 Commission, were a warning of significant potential problems. A summary of the questions and responses follows. It should be noted that for purposes of this study, the authors were most interested in the negative answers, for they reflected the percentage of facilities that are more vulnerable to certain events.

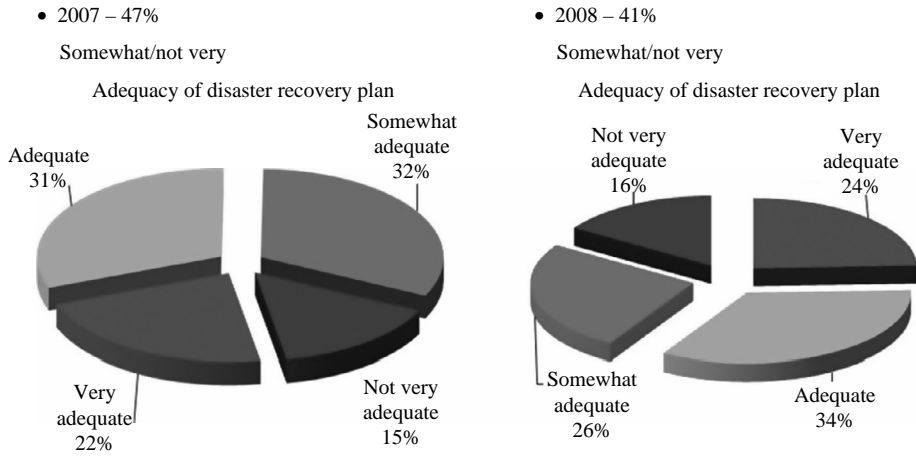
Question 1 asked if the respondents have emergency evacuation procedures, resulting in 87 percent responding “yes” and 13 percent responding “no”.

Question 2 asked participants to identify the department responsible for developing the evacuation plan. A total of 78 percent indicated that either “Facility administration” or “FM planning and design” were the responsible entities. This is considered positive since the FM unit can make emergency planning happen, if it is made a priority.



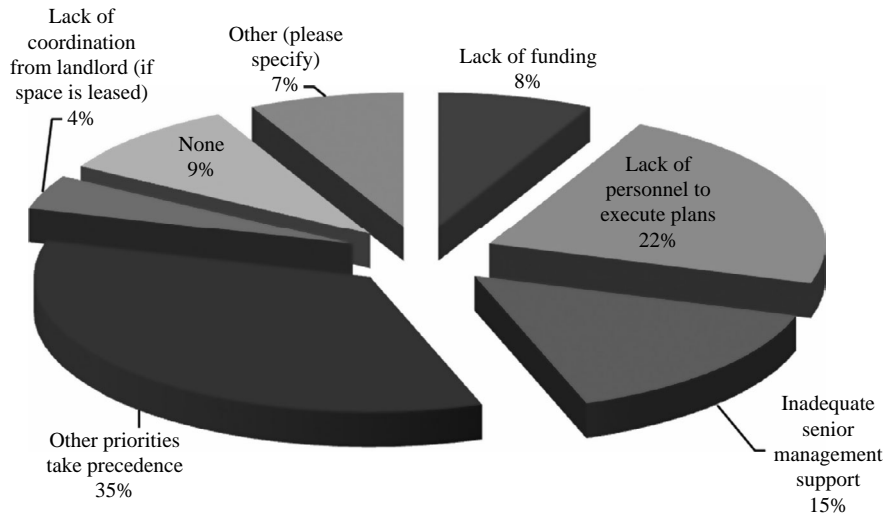
**Figure 1.**  
Survey Question 1  
comparison

