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**INTRODUCTION**

When any group forms, the probability of long-term success is substantially increased if an environment is created that fosters member participation in the group-formation process. This participation contributes to the advancement and growth of the members when they are involved in collaboration or some sort of joint endeavor between participating agencies or within different sections of the same agency. Using a collaborative process allows for formation of a sustainable, high-involvement membership process. This active membership allows us to make use of the notion of “subscription.”

Social scientists have observed that when attempts to form new relationships exclude key leaders and members (whom we now call “stakeholders” in the new endeavor), the organization’s members (the “workers” or “front-line personnel”) often do not cooperate with management’s requests or support the new ways that have been announced. Often they just comply and “do as they are told,” or they “work to rule,” or they undermine the endeavor and its intent; in extreme cases, they actively rebel. In essence, they do not “subscribe” to the new relationship.

A reason for this lack of cooperation and participation is that the members of the group have not had the time to understand the history and formation of the organization and have not figured out how to make the new relationship work for themselves and their organization. At best, they may just bear with the formation and keep focused on getting their “real” work completed.

With this in mind, it is not surprising that getting people to actively support any organization is such a challenge. Using a collaborative process increases the chances for success and ongoing strength of the organization. Aware leaders and active members need to know what they will encounter as they move into any new endeavors. In this article, we will focus on what it takes to get individuals to “subscribe” to inter- or intra-agency collaborative endeavors.

**IMPACT OF AN ORGANIZATION’S CULTURE ON BEHAVIOR**

Individual behavior in an organization is largely defined by and dependent on the culture of the organization in which the individuals serve. In its simplest terms, organizational culture is the manifestation of the written and unwritten, spoken and unspoken “rules” of the organization. It is the way the members perceive what the organization wants, as well as the ways in which they are required to function in order to complete the organization’s work. Each organization has its own vision, mission, guiding principles, strategies, and goals. These aspirations define the organization and mold its culture. Each individual worker decides how he/she will take part. Each individual integrates him- or herself into the larger group and takes on the cultural vision and mission. Thus,
the individual creates his or her own connection to the organization. The member is believed to be “committed” to the organization. Once members achieve that state of commitment, their behaviors comply with the organization’s ways. They have become “acculturated,” since all of their behavior complies with what is expected explicitly and implicitly by the group. Individual members respond to organizational rules based on their particular perceptions of those rules and their own individual interests and concerns, which may or may not be in tune with the organization’s rules. Critical to the success of an inter- or intra-agency endeavor is getting organizational stakeholders (leaders and members) to subscribe to the formation process of the endeavor and alter their behavior as required. When enough members subscribe actively, the organization as a whole will begin to adopt and then integrate the new ways. To state it differently, the organization’s behavior with regard to inter- or intra-agency success will change as more members take on the new attitudes and behaviors. Stakeholders within the organization can initiate and greatly accelerate this requisite behavior change by creating opportunities and/or challenges that encourage leaders and members to change in a particular manner.

If a multi-agency task force is formed with the purpose of investigating potential threats, members from the local, regional, and federal agencies all need to work in a uniform and aligned way. One agency should not “showcase” itself or jeopardize other members by using its own ways of doing things rather than the agreed-upon ways. On the other hand, if the organization does not listen to its members and simply mandates specific behavior, the effectiveness of teamwork and the many other dimensions of working in a new way are negated.

**ESTABLISHING THE CULTURAL ENVIRONMENT**

It is important to understand how an organization’s culture supports and/or undermines inter- or intra-agency efforts, for, as you will remember, it is often this collection of unwritten and unspoken “rules” that determines the many factors that influence “subscription” (or joining) behavior. Organizational examples would include norms around the use of information and/or how one processes it, stakeholder support for change, time and workload demands, reward and compensation systems, collaborative vs. competitive practices, and customer satisfaction. More specific factors include past experience with inter- or intra-agency initiatives in general; recognition of the problem(s) to be solved; the perceived value of the initiative; the ability to address the problem(s); personal interests; and personal operational style, including a risk-taking mentality.

If we were to create a team whose members included police (local, state, regional, and federal), fire departments (local, state, regional, and federal), emergency medical services (the hospital system and all the ancillary pieces), emergency management (all the components at the local, state, regional, and federal levels), and Homeland Security and engage the group in a special recovery-team endeavor, how would the members of each faction interact and join forces? How would they behave as a group? The non-collaborative approach usually used is, X is in charge, and he will tell you what to do, when to do it, and how to do it; the others then comply. Using a collaborative approach, time is initially spent discussing important topics such as vision, mission, and how each party contributes to the collaboration. This creates an environment where each individual creates a connection with the others in the collaboration and consequently comes to own the new organization.

Establishing a cultural environment that supports inter- or intra-agency endeavors is the foundation on which to build a strong organization that is empowered to meet its goals. The culture must provide strong incentives for change and at least the minimum of incentives needed to maintain the status quo. Sponsorship and key alliances need to be developed to support collaboration.

**INFLUENCING INDIVIDUAL SUBSCRIPTION BEHAVIOR**

In order to understand the levels at which organizational stakeholders work together and “subscribe” to the new organization, we need to understand the levels of engagement. Subscription behavior can be described as on a continuum, from “very supportive”
Table 1. Subscription behaviors and definitions

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Committed</td>
<td>Wants to achieve his/her own vision using the formative inter- or intra-agency endeavor and its processes and is willing to go the extra mile to make it happen, including creating whatever new rules or structures are needed.</td>
</tr>
<tr>
<td>Enrolled</td>
<td>Sees personal benefits in the vision and in using inter- or intra-agency endeavors and processes and does everything that is expected; understands the spirit of the law, which he or she follows to the letter.</td>
</tr>
<tr>
<td>Compliant</td>
<td>Does not see the benefits of the vision, but does not want to threaten or jeopardize his/her job or career. He/she follows the inter- or intra-agency endeavor and its processes just enough because it is expected or because he/she “has to” but also lets it be known that he/she is not really on board. These people “work to rule,” or they only “follow the letter of the law.”</td>
</tr>
<tr>
<td>Noncompliant</td>
<td>Does not see the benefits of the inter- or intra-agency endeavor, process, or vision and does not do what is expected. Basically, he/she has an attitude of “you can’t make me do much.” Perceived as apathetic or sometimes actively negative toward any new endeavor.</td>
</tr>
<tr>
<td>Disengaged</td>
<td>Neither for nor against the inter- or intra-agency vision. Is often late turning in materials or turns in poor-quality work. No interest, no energy; attitudes of, “If I wait long enough, it’ll go away”; “This inter- or intra-agency stuff doesn’t affect me”; “Is it five o’clock yet?”; “I’ll be retiring soon.”</td>
</tr>
</tbody>
</table>

to “actively undermining.” Table 1 contains the terms for the levels of subscription and their associated key behaviors.

With regard to any organizational venture/change, each individual will exhibit behavior that falls somewhere along this continuum. Some individuals will almost immediately commit themselves whole-heartedly to supporting the inter- or intra-agency endeavor. Some individuals may never get beyond apathy or noncompliance. Whether or not there will be individual subscription issues regarding inter- or intra-agency actions is not the question. The question is, How can the inter- or intra-agency professional deal with these issues in a way that effectively moves the organization as far as possible toward the commitment end of the continuum? Table 2 explores the levels of subscription and the actions of leaders and members at each of the five levels.

When forming a collaborative effort, the rule is to include stakeholders as much as possible. The more they express themselves and their concerns, values, and beliefs, and the more they can see those ideas incorporated into the venture, the more they subscribe to the process.

Another interesting factor in forming a collaborative effort is that many people exhibit caution when attempting to engage in a new effort. Usually a small group of members sees things in a positive way. These individuals exhibit less risk aversion and are excited by the thought of getting involved early and forming the endeavor. These individuals are called “early adopters.”

The antithesis of the early adopter is the “slow adopter.” Initially such individuals adopt the roles of noncompliant or disengaged individuals. These individuals are often highly invested in their own ways of doing things and need to experience how things work in another way. Eventually, many of these individuals will change their level of subscription, once they see it is O.K. to behave in the new ways and that they, too, can benefit from them.

When creating an inter- or intra-agency endeavor, it is important to be patient. It is necessary to create a structured program for people to which they can subscribe. Allow time and space for learning and changing of perspectives. Individuals will always accept change at their own pace; make it easy for individuals to “join the club” over time. Simply welcome them in and commit yourself to their success as enthusiastically as you did the early adopters, those first in. Encourage the constructive expression of emotions and concerns, and don’t take resistance personally.
**Table 2. The five levels of subscription behavior**

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Leader</th>
<th>Member</th>
</tr>
</thead>
</table>
| Committed      | • Documents and communicates success stories based on work with the inter- or intra-agency endeavor.  
                |   • Engages stakeholders in planning for improvement of the inter- or intra-agency process or for departmental or organizational use.  
                |   • Engages stakeholders to act as spokespersons to promote the inter- or intra-agency endeavor and carry the vision forward.  
                |   • Asks committed inter- or intra-agency customers to test or pilot new inter- or intra-agency processes as early as possible in order to provide involvement. These early subscribers are the successes the sponsors and/or the other members of the organization observe.  
                | • Engages end users in the process of designing new or different inter- or intra-agency applications.  
                |   • Schedules brainstorming sessions to develop creative ideas for improving or expanding inter- or intra-agency work.  
                |   • Encourages end users to share their successes with others |
| Enrolled       | • Shows support and commitment to the sponsors and his/her goals.  
                |   • Engages sponsor(s) in analysis of the inter- or intra-agency function and/or inter- or intra-agency results, and shows them how they can increase effectiveness.  
                |   • Develops training for different aspects of the organization or the inter- or intra-agency endeavor to support ongoing efforts.  
                |   • Enjoy benefits from an inter- or intra-agency process in action.  
                | • Seeks extra training on the inter- or intra-agency processes.  
                |   • Encourages creativity and experimentation with inter- or intra-agency to ensure better processes.  
                |   • Seeks feedback that would improve the processes, thereby helping others do their jobs.  
                |   • Establishes a proactive, problem-solving environment around use of an inter- or intra-agency. Sits with clients and coaches them through the processes. |
| Compliant      | • Identifies individual needs and shows how inter- or intra-agency endeavor can help.  
                |   • Acknowledges accomplishments that wouldn’t have happened before inter- or intra-agency involvement.  
                |   • Engages in reflection on the inter- or intra-agency process, identifying what went well and what would be “even better if . . . .”  
                | • Improves understanding in the organization about what inter- or intra-agency is.  
                |   • Teams up with peers and superiors who are supporting the inter- or intra-agency endeavor. |
| Noncompliant   | • Identifies and emphasizes concerns that keep members from accepting or participating in the inter- or intra-agency endeavor.  
                |   • Focuses on identifying experiences, with as little delay as possible, that illustrate reasons not to be engaged in the inter- or intra-agency endeavor.  
                |   • Communicates problems with the inter- or intra-agency vision, including the significance and any missing benefits.  
                |   • Works with leaders of other areas to gain their cooperation in subverting the inter- or intra-agency endeavor.  
                | • Determines what people do or don’t know about the inter- or intra-agency endeavor and fills in gaps in understanding.  
                |   • Clearly communicates specific concerns about the individuals who belong to the endeavor.  
                |   • Clearly communicates personal and organizational risks and potential consequences for participating in the inter- or intra-agency endeavor.  
                |   • Positions him- or herself so that he/she can see that endeavor does not work and/or “helps” others, sometimes actively keeping them from making a fair evaluation of the new endeavor. |
| Disengaged     | • Doesn’t care about the new endeavor and continues with what he or she had been doing in his or her own ways.  
                |   • Does not engage in finding out the successes of the venture  
                | • Doesn’t participate in activities.  
                |   • Doesn’t actively engage with venture participants.  
                |   • Doesn’t attempt to find out how the venture is working.  
                |   • Focuses only on his/her own work and efforts. |
CONCLUSION

It is critical that the leader of a inter- or intra-agency endeavor actively facilitates participation in establishment of an organizational environment (the culture and structure of the organization) that supports subscription to the inter- or intra-agency endeavor and its related processes. This includes:

- tying the newly formed organization closely to the visions of the original organizations from which the members come, and communicating how the visions support each other;
- gaining stakeholder support within each agency or department and openly valuing their varied contributions;
- letting the stakeholders determine how they will work together and operate to fulfill the mandated endeavor; and
- working closely with the team members to help them build and recognize success.

It is equally important to recognize that individual subscription to the new endeavor can take time, and that individuals respond to change in their own ways and at their own rates. Concentrate on subscription-enhancing efforts within the organization. Invite participation from early adopters and foster contribution from others. Over a period of time and with demonstrable successes, more and more individuals will move toward higher levels of subscription. Eventually, the membership subscription in the new collaboration will be large enough to sustain itself—and there will be no stopping it.

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ABSTRACT
Response to a hazardous material (HAZMAT) incident and/or an environmental crime often involves a legal investigation. Our laboratory, in collaboration with a number of state, local, and federal agencies, developed and deployed a sampling kit designed specifically for first responders to expedite both collection and transportation of physical evidence to the state laboratory for identification, while maintaining chain of custody. These kits have been used for sampling and transport of samples for a number of legal cases and have shown great utility in and among our local first responder community.

INTRODUCTION
In 1999, our laboratory was a charter member of two Central Virginia consortia of first responders: an environmental crimes task force and the Richmond Hazmat Workgroup. These groups consisted of representatives from the hazardous materials (HAZMAT) force, law enforcement, state response agencies, and federal agencies. The mission of each group was to better acquaint group members with one another, their respective agencies, and the agency response plans. In addition, by extending the lines of communication, a broader network that could more efficiently and effectively respond to HAZMAT, events involving weapons of mass destruction, and environmental crimes would result. One of the many outcomes of these groups was the design of a dynamic emergency sampling kit to respond to the aforementioned scenarios, to better aid in legal proceedings from cradle to grave.

Initially the kits were used in response to environmental crimes and/or HAZMAT incidents; however, after the intentional release of B. anthracis through the postal system in 2001, many responding agencies were ill-equipped to sample and transport suspected biological agents. Working with these agencies, the laboratory was able to provide guidelines for sampling and to add specific tools for collection of samples into the kit, while complementing both the safety guidelines and response plans of each agency.

This manuscript describes the evolution of the sampling kit our group has designed in collaboration with our partners and provides some examples of instances where the kit has been utilized in response to HAZMAT or environmental crime incidents.

CREATION AND DESIGN
The idea for the sampling kit came about during meetings with the Virginia Department of Emergency Management, Virginia Department of Environmental Quality, and the Virginia State Police. Historically, evidence submitted for laboratory analysis was often collected and transported in a manner not conducive to proper legal action. Many times, investigators were on scene without proper sampling equipment and were forced to use whatever collection materials were available at that time. For example, the laboratory would receive liquid samples collected in used soda bottles and soil samples collected in plastic sandwich bags. While these sorts of samples were collected in good faith and using a proper collection technique, from a laboratory standpoint, the requested tests were not compatible with the sampling container, i.e.,
water collected in unlined paint cans for volatile analysis, or plastic containers used for organic analysis. Under these conditions, laboratory testing would still proceed; however, caveats and qualifiers had to be placed on the analysis results. In the end, a stronger case could have been made if the sample had been collected in the proper container, which in turn would have yielded better analytical results. It was readily apparent that continuity and cooperation between the laboratory and the first responder community would benefit all parties and allow them to more effectively perform their respective duties.

We chose a 54-quart puncture-proof (hard shell) cooler as the storage container for sampling materials and as the best transportation device (Figure 1). This type of container allows potentially volatile samples to be packed in ice for transport and preservation, a condition that is vital in situations where sample integrity could be called into question. A hard-sided shipment container could be moved in a vehicle without damaging the contents. Additionally, the interior could be decontaminated and reused. In order to provide sample security, the hinge screws in the back were removed and replaced with tamper-resistant screws (Figure 1A) that can only turn one way (in the tightening direction). The standard front hasp was replaced with a metal hasp to allow for a secure closure equipped with a security tab (Figure 1B). To ensure sample security after collection and during transport to the laboratory, a lock was taped to the interior lid of the cooler (Figure 1C), with the laboratory holding the only key.

The cooler contains both glass and plastic sampling containers to provide versatility in sample collection (Figure 2). All the sampling containers and equipment are purchased from a vendor who issues a certificate of cleanliness with each shipment. Specific sampling containers, e.g., one-liter amber bottles, are grouped together in a heat-sealed plastic bag with a card listing the type of container, the volume, and the lot number (Figure 3). By heat-sealing the items together, cross-contamination is prevented and containers are isolated more efficiently. In addition, if there is a request for assistance with collection, the laboratory can direct the caller to certain types of containers to
alleviate confusion over the type of container to use for collection, and the collector can keep the card with his/her case file, pointing to the lot number and cleanliness of the container used. Other items that are necessary for collection and preservation of the crime scene are given in Table 1. All the containers are placed in a large plastic bag within another large plastic bag and placed in the cooler (Figure 4). The cooler is then sealed with an evidence seal for field use, as seen in Figure 1B.

### DEPLOYMENT

Prior to the kits’ deployment, they were field tested to ensure ruggedness, ease of use, and versatility. Numerous exercises were conducted utilizing the kit to ensure that kit contents were easily accessible using Level A protection. To this end, some items were altered to increase user friendliness, and some items were removed and a more appropriate replacement was instituted.

The first kits were distributed locally in the Richmond, Virginia, area. Individuals requiring a kit would come to the laboratory to retrieve the kit. At that time there were eight out in the field and a repository of seven held at the laboratory. When a kit came in after use, it was traded out for a new kit, and the old kit was decontaminated, replenished, and placed in the repository.

About one year after their initial release, more requests for kits started to come in to the laboratory, and the cost to produce kits increased. During a consortia meeting, it was suggested that stakeholders provide the laboratory with a one-time fee to cover costs for materials. This funding covers the bulk of the material costs and enables the laboratory to produce more kits. When a kit is utilized, a new kit is provided simultaneously at no extra cost. To cover additional materials costs, the laboratory submits an invoice for analytical costs and materials for restitution. If restitution is not garnered, the laboratory does not bill back to the agency.

For kit orders that were not near the Richmond area but were within Virginia, we utilized the laboratory’s bonded courier system. Courier sites are located at 133 locations throughout the state, and shipments run twice a day (morning and evening). This system also works well for evidence in cases where emergency testing is not required. In these cases, once a kit is shipped to the laboratory a replacement kit is shipped simultaneously back to the submitter, to ensure constant coverage. For kit orders outside of the state, a commercial courier is used, with the requesting agency paying for shipping costs. Since the kit has perishable items (i.e., camera, saline, and bleach), kits are replaced on a yearly basis by the aforementioned means.

### CASE STUDIES

The following are representative examples of kit usage in Virginia. As can be seen, the utility of the kits, especially in cases where mutual aid was utilized, was instrumental in these situations.
1. It was suspected that a rear discharge valve on a cargo tank trailer parked near a boat ramp on the Nottoway River was opened intentionally, allowing approximately 5,000 gallons of highly viscous oil, used for highway paving, to flow into the river. Investigative efforts focused on obtaining samples of oil from the river and also from the discharge pipe of the cargo tank, in an attempt to match the substances. At this scene, evidence was collected using sterile plastic scoops, resealable bags, and glass jars (eight-ounce and four-ounce).

2. Authorities suspected illegal disposal of what was believed to be waste perchloroethylene. The disposal process involved placing the chemical inside a large metal container with an open top, similar in size and shape to a barbecue grill, and heating the container with a propane-fired burner in order to allow the chemical to vaporize. Evidence collection involved obtaining several samples of the suspect liquid using Coliwasa tubes, eight-ounce jars, and resealable bags as a means of secondary containment.

3. Suspected irritant powder was found inside of a large, otherwise empty roll-off trash bin. The material was reportedly from a container that was later determined to be some form of riot-control device. The container was thrown into the empty trash bin and, upon striking the metal bottom of the bin, broke open, releasing the contents. Several bystanders were reportedly affected by the irritant. Sample collection focused on product identification for purposes of patient care rather than obtaining evidence for criminal prosecution. The suspect material was brushed into an eight-ounce jar and over-packed using resealable bags as a means of secondary containment. The bags were then placed in a one-gallon paint can and evidence-sealed for transport. Analysis of the material revealed that it was 2-chlorobenzalmalononitrile (CS, or tear gas), a common riot control agent.

4. Suspected irritant powder was found inside of a van trailer undergoing dismantling for sale as scrap metal. The individual working with the trailer had come into contact with a white powder on the floor of the trailer and immediately complained of...
severe and localized itching on his upper extremities. The trailer was reportedly obtained from a local chemical company. Contact with a company representative yielded information indicating that the company did not own any van trailers. It was later determined that the trailer had belonged to a construction contractor working at the chemical company’s site. Sample collection focused on product identification for purposes of patient care rather than obtaining evidence for criminal prosecution. Samples of the suspect material were obtained using sterile plastic scoops, eight-ounce jars, and resealable bags as a means of secondary containment. An analysis of the sample identified the material as perlite.

5. Several hundred pounds of a yellow powder were dumped on the ground in the parking lot of a truck stop. It appeared that the material had been discharged from the bottom offload device of some form of a hopper trailer. Evidence collection focused on product identification for the purposes of disposal as well as obtaining criminal evidence for potential criminal prosecution for the illegal disposal of a hazardous waste. Sample collection was accomplished using sterile plastic scoops,
eight-ounce jars, resealable bags as a means of secondary containment, and one-gallon paint cans for transport. Analysis of the samples identified the material as animal feed.

6. Unidentified white powders are frequently reported. The majority of cases have been responses to white powders that are suspected to contain biological threat agents. In these cases, the sample collection materials utilized are Dacron swabs, saline syringes, whirlpaks, resealable bags, paint cans, and evidence tape. The bleach:water dispenser is used to decontaminate the area and the paint can prior to transport.

CONCLUSIONS

The development and use of these sampling kits has been very well received by both the Central Virginia Environmental Crimes Task Force and the Central Virginia Hazmat Work Group. To date, approximately 80 kits are in circulation for use across the Commonwealth of Virginia and in neighboring states. Kits are used by law enforcement, fire, HAZMAT, and enforcement agencies at the local, state, and federal levels.

The kits are inexpensive compared to commercial versions, and the use of the cooler as the principal container makes the system easy to transport and handle regardless of the situation. The addition of a secondary system for the collection of biological samples has proven to be a successful improvement to the kits and indicates the excellent communications between the first responder community and the laboratory. While a few examples were given, they do not completely describe the utility and versatility afforded by these kits.

ACKNOWLEDGMENTS

The authors would like to acknowledge the contributions of the Central Virginia Environmental Crimes Task Force and the Central Virginia Hazmat Work Group. We would like to point out the specific contributions of Harold Adams, VSP retired, and John T. Conover, VDEQ retired. We would also like to thank Lloyd Reitz for assistance with the figures.

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Emergency managers have many responsibilities both before and after disasters. One function that often gets overlooked is debris management. Debris management, in the context of emergency management, can be defined as the clearing and disposal of waste generated by disasters. It includes the collection, sorting, storage, and recycling of rubble and other materials disasters produce.

The following paper discusses the importance of debris management. It also describes the large amounts and various types of debris produced in disasters. Steps that should be taken to manage debris operations effectively are mentioned, along with challenges that should be considered by the emergency manager. The overall goal of the paper is to help those working in the field perform their roles in a successful manner.

Debris management ranks among the most important activities an emergency manager will undertake in the aftermath of a disaster. The presence of debris has a significant impact upon disaster response and recovery operations. For instance, if waste and rubble are not removed from streets, emergency personnel such as police, fire, and medical teams may be delayed in carrying out their life-saving activities. Rebuilding will also be postponed if debris is not dealt with efficiently after disasters.

There are additional reasons that effective debris management is vital for the emergency manager. Debris such as glass and sharp objects (e.g., splintered wood and twisted metal) can be very dangerous for disaster victims, volunteers, and first responders. Debris piles are an eyesore and can impact the mental well-being of the community that has been affected by the disaster. They can also be associated with rodents and the spread of disease. Another concern is that debris management may adversely impact the environment if it is not performed carefully.

The emergency manager should be aware that debris management is a time-consuming post-disaster function. After the Oklahoma City bombing, crews worked 24 hours a day, seven days a week, on debris management. When the Twin Towers of the World Trade Center collapsed, it took at least eight months to remove the debris created by the terrorist attack. The debris generated by Hurricane Katrina and the broken levees may not be disposed of for several years.

When disasters occur, an overwhelming amount of debris may be generated. The Northridge earthquake produced nearly 100,000 tons of debris. After a series of tornadoes struck Oklahoma in 1999, it was estimated that 500,000 cubic yards of debris was removed. Hurricanes are hazards that produce an amazing amount of debris; when Hurricane Andrew struck southern Florida in 1992, it resulted in over 43 million cubic yards of disaster debris in the Miami-Dade County area alone. Hurricane Floyd destroyed 18,000 mobile homes and killed thousands of animals, whose carcasses had to be buried or burned. The number of homes destroyed by Hurricane Katrina is also staggering. It is estimated that that disaster produced over 115 million cubic yards of debris. This is particularly impressive because even small disasters may result in eight times the usual amount of trash to be picked up.
Debris produced in disasters varies widely, ranging from sediment and broken plywood to electrical wiring and damaged brick. However, certain types of hazards are associated with specific types of debris. Hurricanes damage buildings, shift beach sand on top of roads, and result in “green waste” (i.e., severed tree limbs). Tornadoes, flooding, and ice storms destroy homes and corporate offices, leaving behind trails of rubble. Earthquakes are often accompanied by landslides, while fires produce ash and charred wood. Hazards such as industrial explosions may generate contaminated water or soil because of hazardous materials spills.

Regardless of the cause, debris is often classified in one of four ways. Vegetative debris includes tree stumps, brush, leaves, and yard waste. Aggregates are the debris produced from damaged roads and bridges. They include asphalt and concrete. Construction or demolition debris results from damaged structures and consists of wood, metal, insulation, shingles, or other types of building material. All types of disasters are associated with the destruction of personal property. This can include lawnmowers, computers, cars, microwaves, furniture, clothing, and many other items.