3. How adequate is your Disaster Recovery plan?



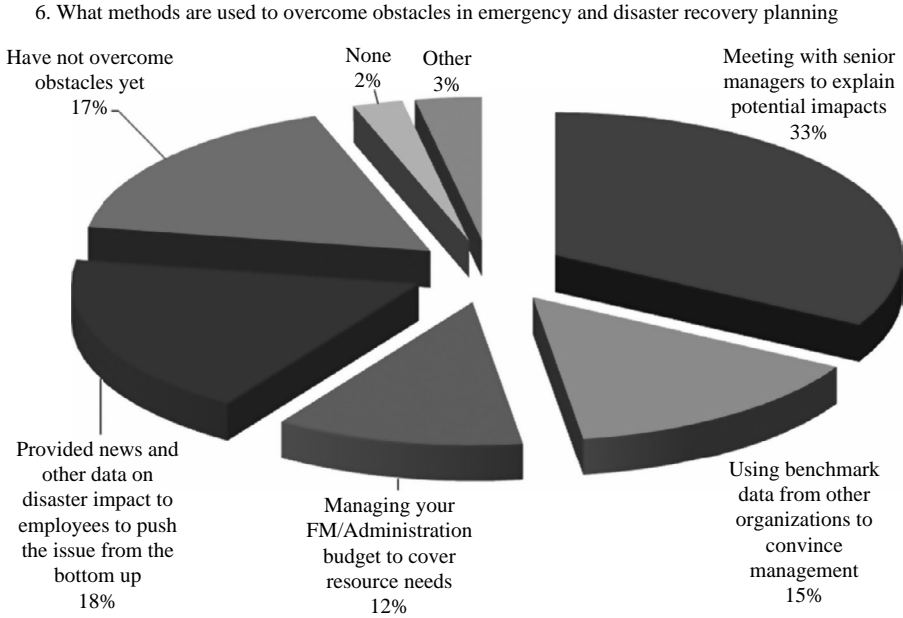
**Figure 2.**  
Survey Question 3  
comparison

5. What are major obstacles in implementing emergency and disaster recovery plans?

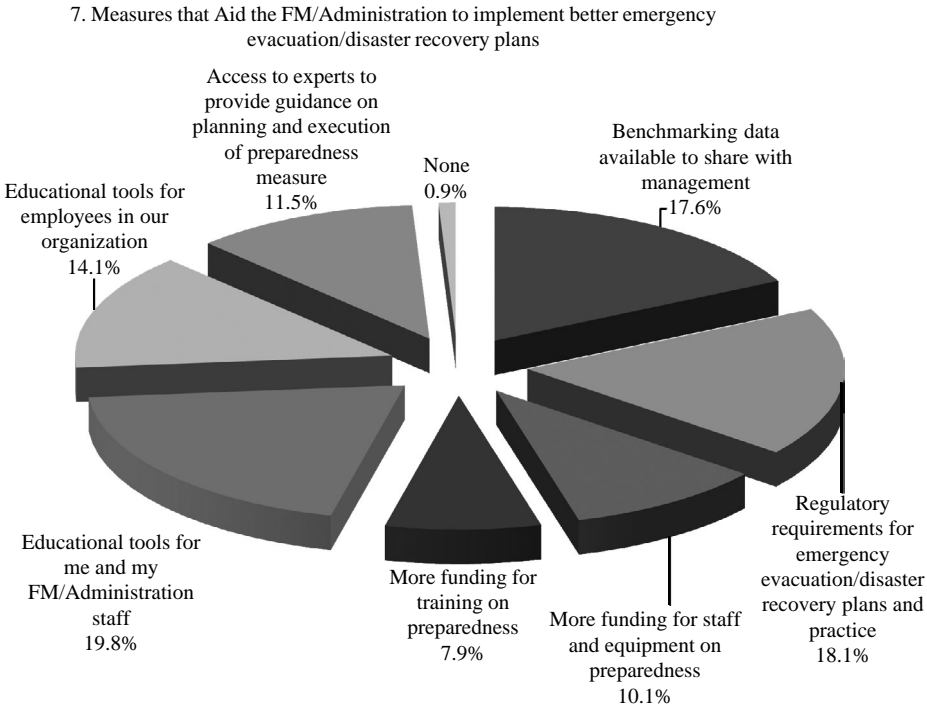


**Figure 3.**  
What major obstacles  
implement emergency and  
disaster recovery plans

Question 3 asked if the participants had a disaster recovery plan in place. A full 70 percent responded “yes”, with 30 percent responding “no”. This answer was the indication that as the survey continued, the answers might become more negative. With current information indicating that more than 40 percent of businesses without recovery plans go bankrupt in the next year (Equinix, Inc., 2005), it is especially unusual that companies and organisations would not have some type of recovery plan in place.