The emergency manager should be aware of the fact that other types of debris are associated with disasters and emergency management activities. Some debris, such as spoiled food, may result from power outages. The response itself may also create an inordinate amount of debris. Sand bags, water bottles, or cans of food may be needed to fight floods or provide hydration and nourishment for first responders. These must also be recycled or thrown away after a disaster.

DEALING WITH DEBRIS SUCCESSFULLY

In order to manage debris operations successfully, several measures must be taken. One of the first priorities is to adequately prepare for debris management operations. This necessitates that someone be given the responsibility to plan for this function. The person in charge of debris management must not plan in isolation from others, however. It is imperative that other organizations be involved in the process.

Possible participants include other departments in the city, as well as mutual aid partners from nearby jurisdictions and contractors from the private sector. Incorporating these entities in preparedness activities will ensure that there is a broad understanding of the types of debris that must be dealt with, the locations where debris is most likely to be produced, and the equipment that is required after a disaster (e.g., chain saws, front-end loaders, and dump trucks). Swan’s research reveals that “the clearance, removal, and disposal of debris is a difficult, time-consuming, and expensive operation that requires a well-defined debris management plan, one that takes into account realistic debris forecasts and current organizations and capabilities. The debris management plan defines the debris management strategies and responsibilities from the cradle (i.e. curbside) to grave (i.e. landfill).”

Contracts with the private sector can also be developed before a disaster occurs. These contracts will fall into one of three categories:

1. **Lump-sum contracts** are commonly used when debris is concentrated and the scope of work is well defined. They may include a one-time payment for the entire debris management operation.

2. **Unit-price contracts** are frequently applied when it is impossible to determine the exact amount of debris produced in the disaster. An example is a payment of “x” dollars for each truck loaded with debris.

3. **Time and material contracts** indicate how much will be paid for personnel and equipment. This may include an hourly wage, as well as truck usage and fuel costs.

The major benefit of reaching an agreement about contracts before a disaster occurs is to obtain a lower price for debris management services. Prearranged contracts will also help emergency managers keep people and equipment at their disposal.
(which may not always be easily done in widespread disasters). Such contracts are of little value, though, if they are not reviewed by the legal department to ensure everything is in proper order. In addition, it is advisable that the city’s legal representative examine issues such as right-of-entry permits, community liability, condemnation of buildings, land acquisition for temporary staging, and reduction sites. This will limit unanticipated legal entanglements that may result from debris management operations.

A second major step is to properly train the personnel involved in debris removal. This should include emergency management staff, public works employees, and others from parks and recreation (or anyone else who operates heavy equipment). Such participants should be advised of what disasters can occur and the types of debris that will be produced. Personnel should be made aware of the need to be available after disasters and advised about possible staffing assignments, removal and storage activities, and goals for recycling and disposal. Training should also focus on the partners that will help with debris-management operations. According to Swan, “prospective staff members should have as much interactive training as possible with other agencies responsible for debris removal and disposal activities, such as the National Guard, State Department of Transportation, State Police, Federal Emergency Management Agency (FEMA), and the U.S. Army Corps of Engineers.”

When the disaster occurs, the initial priority will be to remove debris from roadways so emergency personnel can access disaster sites and carry out their crucial lifesaving missions. This will require a great deal of foresight and an ability to act quickly when the earthquake, tornado, hurricane, or other hazard event takes place. At the same time, it will be necessary that appropriate storage sites be considered. It is advisable that emergency managers consider using:

- public lands, as they will not require expensive leases;
- locations that will not create excessive dust, noise, or traffic nuisances for others;
- large sites that have adequate ingress and egress; and
- areas that will not adversely affect the environment.

Such sites may need to be as large as 100 acres. Fairgrounds or even county airports can be used for this purpose, as long as the debris does not interfere with daily events and operations. Every attempt should be made to avoid areas that are located near homes, businesses, schools, or other important or crowded venues.

While the initial removal is underway, it is advisable that emergency managers determine whether the volume of debris can be reduced through various methods. For instance, vegetative debris can be chipped and used as mulch. Burning can also significantly limit the amount of vegetative debris that must be dealt with (although this may create air pollution if not completed in a careful manner). Aggregates can be crushed and used as road base. Some construction and demolition debris can be recycled (e.g., wood can be made into press board). This may have an enormous and positive impact on the amount of debris that has to be disposed of. However, recycling can only occur if personnel and citizens are made aware of the need to separate debris at the time of removal. A great deal of communication with employees and contractors will also be required. The media can help the emergency manager get vital information out to the public. For instance, when the Space Shuttle Columbia broke up upon reentry, NASA and FEMA officials issued highly public warnings advising people to stay away from any debris, as it could have been laden with hazardous materials. People can be advised as to the best way to cut tree limbs and the importance of not obstructing roads, fire hydrants, and drainage systems with debris. At this point, the community can begin to eliminate debris through reduction and recycling efforts or by burying debris in designated landfills. These steps will be the most time-consuming phase of debris management operations.
Although planning, training, and the proper implementation of debris management activities will limit potential problems with this post-disaster function, the emergency manager should not expect that all difficulties will be eliminated. One of the major challenges is to coordinate all of the diverse parties that participate in debris management. Such parties include citizens, city departments (transportation, public works, parks and recreation), private contractors, FEMA, and the Environmental Protection Agency (EPA). For this reason, it is imperative that communication be clear and continuous and that each of the participants be willing to cooperate with others. Failing to do so will only add to the problems faced after disasters.

Another major challenge to expect is the significant expense resulting from debris management. Because the debris produced in disasters may equal or exceed the quantity of waste produced over the course of an average year, it can be very costly. Debris management is one of the most expensive activities associated with emergency management. A tornado, earthquake, or ice storm may produce debris that costs over $10 million to remove. Expenditures on debris management after Hurricane Andrew

<table>
<thead>
<tr>
<th>Table 1. EPA recommendations for effective debris management (adapted from EPA 1995, 8-10)</th>
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<tbody>
<tr>
<td>Create a long-term debris management plan.</td>
</tr>
<tr>
<td>Plans (including strategies for debris collection; temporary storage and staging areas; recycling; identification, handling, and disposal of hazardous wastes; administration; and dissemination of information to the public) will do much to ensure quick and effective debris management operations.</td>
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<tr>
<td>Consider mutual aid arrangements.</td>
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<tr>
<td>Developing contracts with nearby communities may help jurisdictions find needed personnel and expertise, as well as reduce costs associated with purchasing and maintaining equipment.</td>
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<tr>
<td>Implement recycling program.</td>
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<tr>
<td>It is easier to recycle debris if a waste recycling program has been established before a disaster strikes.</td>
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<tr>
<td>Update the community's solid waste management plan.</td>
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<tr>
<td>Establishing policies and practices for waste management will help to ensure that government departments and contractors understand expectations for the removal and disposal of disaster-related debris.</td>
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<tr>
<td>Develop a communication strategy.</td>
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<tr>
<td>Government officials must tell citizens about special instructions for reporting and sorting disaster debris, as well as when regular trash collection will resume.</td>
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<tr>
<td>Prepare for increased outreach and enforcement staffing needs.</td>
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<td>Additional personnel should be hired after a disaster to answer telephone calls about disaster debris and to assist in the removal of disaster-produced rubble.</td>
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<tr>
<td>Obtain equipment and supplies.</td>
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<tr>
<td>Cell phones, chain saws, portable generators, flashlights, batteries, vehicle repair kits (for flat tires), extra work clothing, water, and other materials for debris management personnel should be readily obtained after disaster strikes.</td>
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<tr>
<td>Select collection and storage sites.</td>
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<tr>
<td>Identifying locations for collection, staging, storage, sorting, recycling, burning, and burning of debris in advance will eliminate unwanted noise and road damage and increase the efficiency of debris management operations.</td>
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<tr>
<td>Determine management options and goals.</td>
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<tr>
<td>Communities should anticipate what types of debris will be produced in a disaster and identify the objectives and methods to appropriately deal with them.</td>
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<tr>
<td>Segregate hazardous waste.</td>
</tr>
<tr>
<td>Ensure that everyone involved in debris management understands how to deal with hazardous materials (so it is not mixed with other disaster debris to produce further environmental degradation).</td>
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<tr>
<td>Prepare contracts.</td>
</tr>
<tr>
<td>Work with the private sector to seek requests for proposals to collect, store, sort, process, and dispose of disaster debris.</td>
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<tr>
<td>Plan for FEMA and State reimbursement.</td>
</tr>
<tr>
<td>Hire staff to record debris management costs, and file for reimbursement in accordance with the rules provided by FEMA.</td>
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</table>
approached $600 million. Overall, expenses associated with debris management average between 15 and 33 percent of FEMA’s disaster expenditures. Although FEMA will pay 100 percent of debris costs during the first 24 hours after a disaster and 75 percent after that, the local government’s portion can still be sizable. What is more, there is no guarantee that a disaster will be declared at the federal level and thus obtain federal support, so cities and counties must be able to cover these costs after any disaster.

There are ways to reduce the cost of debris management. People and equipment can be acquired creatively, thereby minimizing expenses; for instance, prison crews were hired to remove debris after one community disaster. Federal assistance can be obtained after major disasters. If the disaster has been declared at the federal level, it will be imperative that someone track employee hours, equipment used, and fuel costs, as federal reimbursement can only be granted if records have been kept regarding debris management operations. In addition, payments must coincide with federal laws and regulations.

This brings up another important challenge to consider: legal obstacles. Emergency managers who are involved in debris management operations are quick to comment about the unique and sometimes changing nature of regulations that pertain to this area. For this reason, the emergency manager may wish to review the rules that guide debris operations and reimbursement (e.g., the Stafford Act and CFR 44). It is necessary to remember that debris must:

- be a direct result of the disaster;
- be found in the designated disaster area;
- minimize threats to lives and public health;
- reduce additional damage to public or private property;
- adversely affect economic recovery of the area; and
- be removed and disposed of within a definite time period (typically 180 days).

Debris eligible for funded removal includes wastes from roads and public property and hazardous materials that pose a threat to people and the environment. Examples of ineligible debris removal activities generally include: 1) removal of trees and trunks from unaffected forest areas, 2) removal of sediment from river basins that have not been maintained, 3) removal of debris from private roads and gated communities, 4) removal of extra tree trimmings or trees cut up by contractors, 5) yard waste coming from unmaintained lots, and 6) large amounts of construction debris created as a result of remodeling by contractors.

Emergency managers should also understand that federal reimbursement policies can be confusing—even to FEMA officials, at times. This is because rules may be different for each federal agency involved in disasters (e.g., Federal Highway Administration vs. FEMA). Moreover, the federal government may not always be consistent in applying the same standards to each disaster. After Hurricane Ivan struck Alabama, FEMA decided to pay only those communities that entered into contracts with the US Army Corps of Engineers. In other cases, the federal government has paid more than 75 percent of costs associated with debris removal, for political reasons. Knowing the regulations pertaining to debris management can increase the chance that expenses will be reimbursed to the fullest extent possible. Disputing the interpretation of rules can be helpful in certain cases, as long as debris activities are in compliance with federal regulations.

A related challenge is to ensure that fraud is not committed during debris management operations. Because of the millions of dollars spent on debris management, there is a fair chance that some federal officials, local government leaders, and contractors will be involved in dishonest practices and scams. People may try to get reimbursed for nondisaster-related debris. For instance, there have been cases where debris removal companies have cut down trees, loaded them on trucks, and sought additional funds
for their disposal. Local, state, and federal officials should be on the lookout for the hauling of ineligible debris, water placed in the bottoms of dump trucks to increase weight, inaccurate truck-load capacities, and the double-counting of loads (e.g., trucks reentering disposal sites). Taking photographs of those involved in debris management can encourage compliance with federal regulations and honest reimbursement claims. Trained monitors may also document activities and question possible fraudulent behavior. As an example, government agencies may ride along with debris removal trucks to ensure that people do not take advantage of federal funds.8

Finally, emergency managers need to remember that debris removal, debris reduction, and debris disposal may be extremely harmful to the environment. Burning, recycling, and burying debris often degrades the quality of air, water, and soil. Some citizens may take advantage of the disaster by trying to discard items that have not been affected by the disaster (e.g., couches, refrigerators, car doors, and old tires). This could also have significant environmental repercussions. It is therefore necessary to consult with environmental experts to ensure that burning occurs at the proper temperature. The emergency manager can inform the public, through the media, that unrelated debris should not be taken to the curb-side for removal and must be discarded properly.

CONCLUSION

Debris management is one of the most important functions to be performed by the emergency manager and many others after a disaster occurs. Debris can be excessive and may complicate response and recovery operations. Each hazard produces different types of debris that must be dealt with after a disaster. In order to improve the management of debris operations, it is imperative that sufficient attention be given to planning, training, and contract development. Even when steps have been taken in advance, emergency managers will face other challenges, including the expense of debris management, fraudulent practices, complicated regulations, and environmental degradation. These problems can be overcome if the emergency manager implements creative, knowledge-based, and careful debris management operations. It is hoped that this paper can assist emergency managers in reaching this lofty goal.

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REFERENCES
Advanced IT support of crisis relief missions

Peter Sapaty, PhD
Masanori Sugisaka, PhD
Robert Finkelstein, PhD
Jose Delgado-Frias, PhD
Nikolay Mirenkov, PhD

ABSTRACT

A novel distributed control ideology and technology will be described for management of advanced crisis relief missions. The approach is based on the installation of a universal “social” module in highly portable electronic devices, like laptops and mobile phones, which can collectively interpret a spatial scenario language, exchanging high-level program code (waves), data, and control with other modules in a parallel fashion. This technology can dynamically integrate any human and technical resources that were scattered postdisaster into an operable, distributed system capable of solving—autonomously—complex survivability, relief, and reconstruction problems.

Key words: critical infrastructures, key resources, emergency management, emergent societies, crisis relief, information technologies, distributed control, WAVE-WP model, mobile electronic devices, mobile robotics

INTRODUCTION

The big, grim picture

Millions of people are on the move, with traffic jams everywhere. Houses are destroyed, infrastructures gone; the landscape is battered by winds moving at hundreds of kilometers per hour, flooding, and fires. There is no electricity, and food and fuel are in short supply. People’s usual ties are broken, businesses have vanished, jobs have been lost. There are no central authorities or services, and looting and lawlessness prevail . . . This is becoming a familiar picture throughout the world, especially given the effects of global warming and climate change. Hurricanes Katrina and Rita are recent, very sad examples. Earthquakes are another disaster worry (think of the recent one in Pakistan), as are tsunamis, like the Indian Ocean tsunami of 2004. Man-made disasters caused by armed conflicts and terrorist attacks are effectively contributing to this black list, too.

How can victims regain integrity, restore law and order, and reassemble scattered resources for a collective survival? How can they rebuild the damaged territory, revive the previous infrastructures or create new ones, and return to a normal life?

In Figure 1, a symbolic picture of a postdisaster area, once a vibrant organism, displays the wreckage of living quarters, organizations, and infrastructures, along with scattered individuals and their emergent groupings.

Despite indiscriminate damages, the disaster area can still hold key human, technical, and natural resources, and its parts may still be able to communicate with one another; for example, if any cellular towers are still operating and/or access to the Internet remains available, some sort of contact can be made. Radio communications, even if only local, can also be helpful, and some units in the area may have satellite phones. Electricity may still be available, and the same grid can potentially be used for data communications (such promising projects already exist). So there may be sufficient resources for self-survival, and even self-recovery, especially with external aid hurrying to the scene, but resources will inevitably be scattered and disorganized.
Restoring integrity and coordination in the disaster area becomes a primary goal.

Emergency management

Emergency management, due to expanded world dynamics, is one of the hottest topics today. Emergency managers around the world are faced with new threats, new responsibilities, and new opportunities. It is widely believed that the combination of novel technologies and databases can allow law enforcement and intelligence investigators to identify potential terrorist plots, using a multitude of databases that may contain hidden patterns of information about transactions needed to execute plots and then mount preemptive strikes to stop their plans.

The National Response Plan establishes a comprehensive all-hazards approach to enhance the ability to manage domestic incidents. The plan incorporates best practices and procedures from different incident management disciplines. Another prominent document, the National Infrastructure Protection Plan (NIPP), provides a unifying structure for the integration of all critical infrastructure and key resources protection efforts into a single national program.

However, the existing efforts are actually offering yet another infrastructure, to be built on the same principles as the existing ones, i.e., consisting of specialized components, located in specific places and able to communicate with one another, with a good deal of central control over all involved. Due to this, they may be as, if not more, vulnerable to attacks and failures as other existing infrastructures, and thus they may become burdens rather than saviors.

Even in the relatively modest case of Hurricane Katrina, local infrastructures were indiscriminately fragmented and rendered totally inoperable, and federal bodies showed clumsiness and inefficiency. The new global infrastructures, like those we see in NIPP, may result in similar performances in major disasters caused by hurricanes, earthquakes, or WMD attacks.

Toward new emergency management approaches

We believe that critical infrastructure protection, recovery, and relief ideologies and technologies should be based on quite different, revolutionary rather than evolutionary, principles, and they should evolve and operate in other time-space dimensions than the traditional infrastructures and forces that can harm them, in order to be incomparably superior and unaffected themselves in case of major crises.

A completely different approach is being developed for penetrating any distributed and open systems and establishing overwhelming power over them (destruction of malicious infrastructures in these systems being an option). Any global or local scenario we want to implement over any area or system is formulated in a special spatial control language, which is interpreted cooperatively in a distributed system widely using smart mobile program code, covering the system or its parts in parallel. This provides spatial, hologram-like algorithms, which dynamically exist between system components rather than inside them, thus being totally unobservable and unreachable by conventional means.

Actually, this work follows a sort of intelligent supervirus ideology, with potentially unlimited self-penetration and self-recovery possibilities. The approach can also set up, at run-time, any needed infrastructures over scattered, postdisaster human or technical resources, and these infrastructures can evolve and freely migrate in both physical and virtual worlds, self-recovering after damages and preserving integrity and goal orientation.

This paper summarizes a technology, called WAVE-WP, that serves these purposes. We will outline the
technology’s main applications and possible implementation using massively mobile devices. Examples of spatial programming in some exemplary crisis relief operations will be demonstrated.

WAVE-WP MODEL AND TECHNOLOGY

The distributed computation and control WAVE-WP (or world processing) model and technology are based on a higher-level language describing parallel distributed solutions in computer networks as a single, seamless spatial process, rather than the traditional collection and interaction of parts (agents), while shifting these and other routines to an efficient, automatic implementation. Communicating copies of the WAVE-WP language interpreter (WI) should be installed in the most sensitive points of the system to be governed (e.g., Internet hosts, robots, troop carriers, dismounted soldiers, laptops, mobile phones, etc.).

Parallel spatial scenarios (or waves) written in the language can start from any interpreter, covering the network at run-time and cooperating with one another in the distributed space. The approach often provides hundreds of times the standard application code reduction and simplification, allowing us to concentrate on efficient global solutions rather than implementation details.

Spreading via networked WIs, waves can create dynamic knowledge infrastructures, arbitrarily distributed between the system components. Subsequently or simultaneously navigated by the same or other waves, they can effectively support distributed databases, advanced command and control, global situation awareness, parallel inference, and autonomous decisions. It is convenient to operate in this seamless, virtual world, fully ignoring its physical distribution, as virtual networks can migrate (partially or as a whole) in physical networks while being processed.

Installed in advance in different components that may happen to be located in a disaster area, retaining the possibility of their communicating using any remaining channels, WIs can convert a whole area (like the one shown in Figure 1) into an operable, self-organized system. Such a system will be able to solve complex tasks for itself (Figure 2); high-level relief scenarios in WAVE-WP can start and evolve from any interpreter, covering the whole system or its needed parts at run-time, while establishing full control over all involved components.

THE WAVE-WP LANGUAGE

Language basics

We are considering here only the top definition of the WAVE-WP language, with details shown in Figure 3.

Starting from a certain position, the program, or wave, navigates in physical or virtual space, with successive advances starting from positions reached by the previous advances. An advance may consist of moves, which can develop in parallel. Moves may be data processing and/or space propagation expressions of units.

Figure 2. Converting the disaster area into an operable system.

Figure 3. WAVE-WP language syntax.
separated by acts. A unit can represent a value directly, as either constant or variable, or may be an arbitrary wave in parentheses, optionally prefixed by a rule. Variables may be: nodal (dynamically associated with space positions and shared by waves), frontal (moving in space with control), and/or environmental (accessing the navigated environment in points reached).

Rules are either forward rules, coordinating the spreading of waves or setting up special navigation contexts, or echo rules that detail the fusion and return of (remote) states and data. Acts are classified as fusion acts (producing new values from operands), flow acts (moving data and control in space), and/or application acts (activating alien or native procedures). Constants and variables may represent both information and physical matter; they may also represent program code to be created, processed, or modified with a subsequent execution as waves, thus providing high programming flexibility in dynamic environments.

Spatial interpretation

What follows from this language definition is the unwrapping and replication of the recursive formulas, rather than traditional reduction, as shown in Figure 4. The wave program matches, conquers, floods, and covers the distributed physical or virtual world in parallel, establishing full control over the space. Each act is performed in the space positions reached on local data there, or on what is obtained and returned by other waves of the expression. The resultant value on any construct comprises all values obtained in the points of space reached by it. All constructs return control states, which are merged and generalized at higher levels, using rules for making hierarchical spatial decisions.

A number of successful implementations of this approach have been accomplished in different countries, using public domain available on the Internet. The new, advanced version is currently being reimplemented and patented, with orientation on both software products and direct “wave chips.”

CURRENT AND PROSPECTIVE APPLICATIONS

We will now mention some applications of this technology that may be directly or indirectly helpful in advanced emergency management.

Distributed robotic brain

WAVE-WP interpreters on top of (and integrated with) the usual robotic functionality may effectively convert any group of robots into an integral spatial machine capable of doing complex jobs simultaneously and cooperatively. Individual robots may be of any type, from most advanced to primitive; some may even fail at run-time, but the group as a whole could remain functional and goal-oriented.

Future combat systems

Installed in the main components of future combat systems (FCS), WAVE-WP can provide a global vision of the territory and overall situation awareness, despite the limitations of individual sensors and control facilities. It optimizes fusion and distribution of scattered targets and provides flexible command and control (CC); the CC infrastructure may be adaptable at run-time.

Tracing physical objects

The technology enables an efficient chase of (aerial or ground) physical objects by self-navigating and replicating program agents that follow them via computer networks. The multiplied mobile intelligence, migrating in computer networks, provides a new level of flexibility for various management systems. It may
guide, for example, the destruction of unwanted objects after individual investigation of their routes and behavior.

Global fighting of network intrusions

WIs, installed in Internet hosts and accessing usual management tools, can form a higher layer, converting large volumes of raw data into seamless, distributed knowledge for global network analysis and optimization. The WI network can simultaneously discover and analyze viruses throughout the whole world, blocking their spread and inferring attack sources.

National and international infrastructures

The technology can effectively support vital infrastructures of national and international scale, solving complex problems in them in parallel. These problems may relate to politics, economics, demographics, weather prediction, environmental pollution, postal service, transport, industrial-goods flow, the tracing of international criminals, or air and space defense, with optimized solutions not calling for central resources.

USING MASSIVELY MOBILE DEVICES

Emergency management may be fundamentally assisted by massively mobile, individual data processing and communication devices, which are expected to remain with individuals under any circumstances. WIs installed in them (this can be done without problems, taking into account the existing experience of implementation of the WAVE system on different platforms and the compactness of the language interpreter) can make whole societies, especially emergent ones in disaster areas, programmable and controllable in the way required, despite the scattering of resources and limited communications.

Mobile phones, the undisputed leaders among mobile devices, are expected to be the most common consumer electronics device on the planet. By the end of 2009, some 2.6 billion mobile phones will be in regular use around the world. They are catapulting rural Africa into the 21st century, making it the world’s fastest-growing cellular phone market. They are enabling millions of people to skip a technological generation and bound straight from letter-writing to instant messaging. Asia is the next fastest-expanding market.

Many people also use GPS, digital cameras, and portable computers along with mobile phones, and there are already advanced products that combine these and many other features within a single piece (including Bluetooth, WiFi, phone, radio, and television). Third generation, or 3G, technology brings broadband connectivity to mobiles, too. Also, a recently unveiled laptop selling for under $100, with its wireless Internet access and a hand crank for when there is no available power supply, is expected to contribute drastically to the unprecedented electronic integration of the whole world.

We may assume that these devices (at least some of them) would remain able to communicate with one another during and after disasters via wireless networks, the Internet, radio, or other channels, and in the worst case even via humans, who, using voice, handwriting, or gestures, can manually pass the needed codes and data, with a return to an electronic WI level at the reception end.

EXAMPLES OF EMERGENCY MANAGEMENT CODE

We will consider here only elementary examples of spatial programming in WAVE-WP for some tasks that may relate to emergency management, with simplifications necessary for showing program code within the limited paper space.

Spatial counting of all casualties

Let us consider a fully distributed and parallel counting of the total number of casualties in the disaster area, on all affected regions, assuming for simplicity that only a single WI is available for each region or group of individuals (the interpreter-participant can be negotiated locally if there is more than one).

The following program can be applied from any available WI as an entry one; the WI can be located away from the disaster area (say, in a federal center) or can reside within the area, as a special or emergently selected body or individual. Characters “#,” “_,” “?,” and “!” are serving, respectively, as hop,
aggregation, external procedure call, and halt acts; “grasp” and “repeat” are forward rules, and “sum” is an echo rule of the language.

\[
\text{Farea} = \text{disasterarea};
\]

\[
\text{USER} = \text{sum}(\text{direct} \# \text{any} \_ \text{Farea}; \text{repeat}(\text{grasp(Nmark == nil; Nmark = 1); ? casualtiesinfo ! done, any} \_ \text{Farea})
\]

Within the identified “disasterarea,” assigned to and subsequently carried in frontal variable “Farea” (names of frontal variables must begin with “F”), the program first hops into any directly reachable units within the area. Then, from all these units, it repeatedly (in parallel to all reachable neighbors) navigates the area using any available local channels between the interpreters (manual communications are not excluded). The program enters nodes only once, marking each with an individual nodal variable “Nmark” (such names should start with “N” in the language), grasping nodal resources for performing an indivisible check-assignment sequence.