**Figure 4.** Methods used to overcome obstacles in emergency and disaster recovery planning



**Figure 5.** Measures that aid in implementing better emergency evacuation/disaster recovery plans

Question 4 asked about the department responsible for the planning of emergency procedures; 71.4 percent indicated either “Facilities administration” or again, “FM planning and design”. The response here was the emergence of a new “other”, described as the business continuity office or manager. In addition, 14.3 percent answered that they had no one responsible (one of the selection options). Managerial experience would suggest that if no one is specifically responsible for a task, it will not be done, perhaps accounting for the 30 percent negative response to Question 4.

Question 5 addressed the critical factor in the 9/11 survival issue: “What type of evacuation/drill rehearsals do you conduct?” The results were as follows:

- Fire drills – 80.6 percent.
- Communication drills – 26.5 percent.
- Muster station drills – 9.2 percent.
- Other – 5.1 percent (includes tornado, information technology transfers, desktops, bombs, etc.).

With 18.4 percent of the sample responding that they do not conduct evacuation drills, the research further asked “If not, why not?” The answer to this question was that some FMs are working in environments (health care primarily) where they practice “protect in place”. This only accounted for 28.6 percent of the respondents, which means that the majority (71 percent) of the 18.4 percent who said they do not have drills, had no valid reason to not drill.

Questions 6 and 7 addressed the inquiry into frequency. Question 6 asked how often the FMs conduct evacuation drills with notification; 44.4 percent do not conduct total drills of any kind with notification. Again, extracting the percentage of respondents from the health care field (approximately 12 percent), there are still many organisations that have the capacity to do drills with notification, but do not. Question 7, which asked if drills are done without notification, provided a similar percentage, 42 percent. In fact, the combination of “infrequently” and “do not conduct” was 48 percent, close to half of the entire sample.

Question 8 asked “how often is evacuation training held for employees”; 40.4 percent responded “not scheduled on a regular basis”. It was at this point in the survey that it was noted that 43 percent of the participants in the survey had not identified themselves, and that this figure may be a close correlation to the 44.4 percent who do not conduct drills or the 40.4 percent who do not regularly train their employees. This similar correlation also emerged on later questions, which was one of the original reasons for the confidential aspect of the survey, that is, an attempt to gain the truth.

Question 9 looked at potential building modifications in response to either 11 September or Hurricane Katrina. Responses indicated 60.8 percent had no plans to make any modifications at the current time.

Question 10 asked about the “completed components” of the emergency evacuation and disaster recovery plan. With 83.7 percent of the sample indicating that they have written evacuation procedures, it is clear that plans are being written, but not practiced. Here, is where discrepancies in the plans and practices were noted, with most organisations having plans, but much fewer; about half of the 83.7 percent, practicing the plans. Even on this response, 16.3 percent indicated that they have no written procedures in place for evacuation. Almost 30 percent of the respondents have no

---

family communication plans in place, or mail re-routing plans, and 58.2 percent have not designated floor wardens for their facilities, a key component in the saving of lives on 11 September 2001.

Question 11 followed up with the intentions, asking if there were plans to implement or complete plans in the next six to 12 months. A curious phenomenon occurred on this inquiry; up to this point in the survey, almost all the questions were answered by 98-100 of the respondents. When they came to Question 11, 40 of the respondents, again perhaps correlating to the 43 people who chose not to identify themselves, skipped or did not complete this question. This led to speculation that perhaps not only did these respondents not really have good plans, but also there were no plans in place to either implement (practice/drill) or existing plans to complete. This is a dangerous possibility for these organisations.

The same phenomena occurred, but not to the same extent, on Question 12, which asked about contingency plans. About 20 of the respondents skipped this question. The 82 people who answered all indicate some level of contingency planning, with 43.8 percent noting that they have a redundant facility in another region.