This parallel spatial process forms a spanning tree, covering (if communications permit) the whole disaster area via the reached WIs in it. In each WI reached by the waves, an external procedure, “casualtiesinfo” (which can be performed manually, by individuals or groups sharing the same WI), returns the number of detected casualties in this region. These collected numbers are then summed up in parallel in the tree nodes and moved up the tree in the global echo process, arriving finally at the total number of casualties in the whole area and outputting this number to the user owning the entry WI.

As can be seen in Figure 5, the whole disaster area will have been dynamically converted into a parallel spatial machine capable of solving the problem in a fully distributed manner, without the need for central computational resources.

\[
\text{Farea} = \text{disasterarea};
\text{Nmax} = \text{max}(\text{direct} \# \text{any} \_ \text{Farea}; \text{repeat}(\text{grasp(Nmark == nil; Nmark = 1); number ? casualties _ WHERE ! done, any} \_ \text{Farea})
\]

Using the obtained first value in “Nmax,” it is easy to use WAVE-WP to describe the assemblage of the needed number of relief packages (storing all physical packages in frontal variable “Fsupply”). This can be succeeded by a direct movement into the

Figure 5. Spatial counting of the total number of casualties.

Relief delivery to the most affected region

If one decides to use echo rule “max” instead of “sum” in the previous program and also lift physical coordinates of the regions navigated (via environmental variables “WHERE” associated, say, with GPS devices), it is possible to get the final result on the disaster area as the following aggregated value. The first part of it will give the number of casualties in the most affected region, and the second provides the physical coordinates of this region (as measured from the related WI). The following program records this two-value result in the nodal variable “Nmax,” associated with the entry node.

\[
\text{Farea} = \text{disasterarea};
\text{Nmax} = \text{max}(\text{direct} \# \text{any} \_ \text{Farea}; \text{repeat}(\text{grasp(Nmark == nil; Nmark = 1); number ? casualties _ WHERE ! done, any} \_ \text{Farea})
\]
physical location in space (by the second value in “Nmax”), distributing the relief packages between the suffering individuals (using external manned procedure “distribute”) afterwards, as follows:

\[
F_{\text{supply}} = \text{“reliefpackage”} \times N_{\text{max}} : 1; \\
\text{direct } \# N_{\text{max}} : 2; \\
F_{\text{supply}} ? \text{distribute}
\]

In this program, “:” is an indexing act of the language, being superior to multiplication “*,” the latter working on physical matter at the left (“reliefpackage”) and information at the right (number of packages needed, same as number of casualties).

**Delivery to all regions**

It is easy to modify and merge the previous two programs in order to find separate casualty numbers on all affected regions and the corresponding coordinates of these regions, and then assemble the needed amount of goods for every region and forward them to the proper destinations, with a subsequent manual distribution, as follows:

\[
F_{\text{area}} = \text{disasterarea}; \\
N_{\text{all}} = ( \\
\text{direct } \# \text{ any } _ F_{\text{area}}; \\
\text{repeat}( \\
\text{grasp(Nmark == nil; Nmark = 1);} \\
\text{number } ? \text{ casualties } _ \ \text{WHERE ! done}, \\
\text{any } \# F_{\text{area}} \\
) \\
) ; \\
N_{\text{all}}; N = \text{VALUE}; \\
F_{\text{supply}} = \text{“reliefpackage”} \times N : 1; \\
\text{direct } \# N : 2; \\
F_{\text{supply}} ? \text{distribute}
\]

The needed number of packages will be delivered to all related destinations via the routes available, which may happen to be complex, taking into account the remaining usable road infrastructures and peculiarities of the terrain. This delivery may be performed by manned vehicles or convoys, or by advanced, unmanned, mobile ground systems. Any detailed delivery, including path-finding and avoidance of obstacles, can be effectively represented in WAVE-WP, with related examples discussed elsewhere. The general picture of parallel physical delivery to the needed destinations may look like the one shown in Figure 6.

In a similar way, it is easy to describe and execute much more complex scenarios of self-organization of affected regions, including massive evacuation, the formation of new emergency infrastructures, the fight against malicious postdisaster infrastructures (like looting), movement and spreading of communicating relief teams, cooperation with the self-organizing disaster area, and so on. As WAVE-WP technology allows us to set up a formal description of what was considered predominantly human territory before, the relief scenarios can be effectively performed by any combination of manned and unmanned units, with humans and robots sharing responsibility for key decisions in different space-time locations.

**CONCLUSIONS**

A ubiquitous, supervirus-like approach for emergency management and the protection of critical infrastructures and key resources has been proposed, based on the universal distributed processing and control technology WAVE-WP. Effectively operating in a different space-time continuum than the existing
systems or the forces that can harm them, it can dynamically set up unlimited power over the distributed worlds, being much less vulnerable to damages than other systems.

The compactness and simplicity of relief scenarios in the WAVE-WP language allow us to program them on the fly, reacting in a timely manner to rapidly changing situations. The technology can effectively convert scattered human and technical resources into highly operable distributed systems capable of organizing relief missions in other systems or autonomously solving complex self-survivability and self-recovery problems.

The technology can be easily implemented on any existing software or hardware platform, and the corresponding “social” module, as a software or hardware wave interpreter, can be readily installed in many mobile devices, most importantly mobile phones and handheld and/or laptop computers.

Large-scale use of advanced mobile robotics in future relief missions, and its integration with manned components under unified command and control, can also be drastically simplified by this flexible control model.

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ABSTRACT

Animals play a major role in people’s lives. Humans interact with animals in the food chain, train them for entertainment, and often accept them as integral members of their families. Recent disasters have shown the strength of the human-animal bond; for example, a number of people have refused to leave flooded homes without their pets.

Organizations that deal with animal control can play a vital role during disasters. This case study highlights the employment of emergency management principles at a community animal shelter. The study follows the project from initial assessments through the development of an initial emergency program. Key elements in this process include a realistic risk assessment, training, and available local support, as well as economic concerns. Although this does not display a finished product, it demonstrates the initial steps involved in creating an emergency management program for a small public service organization.

INTRODUCTION

An entire community is affected by a disaster. Public officials must gain assistance from other jurisdictions and ensure agencies are coordinating efforts. Emergency services, hospitals, and government employees of other agencies must carry out required actions to save lives and property. Media agencies try to gain information to disseminate to the community, business and industry owners attempt to limit damage and resume operations, and citizens deal with the emergency as they attempt to protect themselves and their property.

During the response phase of an emergency, another aspect of the community is impacted as well.

Animals, whether they be livestock or household pets, are a significant part of a community, not only due to their economic worth but in terms of families’ emotional ties to them and the impact these factors can have on response and recovery efforts. For these reasons, the role animals play during disasters must be considered in any emergency management plan.

Corvallis, Oregon, a city in the Willamette Valley and home to Oregon State University, has considered this. The city’s Heartland Humane Society (HHS) provides animal control as well as rescue and adoption services. This case study provides an overview of the process of establishing an emergency plan for HHS that will also provide additional support to the community.

The emergency plan for HHS was developed with a holistic approach to emergency management. The all-hazards model of addressing mitigation, preparedness, response, and recovery was employed. Using these aspects, an inside-out approach was taken so as to address the safety of animals, facility workers, visitors, and the community as a whole.

ANIMALS IN DISASTER

Animals can create a myriad of concerns for emergency planners. The Emergency Management Institute provides information regarding these issues. Zoonotic diseases are those which can be transferred from animals to humans. This transmission is most likely to occur when drinking water is contaminated with animal waste or remains. Examples of such diseases include but are not limited to:

- coliform bacteria;
- salmonella;
- campylobactor;
- giardia;
- ringworm;
- rabies;
- vector-borne diseases (e.g., equine encephalitis);
- Clostridium botulinum; and
- anthrax.

Animals, especially dogs, can pose a significant physical threat to the community following a disaster. Dogs that are normally docile may attack under the stressful conditions of a disaster. Large numbers of dogs may be roaming communities following disasters. These dogs may be stressed, injured, and carrying disease. This poses a threat to citizens as well as first responders. Animals that are killed during a disaster also pose a significant risk, since decaying remains create biological hazards, attract insects (flies) and rodents, and contaminate groundwater.1

In addition to public health concerns, the loss of pets can adversely impact the mental health of their owners and, in some cases, cause owners to place their own lives in jeopardy. For many people, pets are considered an integral part of the family unit. Property loss following a disaster, compounded by the loss of a pet, can place considerable stress on mental health. In some cases, concern for pets can lead to loss of life. Several cases are documented in which people have been killed while trying to rescue their pets or returning to unsafe areas in search of missing pets. Emergency planners must be aware of these concerns and the resources available to assist in mitigation of these hazards in response and recovery efforts following disasters. Local Humane Societies can play a vital role in this effort. In order for a facility to be effective, however, it must have internal policies and programs in place to support its own sustainability and its ability to cooperate with other agencies and organizations.

**HHS EMERGENCY PLAN**

**Hazard and vulnerability assessment**

The initial step in developing an emergency plan is determining the hazards calling for the greatest concern. For HHS, these hazards were categorized as regional, community, and facility hazards. Regional hazards were determined to be a major earthquake and flooding. Community hazards included flooding, hazardous chemical spills/releases, community evacuation, and power outages. Facility hazards were identified as 1) evacuation, 2) hazardous chemical spills/releases, 3) power outages and utility failures, 4) fire, 5) medical emergencies, 6) disturbed persons, 7) security issues, and 8) animal-borne disease outbreaks.

Regional hazards assessment included a review of possible natural and man-made disasters. The Pacific Northwest has a history of earthquakes—there was an earthquake in the Seattle area only a few years ago. Volcanic activity in the Pacific Northwest is also a known danger, but Corvallis lies out of major damage zones. The Willamette Valley has a history of flooding, as well. Man-made regional disaster hazards were listed as minimal. The closure of Trojan Nuclear Power Plant in the late 1990s removed concerns (however minimal) over nuclear hazards; a small test reactor operated by the Nuclear Engineering Department at Oregon State University was reviewed. Inherent safety designs, minimal core loading, security controls, and tracking efforts by the Nuclear Engineering Department and Oregon State Police can effectively mitigate a major threat. No likely terrorist targets exist in the immediate region, and there are no significant federal buildings or facilities in the area; the next major city, Portland, is approximately 85 miles away.

Community hazards assessment presented more worries. As with the general region, Corvallis itself is susceptible to flooding. HHS lies within the 100-year flood plain. Due to its vulnerability, plans needed to be developed that addressed not only community flooding but possible evacuation and loss of utilities at the HHS facility.

Rail lines from the coast, Eugene, and Portland pass through Corvallis. These lines, passing within
50 yards of the facility, created hazard concerns surrounding train accidents, particularly hazardous material spills or leaks. In the event of flooding or a hazardous chemical release, portions of the community, as well as of the facility, might require evacuation.

Other community hazards were also assessed. These included the loss of power, electricity, and/or water services.

In addition to emergencies taking place in the region or community, the facility also needed plans for internal emergencies. These plans covered several hazards, including those mentioned previously, such as evacuation and utility failure. Fires, medical emergencies, and disturbed persons on the facility grounds were also assessed as hazards.

Several of the hazards mentioned would require evacuation of the facility. Distinctions were made as to whether the evacuation required would be controlled or uncontrolled. These evacuation plans addressed both animal and human safety. In addition to a chemical spill/HAZMAT accident outside the facility, chemicals held on site were also evaluated and incorporated into the planning. Loss of utilities hazards could result in issues regarding drinking water, heat, and light. In addition to these hazards, a walk-through of the facility and discussion with the director highlighted other hazards, as well.

Fire hazard evaluation brought up concerns. The facility used a large industrial dryer for all linens at the facility. Soiled and clean linens are both stored next to this dryer. In the event of a dryer fire, these linen items would provide fuel for the fire. Additionally, no remote shut-off other than the breaker box was installed. If a fire were to occur, toxic gas and smoke could rapidly incapacitate animals and workers alike. Evacuation could be hampered by poor emergency lighting and the lack of additional evacuation markings (such as fluorescent tape).

Medical emergencies can occur at any time. HHS deals with animal control and receives strays on a regular basis. This could pose a hazard to staff, volunteers, and visitors. Plans were developed to improve first aid capabilities and coordination with emergency service personnel.

Finally, the facility director mentioned concerns over disturbed persons. She had read of attacks on Humane Societies and shelters. An example of a basis for such an attack could be a disgruntled pet owner who has recently had animals removed from his or her home by authorities. The facility had no plan to covertly warn staff and volunteers of such an event.

**Mitigation and preparedness efforts**

Once hazards were identified, plans were made to mitigate these hazards and develop response plans. These plans were based on hazards, vulnerabilities, possibilities of community support, and financial issues. Each hazard, or its potential outcome(s), was addressed, and mitigation suggestions were provided.

**Flooding.** There are both human and animal safety concerns with flooding. Human factors concern visitors, volunteers, staff, and the community as a whole. Information from local government and weather services was used to provide criteria for closing the facility to nonemergency personnel. This would prevent visitors from being endangered and allow staff and emergency volunteers to direct their efforts toward the removal of animals if facility evacuation were required. Additionally, volunteers could also take part in forming animal rescue teams to assist EMS personnel and coordinate with other animal care organizations.

Flooding may result in either an influx of animals to the facility or the evacuation of the facility, depending on the location of the flooding. For the case of facility evacuation, several factors were evaluated. First was the physical evacuation of the facility, which will be covered as its own plan. Second, the temporary housing and fostering of animals was addressed. Foster care homes were identified. Of concern, however, was the location of these homes. Recommendations were made for focusing on homes that lay outside the flood plain. Cross-referencing of volunteer addresses with GIS overlays of flood plain data provides an effective means of accomplishing this task. A simple tracking program was recommended in order to track foster homes and animals. Food and medicines are required for these animals, and recommendations were made to provide each foster home.
with one week’s worth of food and necessary medicines, an amount that the facility keeps on hand. Agreement contracts (memorandums) were recommended as well. These contracts could be discussed with Oregon State Veterinary School, local kennels, and transportation companies. Contracts would allow for mutual assistance in the housing of animals following mass disasters or individual facility incidents.

On-site animal safety was addressed. A good record keeping and animal tracking program was already in place, which allowed for more efficient staging of animals for evacuation. In cases where animals could not be evacuated, plans were proposed to use the upper floor, currently divided into office spaces, as a location for animals, supplies, and equipment. Another flood concern was the facility’s Material Safety Data Sheet (MSDS) records. These were provided to local emergency services.

**Hazardous material spill/release.** This event would most likely result in an immediate evacuation of the facility. Recommendations included coordination with the public health department in planning for possible mass animal casualties and the resultant need for disposal of remains.

**Utility failures.** Utility failures would result in closing the facility to the public. Animal safety issues would still exist, however, such as the provision for environmental control and fresh water. Foster care and the mutual agreements previously mentioned would be enacted for those animals most susceptible to harm or illness. Alternate power supplies for heaters and fans were recommended, but this was not financially feasible; fortunately, the Pacific Northwest is not prone to extreme temperature conditions. Also recommended was a calculation of minimum daily water usage. Once calculated, 72 hours’ supply was recommended to be stored on site.

**Fires.** Fire posed a threat to humans and animals alike. Major concerns surrounding fire hazards were the dryer, smoke and toxic gas dangers, and evacuation problems. The industrial dryer posed the most major fire risk to the facility. Recommendations for mitigation included installation of a localized sprinkler system in the vicinity of the dryer and installation of a remote shut-off switch.

Several features made the threat of toxic gas and/or smoke a serious concern. The open structure (no doors in animal areas or laundry) could promote the spread of smoke and gases, while the linens and the paint on the brick walls could be sources of toxic gases. Mitigation recommendations included the purchase of smoke blankets to be stored in key locations to limit the spread of smoke and toxic gases.

Evacuation during a fire is also an issue. To address human concerns, an all-hazards evacuation plan was created. One mitigation factor was recommended specifically for evacuation during a fire, however: the use of fluorescent reflective tape to indicate exit routes.

Even in the case of the immediate evacuation of humans, animal safety is still a concern. At HHS, each kennel has a door to an individual outside run. Although simply allowing the animals to move to an outside run may not be a 100-percent effective answer, it would lessen the impact of toxic gases and heat. With this in mind, it was recommended that a mechanism be created to allow for remote operation of all doors. Other animals, such as rodents and cats, do not have runs. Unfortunately, no recommendations other than removal by staff were provided for the evacuation of these animals. This places the staff in danger, while simply opening their cages could prove dangerous to emergency services personnel and could potentially lead to a public health and/or liability issue.

Another mitigation option was limited firefighting training for select staff. Tualatin Valley Fire and Rescue (TVFR), near Portland, provides courses in basic fire chemistry and extinguisher operation, as well as first aid. This training would not be conducted with the idea of having staff combating major fires; the goal would be to enable the early extinguishing of fires and to gain a better understanding of the dangers associated with fire.

**Medical emergencies.** Recommendations provided for medical emergencies were ensuring staff personnel were first aid and CPR qualified (both the American Red Cross and Oregon State University offer courses) and that an automatic electric defibrillator (AED) be purchased and kept on site.
Evacuation. Many incidents could lead to facility-wide evacuation. Evacuations were categorized into two types, controlled and uncontrolled. Controlled evacuation would be conducted when adequate warning was provided. Uncontrolled evacuations would take place when immediate hazards to life occurred unexpectedly. Key aspects of evacuation plans involved being able to account for staff, volunteers, visitors, animals, and records.

**Response/recovery**

Templates for emergency action (EA) plans were created. These plans were presented to cover hazards mentioned in the previous sections. They are meant to be contained in a binder and tabbed for quick reference and study by staff and volunteers. The “forms” mentioned in EAs are administrative forms. These plans also incorporate supplemental steps that will aid in recovery operations.

**Maintenance of programs**

In order for the plan to be effective, it is necessary to frequently review plans, agreements, and hazards. Recommendations for maintenance included becoming more involved in the community’s emergency management framework. Drills were also recommended. Facility drills incorporated medical emergencies, disturbed persons, and evacuation scenarios. Cooperation and coordination with community EMS organizations was also proposed, to improve working relationships and to ask for incorporation of HHS in established community-wide scenarios.

**CONCLUSION**

These efforts did not yield a finished product. As with all emergency plans, those discussed here will continue to grow and change. This is the result of several factors, including community change, the level of public and government support, new hazards, and technology, to name a few. The goal of the emergency plan for HHS was to establish a baseline of awareness and planning, so that HHS could sustain itself and support the community following a disaster.

LTJg Christopher Dorsey, USN, Emergency and Disaster Medicine, American Military University, Goose Creek, South Carolina.

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The delivery of essential humanitarian services after the tsunami in Aceh, Indonesia

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Anita Shankar, PhD
Bahie Rassekh
Courtland Robinson, PhD
Gilbert Burnham, MD, PhD

ABSTRACT
A survey of 478 Indonesian households displaced by the tsunami was conducted in two districts in Aceh Province in late March and early April 2005. Essential services (shelter, water, food, health services) were provided to approximately half of internally displaced persons (IDPs) within seven days of the tsunami, and this figure rose to around 70 percent within two weeks of the tsunami. Essential services reached significantly greater proportions of the tsunami-displaced population in Aceh Besar than Banda Aceh at both two and four weeks post-tsunami. The majority of IDPs reported satisfaction with essential services other than shelter in the first two weeks post-tsunami, and satisfaction with essential services other than food increased by four weeks after the tsunami. Of IDP households surveyed, the vast majority reported that there were services they would have liked to receive but did not, both in the month following the tsunami and at the time of the survey.

Key words: tsunami, Indonesia, humanitarian assistance, beneficiary, satisfaction

INTRODUCTION
The tsunami on December 26, 2004, devastated coastal areas in the Indian Ocean region and resulted in massive mortality and displacement. A natural disaster unprecedented in modern times, the tsunami received significant media attention and an enormous international response in terms of both financial aid and humanitarian assistance. An estimated 300 international nongovernmental organizations (NGOs) responded to the tsunami, along with numerous UN agencies and foreign military contingents. Governments have pledged over 5.8 billion dollars for recovery efforts, and estimates of private contributions to NGOs range from five to seven billion.1

Indonesia’s Aceh Province was most affected by the tsunami, due both to its proximity to the earthquake epicenter and its large coastal population. The Indonesian government’s disaster relief coordinating agency, BAKORNAS, was reporting a total of 128,645 dead in Aceh, 37,063 missing, and 532,898 displaced at the end of March 2005.2 Humanitarian assistance has focused on Aceh, where an estimated 2,000 foreigners and thousands of Indonesians arrived to provide relief.1 As the situation moved from emergency assistance to reconstruction, the international presence in Aceh has remained, and both the UN and NGOs are playing a major role in rebuilding.

The humanitarian response to the tsunami is especially complex in Aceh due to the numbers of affected people, the scale of destruction, and protracted conflict in the region. From 1998 to 2004, an estimated 200,000 residents of Aceh were displaced by fighting between government soldiers and the Free Aceh Movement (GAM), with about 14,000 displaced to other locations within Aceh and the rest moving to different provinces.3 As a result of civil conflict, Aceh was largely closed to the international community before the tsunami, and international organizations had a minimal presence; estimated NGO expenditures...
in Aceh totaled two million dollars in 2002,1 and at the time of the tsunami few international staff were present. In addition to ongoing conflict and minimal NGO capacity, other factors complicated the response, including loss and traumatization of staff, destruction of records and equipment, and communications difficulties.

The unprecedented international response to the tsunami will certainly be the subject of many evaluations; however, involvement of beneficiary populations in impact evaluations is rare in the humanitarian sector.4 As one author notes, “humanitarian agencies are often poor at consulting or involving members of the affected population and beneficiaries of their assistance. Consequently, there can often be considerable discrepancy between the agency’s perception of its performance and the perceptions of the affected population and beneficiaries.”5

In order to better understand the humanitarian response immediately following the tsunami from the beneficiaries’ perspective, we conducted surveys in the Banda Aceh and Aceh Besar districts (Figure 1). The aims of the surveys were to 1) document selected aspects of tsunami impact and the humanitarian response, and 2) learn about perceptions of relief efforts and satisfaction with the immediate response among tsunami-affected populations.

**METHODS**

A survey of the tsunami-displaced populations in Banda Aceh and Aceh Besar was conducted between late March and early April 2005. An estimated 184,300 to 243,100 internally displaced persons (IDPs) were residing in the two districts at the time of survey planning.6 The survey employed a 20 x 24 cluster sample design with probability proportional to size sampling. The sample was based on a list of all known IDP locations in Banda Aceh and Aceh Besar that was compiled by the Humanitarian Information Center (HIC).6 The list included IDP sites with estimated populations and geographic coordinates of location. The sampling frame was developed by aggregating known IDP locations (n = 386) with the same geographic coordinates into IDP sites (n = 129) and then drawing sample clusters, with probability proportional to size of the IDP populations within the sites. Once an IDP site was selected, each location within the site was included in the survey. Upon implementation of the survey, it was observed that the actual IDP populations were significantly different from the official estimates of IDP populations. In cases where displaced populations could not be identified in the selected IDP locations, the closest known IDP populations or settlements were sampled; in order to maintain appropriate geographic distribution, sampling was always conducted in the originally selected subdistrict.

The sampling interval was determined based on a total reference population of 213,700 IDPs (67,400 residing in Banda Aceh and 146,300 residing in Aceh Besar). Of the 20 resulting clusters, there were seven clusters in six subdistricts in Banda Aceh and 13 clusters in nine subdistricts of Aceh Besar. Twenty-four households were sampled in each cluster. IDPs were residing in IDP camps (typically temporary tent communities), barracks (semipermanent wooden structures), or in homes within host communities. For households residing in IDP camps or barracks, within-cluster sampling was conducted by estimating the
total number of households in an IDP site and then selecting every $n^{th}$ household. Self-settled IDP households that were residing in host communities were identified by randomly selecting a direction from a central point within the community (usually the mosque), proceeding to the nearest house, and inquiring as to whether any IDPs were being hosted. Each adjacent house was visited until the cluster was completed. Informed verbal consent was obtained from each respondent before interviews were conducted.

IDP household information was collected using questionnaire-based interviews. The questionnaire focused on household composition, current status of household members, living conditions, and the experiences of the household immediately following the tsunami. The questionnaire was developed in English and translated to Bahasa. Back-translation and field testing were performed with the support of Mercy Corps Indonesia. Interviewers were either university students or Mercy Corps employees. All interviewers received two days of training. Data analysis was performed using STATA Version 8 (Stata Corp, College Station, TX) and SPSS Version 12.0 (SPSS Inc., Chicago, IL). Permission to conduct the survey was received from local authorities in Aceh, including the Ministry of Foreign Affairs and the police. The study was approved by the Johns Hopkins Bloomberg School of Public Health Committee on Human Research.

**RESULTS**

A total of 480 interviews were conducted; two interviews were dropped because of concerns with the quality of the responses. Of households sampled, 35 percent were residing in Banda Aceh and 65 percent were residing in Aceh Besar. Tsunami-displaced households included in the survey were residing in IDP camps (46 percent), temporary living centers or barracks (34 percent), and host communities (20 percent). Average distance of displacement was 20 km (95 percent CI: 17 to 23) from the pre-tsunami residence, and 88 percent (95 percent CI: 85 to 91) of households reported being displaced outside their pre-tsunami community. Tsunami-displaced households reported living in an average of 1.9 places (95 percent CI: 1.8 to 2.0) between the tsunami and the time of the survey, with an average of 56 days (95 percent CI: 54 to 59) residing at their current residence. The majority of households (71 percent) were displaced within the same district; 42 percent of Banda Aceh residents were displaced to Aceh Besar.
and 9 percent of Aceh Besar residents were displaced to Banda Aceh.