Question 13 was designed to ask for the same information in a slightly different way, and this question also received a predominantly negative response. In response to "in case of a catastrophic event, do you have a back-up location available?", 97 responses reflect 27.8 percent indicating that they have no back-up location at all. This is another critical finding, because as is demonstrated in the case studies later in this paper, back-up locations are crucial to the survival of the business. Even universities must have back-up locations; witness the operating of Tulane University from a hotel room in Houston, Texas, during the aftermath of Hurricane Katrina.

The answer to Question 14, "in your opinion, how adequate is your disaster recovery plan?" was of most concern. Of the total respondents, more than 47 percent indicated that their plans were either "somewhat" or "not very adequate". When this question is correlated to Questions 2 and 4, it becomes even more clear that facility professionals have the opportunity and responsibility to address evacuation and disaster recovery planning, but in some cases, are not stepping up to this responsibility. This negative finding is important information to share with the FM community. The responsibility and planning done in 1993 by the Port Authority building team saved thousands of lives. The results speak for themselves; 95 percent of the people below where the planes hit the WTC evacuated safely.

## Study

It was clear to the research team that further work was needed to determine why the survey garnered the results that it did. It was determined that a follow-up survey to approximately 100 facility executives that participated in the first research project could shed some light on the barriers to better planning and implementation of emergency and disaster recovery processes. A short, focused questionnaire that would take a minimal amount of time for response was structured to achieve answers to these questions.

Therefore, in the spring of 2008, a second short survey was distributed to the original database, anticipating that the majority of the respondents would be those participants in the first survey. Owing to the anonymity of the sample from the first survey, it was decided that this would be the best effort to reach those people. In 2008,

---

84 facility executives and managers answered the second round of questions, which the team determined was valid for purposes of follow-up (the original survey response was 102 participants of a pool of 956). A summary of the responses to the seven issue questions is outlined next.

### Findings and comparisons

Question 1 asked the participants if they had emergency evacuation procedures in place; and 91.7 percent of the participants indicated that they did; however, 8.3 percent did not. This was considered negative, given the information about the efficacy of evacuation as a life-saving operation in the event of a catastrophic building failure. However, a small increase of 5 percent was noted. Figure 1 shows the 2007 and 2008 responses.

Question 2 asked a similar inquiry about disaster recovery plans in place; only 80.5 percent of the respondents had a plan in place and 19.5 percent did not. Again, the candor of the respondents was appreciated and the 10 percent increase in organisations with procedures in place was noted. However, the 16 companies that did not have a disaster recovery plan in place is an area of concern.

Question 3 (2008 survey; Question 14 in 2007 survey) asked how “adequate” did the respondents feel their plan was; these answers were quite divided with (2008 responses), 24.4 percent who felt their plan was “very adequate”; 34.1 percent “adequate”; 25.6 “somewhat adequate” and 15.9 percent “not very adequate” (which corresponds closely to the numbers in Question 2). Figure 2 shows the 2007 and 2008 responses.

Question 4 addressed an important angle of the planning scenario, the inclusion of a disaster recovery plan in the organisation’s overall strategic plan. Interestingly, only 63.9 percent of respondents indicated that a disaster recovery plan was included in the strategic plan. About 21.7 percent said that it was not; and 14.5 percent of the participants said that they “did not know”. This is a concern for FM on several levels; most importantly, it indicates a disconnect between the facility master planning and institutional strategic planning. Any facility executive or manager who is not aware of their company’s disaster recovery plan needs to recalibrate priorities.

Question 5 went to the heart of the problem; what did the respondents consider the major obstacles to implementing emergency and disaster recovery plans within their organisations. Only, 8 percent felt that “lack of funding” was the cause; 22 percent indicated a “lack of personnel to execute plans” as the primary issue; but 35 percent identified “other priorities take precedence” as the main factor. The balance of the sample (35 percent) listed a wide variety of company-specific reasons, including eight respondents who had “no barriers”. Typical of the remarks in this section were several notes about issues of territoriality and “silo” problems. It is difficult to understand that any other priority could be ultimately more important than saving the lives of employees, but that seemed to be the inference from this question. Funding and personnel issues ran a close second. Figure 3 graphically shows the responses.

Question 6 then asked what methods the successful managers used to overcome the obstacles to effective planning in this critical area. More than half the sample indicated that they meet with senior management to explain the impact, and combined that with using news, other data, and benchmarks from other companies to support their conversations. But 17 percent of the sample felt that they had not overcome the

---

obstacles yet. Figure 4 shows the responses to Question 6 on methods to overcome obstacles.

Finally, Question 7 asked what measures would help the facility executives and managers in the implementation of better emergency/disaster recovery planning (the survey question asked selection of all that would be helpful). More than half of the respondents indicated that benchmarking data and educational tools would be very important. Almost 54 percent of the sample felt that “regulatory requirements for emergency evacuation/disaster recovery plans and practice” would be effective in helping to overcome the barriers to moving forward. The inference here was that if any outside authority or agency was to “require” such plans and drills, more attention would be paid to this process by senior management. Figure 5 graphs these responses.

It seems the gap is still on how to do what facility executives and managers know needs to be done, despite economic restrictions that still impede many organisations. The 41.5 percent (25.6 + 15.9) of respondents in Question 3 who selected “somewhat adequate” and “not very adequate” for their disaster recovery plans seems to be a positive point, but then contrast that to the only 63.9 percent who respond that disaster recovery planning is part of their organisation’s strategic plan. Not walking the talk or putting money into these efforts, could be the downfall for these facility personnel. As outlined by Moe and Pathranarakul (2006), tools such as the balanced scorecard, utilising four essential activities of mitigation, preparedness, response, and recovery, are suggested for management and recovery from natural disasters and these tools could also be applied to any preparedness effort.

It should also be noted that another strategic implication of these results is the need for benchmarking data, and educational tools to support the facility executives and managers in their quest for better emergency/disaster recovery plans and practices. A number of researchers have looked at ways to strengthen emergency preparedness measures. Alexander (2003) recommends development of standards in emergency management training and education, which could provide organisations the background and training needed to improve preparedness and recovery efforts. Others recommend the use of geographic information systems (GIS) in emergency preparedness, primarily for natural disaster planning (French, 1991). An even stronger research theme proposes a social cognitive model for disaster preparedness. This model describes “a developmental process that commences with factors that motivate people to prepare, progresses through the formation of intentions, and culminates in decisions to prepare” (Paton, 2003). With this model, it is noted that no one strategy is responsible for facilitating change in motivation, intention and decisions to prepare; but various methods including periodic audits of preparedness are required to maintain individuals’ commitment overall (Paton, 2003). There is no doubt that there is a deep level of concern in the facility community about preparedness, and how to achieve organisational and preparedness goals in this area. This survey indicates that continued education and information appear to be key tools in this effort.

### **Recommendations**

Based on the success of changes implemented at the WTC following the 1993 attacks, lives were saved when terrorists crashed into the WTC Towers on 11 September 2001. Therefore, the practices of preparing emergency preparedness and disaster recovery plans are essential to saving lives and continuing operations of an organisation.

Also critical is practice and drills of the plans. Without these essential opportunities for occupants to learn first-hand, the potential to save lives and improve recovery will be hampered, or possibly be lost. FM professionals could benefit from additional information, best practices and boilerplate templates for emergency plans, as well as disaster recovery plan templates. Additional research and provision of these essential tools is needed to aid facility managers and others responsible for the safety of building occupants in the goal of achieving maximum preparedness and recovery planning. A call for further and deeper research in this area and at the broader corporate leadership level is appropriate.

Unfortunately, as can be seen from these research surveys, the answers to resolving preparedness and recovery are still not complete, even seven years following 11 September and other world disasters. The most important element to implementation of emergency strategies is the commitment of executive level management to the program, the concepts, the responses, and the financial resources to accomplish the plan. The FM team must take the responsibility for keeping these issues in front of senior management and their boards until the team is satisfied they are prepared for a catastrophic facility loss. The new standard for all facility executives is whether or not your organisation could withstand events at the level of 11 September 2001.