**Time to provision of essential services**

Essential services (shelter, water, food, health services) were provided to approximately half of IDPs within seven days of the tsunami and to the majority of IDPs within two weeks of the tsunami (Figure 2). Approximately 50 percent of IDPs had essential services within the first week (shelter: 55 percent [95 percent CI: 51 to 60]; drinking water: 56 percent [95 percent CI: 51 to 50]; water for hygiene purposes: 57 percent [95 percent CI: 53 to 62]; food: 51 percent [95 CI: 47 to 56]); and health services: 49 percent [95 percent CI: 45 to 54]). This figure rose to around 70 percent by the end of the second week post-tsunami (shelter: 72 percent [95 percent CI: 68 to 76]; drinking water: 74 percent [95 percent CI: 69 to 78]; water for hygiene purposes: 71 percent [95 percent CI: 66 to 75]; food: 75 percent [95 percent CI: 71 to 78]; and health services: 68 percent [95 percent CI: 63 to 72]). Essential services were available to the vast majority of IDPs within one month of the tsunami and were reported as follows: shelter: 93 percent (95 percent CI: 91 to 95); drinking water: 87 percent (95 percent CI: 84 to 90); water for hygiene purposes: 85 percent (95 percent CI: 81 to 88); food: 90 percent (95 percent CI: 88 to 93); and health services: 87 percent (95 percent CI: 83 to 90).

Essential services reached greater proportions of the tsunami-displaced population in Aceh Besar than in Banda Aceh at both two and four weeks post-tsunami. Households in Aceh Besar were significantly more likely to have received shelter, drinking water, food, and health services at two weeks and four weeks post-tsunami than those in Banda Aceh (Table 1).

Additional services (provision of cooking materials, utensils, clothes, and household items) were provided at a slower rate than essential services. Cooking materials and utensils were available to 34 percent (95 percent CI: 30 to 39) of the tsunami-displaced households by the end of the second week and 65 percent (95 percent CI: 60 to 69) of respondents at one month post-tsunami. Clothes and household items were supplied at a slightly higher rate, with 50 percent (95 percent CI: 45 to 55) of households reporting receipt of items within the first two weeks and 73 percent (95 percent CI: 68 to 77) within the first month.

Access to prayer areas and burial services were determined to be important measures by many of the Indonesians participating in the survey. However, perhaps because of the sensitive nature of the questions, response rates were significantly lower than for other measures (82 percent [n = 390] for prayer areas and 83 percent [n = 396] for burial services). Of

### Table 1. Receipt of essential services by district

<table>
<thead>
<tr>
<th></th>
<th>Two weeks post-tsunami</th>
<th>Four weeks post-tsunami</th>
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<tr>
<td></td>
<td>Banda Aceh (percent)</td>
<td>Aceh Besar (percent)</td>
</tr>
<tr>
<td>Shelter</td>
<td>62</td>
<td>76</td>
</tr>
<tr>
<td>Drinking water</td>
<td>65</td>
<td>78</td>
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<tr>
<td>Water for hygiene</td>
<td>68</td>
<td>72</td>
</tr>
<tr>
<td>Food</td>
<td>62</td>
<td>81</td>
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<tr>
<td>Health services</td>
<td>55</td>
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households surveyed, 54 percent (95 percent CI: 49 to 59) reported access to prayer areas in the first two weeks, and this number increased to 75 percent (95 percent CI: 70 to 79) by the end of the fourth week. Receipt of burial services was reported by 38 percent (95 percent CI: 33 to 43) of households in the first week, and this figure rose to 44 percent (95 percent CI: 38 to 49) by the end of the fourth week.

Satisfaction with services
Tsunami-displaced populations were asked about their satisfaction with essential services in the month following the tsunami and at the time of the survey (Table 2). Of essential services provided in the month post-tsunami, satisfaction with health services and provision of food ranked the highest, with 77 percent (95 percent CI: 73 to 81) and 71 percent (95 percent CI: 67 to 75), respectively, of IDPs reporting that services were provided adequately. Approximately two-thirds of displaced households were satisfied with provision of water for hygiene purposes (63 percent, 95 percent CI: 58 to 67) and drinking water (66 percent, 95 percent CI: 62 to 70). IDPs were least satisfied with provision of shelter immediately following the tsunami, with only 43 percent (95 percent CI: 39 to 48) reporting access to shelter and 40 percent (95 percent CI: 35 to 44) indicating that, while shelter was provided, it was not adequate.

Satisfaction with essential services, with the exception of food, increased between the first month post-tsunami and the time of the survey. For essential services other than food, approximately 75 percent of tsunami-displaced households reported being satisfied with current services. A decrease in satisfaction with food aid was observed—current satisfaction was reported at 63 percent (95 percent CI: 58 to 67) as compared to 71 percent (95 percent CI: 67 to 75) in the month following the tsunami; however, this was not statistically significant.

Unmet needs
Of tsunami-displaced households surveyed, 84 percent (95 percent CI: 80 to 87) reported that in the first month after the tsunami there were services they would have liked to receive but did not. When asked about current services, 76 percent (95 percent CI: 72 to 80) of households reported they were not receiving all of the services that were needed. The most commonly reported unmet needs during the first month after the tsunami included household items, especially beds and cooking supplies (31 percent); better quality food (21 percent); clothes (19 percent); and financial assistance (19 percent). Additional reported needs included access to schools, electricity/fuel, information, and adequate health services.
Three months after the tsunami, unmet needs shifted somewhat, with the need for financial assistance in the form of business- and income-generating opportunities to support livelihoods being reported by 37 percent of respondents, followed by the needs for household items (23 percent), clothes (10 percent), and access to schools (10 percent). Relocation back to one’s own village was desirable for most respondents; however, the lack of housing prevented most families from returning (69 percent). Only 6 percent of respondents reported trauma as being a primary factor for not returning to their home villages.

Living conditions

Living conditions of IDPs at the time of the survey were assessed according to a variety of measures. Average per capita living space among IDPs was 28.5 m²/household and 4.0 m²/individual (calculated only for households that reported living space was unshared; for households where a host-family situation was reported, shared living space was assumed). Average household water consumption was reported at 52 L/day (95 percent CI: 47 to 57) and mean per capita consumption was 10 L/day (95 percent CI: 9 to 11). The majority of households reported adequate access to clean toilets (67 percent) and bathing facilities (73 percent), as well as designated locations to discard trash (68 percent). Of all households, 73 percent (95 percent CI: 69 to 77) reported having access to water every day, and 27 percent (95 percent CI: 23 to 31) of households indicated they used at least the minimum Sphere standard of 15 L/person/day. As compared to households residing in IDP camps and host communities, households in the barracks reported significantly greater water consumption and were significantly more likely to meet or exceed the Sphere standard (p < 0.001 for both comparisons). Adequate access to healthcare was reported by 81 percent of households in barracks, 80 percent of households in IDP camps, and 60 percent of households in host communities (p < 0.001).

Discussion

The majority of tsunami-displaced populations were satisfied with essential services they received; however, they continue to have unmet needs. While the presence of foreign humanitarian organizations is clearly supported, several concerns about relief efforts have been documented among local NGOs; specifically, they do not feel sufficiently consulted in the response, and some fear that if international organizations follow reconstruction plans of a distrusted government and/or military that have not gone through a community vetting process, Acehnese aspirations of greater freedom and autonomy could be undermined.

Essential services (shelter, water, food, health services) were provided to approximately half of IDPs within seven days of the tsunami, and this figure rose to around 70 percent within two weeks of the tsunami. When compared to the responses in India and Sri Lanka, relief efforts in Aceh may have been slower. One analysis suggested that in India and Sri Lanka, 90 percent and 78 percent, respectively, of tsunami-displaced households received food within the first 48 hours. In comparison, only 51 percent and 75 percent of tsunami-displaced populations in Aceh reported having received food at one and two weeks post-tsunami, respectively. Information for comparison on other measures was not available from the report on India and Sri Lanka; however, conclusions highlighted the need to include affected populations in assessments of aid effectiveness.

In the two weeks following the tsunami in Aceh, the humanitarian response was primarily marshaled by communities and foreign militaries; international organizations, including the UN and various NGOs, took time to arrive in Aceh and establish working offices. Most rescue and immediate relief efforts were provided by community members and local volunteers and were followed by assistance from military forces that arrived in the days following the tsunami. Military forces have been identified as critical partners in the response to emergencies, and rapid deployment of the Indonesian and foreign militaries was extremely valuable, particularly in areas where transportation infrastructure was destroyed.

While the time to essential service provision in Aceh may have been greater than in India and Sri Lanka, greater infrastructure damage and the larger displaced...
population were clearly factors contributing to delays in relief. Other factors that may have influenced the comparatively slow response were the greater magnitude of devastation that occurred in Aceh, including significant infrastructure damage; that international organizations had essentially no personnel and/or infrastructure in Aceh; and that coordination was reportedly mediocre.\textsuperscript{1,10}

The majority of IDPs reported satisfaction with essential services other than shelter in the first two weeks post-tsunami, and satisfaction with essential services other than food increased by four weeks after the tsunami. Of IDP households surveyed, the vast majority reported there were services they would have liked to receive but did not, both in the month following the tsunami and at the time of the survey. Needs in the emergency phase immediately after the tsunami were overwhelming, and immediate provision of services on a large scale is challenging, making these results not unexpected.

In evaluations and impact analysis of humanitarian action, there are very few examples of participatory approaches, reflecting a dearth of consultation and participation of beneficiary populations in the context of humanitarian response.\textsuperscript{11,12} Many organizations are working in Aceh and have programs that focus on areas identified as unmet needs by IDPs, such as housing and livelihoods. The large size of the displaced population requiring services, infrastructure damage, and concerns over politics and conflict are all factors that make provision of adequate services challenging. However, the fact that most households reported they were not receiving all of the services they would have liked potentially indicates a need for enhanced communication between providers of humanitarian assistance and beneficiary populations.

Key limitations of the study included limited information on the IDP populations in Banda Aceh and Aceh Besar and failure to ascertain types of providers of services in the month following the tsunami. Adequate knowledge of the location of displaced populations is often difficult to obtain in an emergency context. Information used for survey planning was compiled by the HIC, which provides a coordinating function in many emergencies. At the time of the survey, the HIC list was considered the best source of information on IDP location, and the sample was planned accordingly. However, the list proved to be significantly different than the field reality, largely because of the high mobility of IDPs. Because sampling was conducted based on the HIC list, it is possible that findings may not be representative of the actual IDP population if, as is likely, the distribution of IDPs on the HIC list was significantly different from that of the actual IDP population.

While time to service provision is important, the survey ideally would have identified the type of provider. Immediately after the tsunami, local communities and military units (both Indonesian and foreign) were praised for providing rapid services to the tsunami-affected population. If service provision by organization type had been collected, it could have served to document organizational roles in the tsunami response and provide insight into service satisfaction by provider type. For example, in India, half of IDPs surveyed indicated receiving assistance from NGOs and community organizations, while 12 percent received military assistance; in Sri Lanka, assistance was primarily attributed to the armed forces (39 percent) and international organizations (37 percent).\textsuperscript{8}

Living conditions of IDPs were reasonably good at the time of the survey. While the Indonesian government originally faced criticism for the construction of barracks, the facilities provided a reasonable standard of living and, according to anecdotal impressions, were preferred to tents found in the IDP camps for a variety of reasons, including better quality of housing and security and improved access to basic services such as water and sanitation. Clearly, access to water was greatest in the barracks, and all barracks visited during the course of the survey appeared to have substantially more latrines than did IDP camps. That IDPs in camps and barracks reported greater services and access to healthcare is not unexpected, since these areas were targeted in the relief effort.

**CONCLUSION**

Provision of a timely and equitable humanitarian
response is challenging in nearly all disasters and complex emergencies. In post-tsunami Aceh, provision of essential services was relatively slow, with approximately half of IDPs reporting access to essential services at one week post-tsunami, though this figure increased to around 70 percent by two weeks post-tsunami. Local communities and militaries were the primary providers of assistance immediately following the tsunami. Improved communication, coordination, and division of labor among responding organizations may have resulted in a more efficient response. Most IDPs reported being satisfied with provided services; however, the majority indicated that some needs were persistently unmet. That households reported not receiving all of the services they would have liked indicates a need for enhanced communication between providers of humanitarian assistance and target beneficiaries.

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Many of today’s perspectives are limited because they are based on antiquated paradigms. Preparedness (the state of readiness to perform and support) is an operational goal for realistic solutions. Planning is a critical element for creating preparedness. Effective emergency management incorporates the planning process from the outset. This allows for consideration of the spectrum of possibilities and for adjusting actions as conditions change.

The planning process has universal applications, and its utilization clearly has an impact on the rate of successful outcomes. It is helpful to examine challenges faced by and responses from those involved in emergency management and disaster preparedness, including government officials. It is important to explore the forces that support solutions and those that impede them. This analysis will offer such a focus.