### References

- (The) 9/11 Commission Report (2004), *Final Report of the National Commission on Terrorist Attacks Upon the United States*, Authorized First Edition, W.W. Norton & Company, New York, NY.
- Alexander, D. (2003), "Towards the development of standards in emergency management training and education", *Disaster Prevention and Management*, Vol. 12 No. 2, pp. 113-23.
- Answers Research, Inc. (2008), "Sample size calculator", available at: [www.answersresearch.com/size.php](http://www.answersresearch.com/size.php) (accessed 12 May 2008).
- Equinix, Inc. (2005), "36% of UK technology businesses still without disaster recovery plan", available at: [www.equinix.com/equinix/news/press/eu/2005/news-263/](http://www.equinix.com/equinix/news/press/eu/2005/news-263/) (accessed 23 March 2005).
- French, S.P. (1991), "Utilization of geographic information systems for land use planning and disaster preparedness", *Disaster Management and Regional Development Planning with People's Participation*, Vol. II, United Nations Center for Regional Development, Dhaka, pp. 3-28.
- Leibowitz, J. (2001), "Facilities facing fear", *Facilities Design and Management*, pp. 42-5, October/November.
- Look, D.W. and Spennemann, D.H.R. (2001), "Disaster planning, preparedness and mitigation", *Cultural Resource Management*, No. 8, p. 4.
- Moe, T.L. and Pathranarakul, P. (2006), "An integrated approach to natural disaster management: public project management and its critical success factors", *Disaster Prevention and Management*, Vol. 15 No. 3, pp. 396-413.
- Paton, D. (2003), "Disaster preparedness: a social-cognitive perspective", *Disaster Prevention and Management*, Vol. 12 No. 3, pp. 210-6.
- USA Today (2001), "For many of September 11, survival was no accident", *USA Today* (online), available at: [www.usatoday.com](http://www.usatoday.com) (accessed 19 December 2001).

### Further reading

- Glanz, J. (2001), "Why trade center towers stood, then fell", *New York Times*, 11 November.
- Jenkins, C. (2006), "Risk perception and terrorism: applying the psychometric paradigm", *Homeland Security Affairs Journal*, Vol. II No. 2, p. 11.
- New York Times* (2001a), "Employees in the Twin Towers", *New York Times*, 16 September.
- New York Times* (2001b), "Leadership, put to a new test", *New York Times*, 16 September.
- New York Times* (2001c), "Mapping the surface of a disaster", *New York Times*, 16 September.
- New York Times* (2001d), "Up from the ashes, one firm rebuild", *New York Times*, 16 September.

### About the authors

Victoria Hardy, CFM, CFMJ, is the CEO of the Star Island Corporation, a New Hampshire, USA not-for-profit that manages a 35 building conference complex on an island eight miles off the coast. Prior to her appointment as CEO, she served as the Academic Department Head of Design and Facilities at Wentworth Institute of Technology. Before joining Wentworth, she was the primary tenured Facility Management faculty at Ferris State University for almost ten years. Before joining Ferris State, she spent 20 years managing facilities at Stanford University, in the Meadowlands in New Jersey, and in Detroit, in addition to consulting in the arts and entertainment industry. She was named the IFMA Distinguished Member of the Year for 2005, received the Boston IFMA Chapter Education and Professional Development Award in 2005, and was selected in 2001 as the IFMA Distinguished Educator. She holds a BSc, Master's degree in management, and is a graduate of the Stanford Management Development Program.

Kathy O. Roper is an Associate Professor at Georgia Institute of Technology in Atlanta, Georgia, USA. As academic leader of the IFMA Foundation Recognised graduate FM program, her interests in sustainable operations and strategic facility planning stem from over 20 + years in practice as a facility and corporate real estate professional. Kathy O. Roper is the corresponding author and can be contacted at: [kathy.ropoer@gatech.edu](mailto:kathy.ropoer@gatech.edu)

Suzanne Kennedy is the Head of the Design and Facilities Department, at Wentworth Institute of Technology in Boston, Massachusetts, USA, where she teaches and manages the IFMA Foundation Recognised Degree Program in FM.