Planning is a strategic and dynamic process that goes beyond the sole development of a plan. This process is strategic because it has a defined focus, is intentional, applies the best case, and utilizes best-fit analysis. Planning incorporates “connecting the dots” to support decision making, and it is dynamic because it is flexible and capable of adaptation. This process requires all assumptions to be constantly examined and reexamined. Prevention should be a primary goal of the planning process.

Prevention is the act of impeding a situation from happening through employing advanced planning. It incorporates anticipatory counteraction, thereby effectively averting, neutralizing, or disposing of a circumstance before it can occur. Prevention equals survival and security, and it is the most cost-effective strategy available. Included in this is the propensity for applying prevention-based strategies and prevention-based problem solving that lead to the thwarting of negative acts and support positive outcomes.

Integral to prevention is a system of actions with the primary role of guiding entities to heightened involvement in the processes that influence stability,
security, and safety. These processes include: applying advanced planning techniques, technologies, and their applications; gathering real-time information and integrating it to determine the existence of trends for analysis, decision making, and action; establishing effective communication; establishing education and training at all levels; and managing resources. For example, information sharing and effective communication among government agencies involved at the federal, state, and local levels, or throughout a given sector, is mandatory.

The planning process has universal applications, from the military to industry, from the basic issues of daily life to major political, social, economic, global, and environmental issues that will impact the future. The absence of planning in a number of these areas has been glaring. These deficiencies have been repeatedly manifest over the years and visible in all sectors.

Take, for example, the Northeast and Midwest United States’ massive power grid failure during the summer of 2003, now but a distant memory for most Americans. Little has been done since to rectify the problems that led to it, and an ongoing planning process is yet to be instituted.

A recent example of an absence of planning relates to the American automobile industry, which has continued to depend on previously popular and profitable sport utility vehicles despite their energy drawbacks. September 2005 sales figures show that oversized sport utility vehicle sales dropped 43 percent in a year. By comparison, sales of Toyota’s hybrid Prius increased 90 percent. The Toyota planning process to produce a more fuel-efficient vehicle that could succeed in a competitive market was first started in 1994, and their first hybrid vehicle was available in 1997. The application of a planning process stimulates decision makers to at least consider issues framed in future terms.

The ramifications of globalization, free trade, and offshore outsourcing are major concerns. The recent Delphi (an auto parts manufacturer, formerly a division of General Motors) bankruptcy may trigger the automobile industry in the United States to push strongly for lower employee wages. Such a move to limit wages and benefits is being justified by citing “global competition” and the problems in providing healthcare insurance for employees and retirees. Potentially, this direction could make it nearly impossible for working Americans to be part of the middle class.

Planning to deal with the progressive decline of the American working middle class over the past generation has not been a priority for anyone. A viable middle class has served as the backbone for the economic stability of the United States. The continued absence of planning in this area can result in adverse impacts for America’s future.

“WAKE-UP CALL”

The 2005 Gulf Coast disaster is now being touted as the “wake-up call” for America to recognize its lack of preparedness in handling natural disasters and even terrorism threats and acts. The most recent action being requested by the Department of Homeland Security (DHS) and the present administration is the development of “up-to-date plans for responding.” This request is not only insufficient but also “a day late and a dollar short.” This is by no means America’s first “wake-up call,” nor, probably, will it be its last, based on the post-traumatic events and warnings of the past.

How quickly we have forgotten the first New York World Trade Center bombing, the American Embassy bombings in Africa, the USS Cole bombing in Yemen, the Bali terrorist bombing in Indonesia, the Madrid train bombing, the London subway bombing. These and others, “wake-up calls” all, have been rapidly and easily put out of mind. America seems to have missed the opportunity to prioritize preparedness offered by the past four years. How many more “wake-up calls” will it take for the powers that be and the American people to get the message?

Four years ago, the September 11, 2001, terrorist strikes in New York City and at the Pentagon and the attempt that ended in a field in Pennsylvania were America’s “wake-up call,” and they were followed by the development of detailed state, county, and local plans, and the expenditure and distribution of billions of dollars. The net result was the shelving of many of these plans to collect dust. No guidelines or standards were established by the federal authorities for the development and implementation of these plans. Expectations for an ongoing planning process were not even hinted at,
much less promulgated. No standards or guidelines were applied to the distribution of the American people’s tax dollars. No road map came with the edict for state and local entities to implement a system to protect America against terrorism while simultaneously performing their responsibilities in natural and other disasters (train wrecks, chemical spills). The states and communities were on their own, and this continues to be the case.

THE STATUS OF LOCAL AND STATE PLANNING AND PREPAREDNESS

Disaster planning and preparedness are essential for the long-term survival of American society. In order to accomplish this essential outcome, a state of readiness to perform and support the prescribed course of action must exist along with all of the requisite planning, training, training reinforcement, education, systems, and identified/available resources. This defines the concept of preparedness.

Since 9/11, Texas has spent more than $1.4 billion on safety and security. A number of local disasters have demonstrated that Texas counties and communities remain vulnerable and inadequately prepared. Spending must be done in conjunction with adequate planning. Monitoring, coordination, and accountability have been insufficient. Purchased emergency equipment is found stored in its original packaging, never having been opened, checked, maintained, or used in training; therefore, we can assume it is not readily available to be used in an emergency. In an attempt to bring independent local efforts together in purchasing new equipment, the state now requires that the items to be purchased qualify as “regional.” Nobody knows what that means, so regions are once again on their own.

Since 2001 the federal government has distributed $1.5 billion to the states for radios and related equipment. Texas has spent $41 million on communications requests, yet first responders from different departments (firefighters and police) can not communicate by radio during an emergency. The same problems occurred during Hurricane Katrina as on 9/11. The solution for this problem is probably years away. The state deadline for communities to fix the communications problem is January 2007. Once again, there is a shift of responsibility from state to local officials. Joint training of various departments and entities in full-scale exercises has yet to occur. Such training would allow for uncovering potential flaws and obstacles to be avoided in an actual emergency.

Texas is at high risk for a disaster involving chemical plants and/or chemical spills of toxic and deadly materials during transport by tanker trucks and railroad tanker cars. Such a disaster, caused by an accident or even a deliberate terrorist act, could result in mass deaths and disability. Texas has more chemical plants than any other state, and they could endanger large numbers of people through the release of deadly chemicals. Toxic substances pass through densely populated urban areas across the United States every day. Domestic security rhetoric is common. The ongoing planning for such disasters, the adequate training for first responders, the necessary equipment to support a major coordinated effort among multiple agencies and communities that would be required, and the funding for reasonable safety measures to prevent such disasters are yet to be obtained or implemented in any significant way.

Emergency preparedness and disaster management professionals have been patting themselves on the back for their “success and preparedness” in the Hurricane Rita experience after the problems experienced with Hurricane Katrina. In reality, the Hurricane Rita experience highlighted communication issues and a widespread absence of community education as major factors contributing to the evacuation fiasco. The same systemic failures were glaringly demonstrated, although they could have been addressed and minimized in the long run had ongoing planning been utilized from the beginning. A plan existed, but an apt description of its shortcomings is expressed by the observation, “What good is a plan if you do not tell anyone (the community involved) about it?”

Despite recent state mandates for regional plans that include deadlines for specific deficiencies, regional plans do not presently exist. It will be at least another year before a computerized inventory for a region can be available. A state-wide equipment list for large items has been available, but everyone was not required to participate until April 2006. An extension of this deadline has been requested.
Local, county, and state officials have announced that they are “breaking down many of the old barriers to cooperation.” This is the same refrain that has been propagated for the past four years since 9/11. How long will it take to accomplish this required element needed to support successful outcomes? There are existing problems in coordinating plans among emergency responders in the same county; there are existing problems in the efforts to prepare for the next disaster while facing inadequate planning and deficient communication between different departments that are part of the same government entity. These situations speak strongly to the long and difficult uphill road ahead, until cooperation is a reality.

**SOLUTIONS**

The Bush administration, post-9/11, pushed for the American people to resume “life as usual” by returning to activities as though nothing had changed. This was unrealistic and short-sighted and obstructed the real need for Americans to join together in a planning process and to commit to necessary sacrifices to create preparedness for the future work. The administration’s position contributed to the attitude that government knew best, and it was prepared to execute a “war on terrorism” that could be won solely with dollars and the military. America’s protective two-ocean barrier of the past was shattered by 9/11 and has been replaced by an illusionary vision of the United States as being protected by its status as the invincible “remaining superpower” that can act unilaterally and indulge in nation building with impunity.

Present public policies that favor special interests are severe roadblocks to solving the major problems facing this nation. The solution envisioned by the present administration is to maintain the status quo through allocating federal funds to support recovery while proposing and implementing very expensive ventures including: a manned flight to Mars and a return to the moon; continuing work on the Star Wars ballistic missile defense system; social security privatization; expanding and making permanent the recent tax cuts; eliminating the inheritance tax; and funding earmarked projects, or “pork,” attached to legislation like the transportation bill of 2005 and many others. The cost of the war in Iraq, estimated at $5 billion per month, has risen to almost $10 billion per month. The costs for rebuilding the Gulf Coast after Hurricane Katrina, at between $250 to $300 billion, raise serious questions about fiscal soundness. The cost for all of this is expected to be handled by budget cuts to programs that presently benefit the poor, the middle class, education, and healthcare for the most vulnerable in the United States. The remaining shortfall is to be funded through increased federal borrowing from foreign countries like China, and the rest will be added to budget deficits.

America is facing record and increasing budget deficits, as well as monumental trade deficits. The number of Americans living in poverty is now 37 million, and this has increased by 1.1 million over the past 18 months; 45.8 million Americans are without health insurance, also an increase. We are plagued by increasing offshore outsourcing by American corporations and businesses, corporate corruption, and high gasoline and natural gas prices with no relief in sight.

In mid-September 2005, the president said, “Government must have clear, up-to-date plans for responding not only to natural disasters but to outbreaks of disease and terrorist attacks. The plans must encompass the evacuation of large numbers of people and provide adequate food, water, and security.” At the present time this is not enough. It was hoped that he would call for legislation to provide job training, education, housing, small business support, tax cuts to encourage businesses to stay in the Gulf Coast region, and healthcare. To date, no such legislation has been contemplated or introduced in Congress. However, legislation has been introduced in Congress to cut the budget for domestic programs that assist America’s most vulnerable by $50 billion to help pay for the Gulf Coast disaster.

The practice of ongoing planning needs to be incorporated into every process applied to preparedness, prevention, mitigation, reaction, and response. A solution can occur when change occurs over time in response to the application of a process to a specific problem. There are many viable approaches to be considered and implemented in order to bring about significant, dynamic, and strategic solutions. Several are briefly presented.

- Communication flaws, glitches, gaps, and
disconnects (technical, language-based, and human) must become a priority for resolution. Without the ability to communicate, all other systems will fail.

- Cooperation and the sharing of information are paramount on all levels within and between entities. There is no room for turf, stovepipes, or personal gain.

- Education of all involved must be actively pursued. This education is mandatory for decision makers, strategic partners, management and support personnel, responders, the target audience, and the community.

- Training with hands-on and joint exercises that are repeated are key elements in the preparedness process. Frequent and documented exercises are required. The dictum applied is: train and train, and then train some more. In this ongoing training, new ideas, techniques, and areas of concern can be explored and incorporated.

- The distribution of specialized equipment and funds to support disaster preparedness must be accompanied by training in the proper use, care, maintenance, and storage of the equipment. Guidelines and standards must be promulgated and adhered to by the responders and their organizations. Further purchases must be made in line with ongoing planning and monitoring; coordination and accountability are mandatory.

- Ongoing planning will evolve into the development of local and even regional operational guidelines. This may even develop into policies and procedures. This is a positive transition; however, flexibility and adaptability are vital considerations for keeping the process updated and viable.

- Federal agencies must supply guidelines and standards for the implementation of the plans that they require of state, county, and local entities. Before distributing these guidelines and standards, the federal agencies must be required to compare them with those of other federal agencies to remove contradictory components that can only guarantee that nothing will get accomplished.

- Key agencies and functions must be culled out of the DHS and established as independent agencies, both fiscally and operationally. For starters, the three reconstituted entities should include: 1) the Federal Emergency Management Agency; 2) all former agencies and functions that dealt with transportation of all varieties; and 3) all agencies and functions that dealt with border security and immigration, including the US Coast Guard. Others should be moved out in the next go-around. The DHS is too big and too unwieldy at the present time to manage all of the vital and critical functions for the security and safety of the American people; maybe in 10 or 15 years the situation will change.

There are many solutions, but they take time, effort, shared risk, and sacrifice. All of the solutions mandate ongoing planning processes. These solutions are doable. Prevention strategies and prevention preparedness, developed simultaneously with the preparedness to respond, are the foundation for any realistic long-term solution that works on a practical level. This pathway is the surest means to develop security and safety for the American people. The mechanisms to make this happen are readily available.

Saul B. Wilen, MD, CEO, International Horizons Unlimited, San Antonio, Texas.
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