# DomPrep Journal

OLD WAY

NEW WAY

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# Featured in This Issue

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# Finding New Ways to Prepare

*By Catherine L. Feinman*

*One common sentiment that can hold people back from thinking outside the box is, "That's how it's always been done." Lessons learned and best practices are critical components of disaster preparedness efforts. However, no matter how many lessons are learned and best practices are discovered, the pursuit for new lessons and even better practices should never end. In this January 2022 edition of the Domestic Preparedness Journal, a new year begins with four new ways of looking at disaster preparedness.*
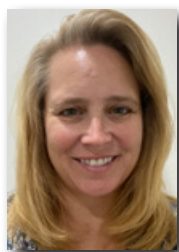
First, during a crisis, each stakeholder agency has established roles to play. When the scenarios and key players change, the roles may need to adapt with them. In addition, modern natural and human-caused disasters are growing in complexity and frequently span jurisdictions and disciplines. For example, COVID-19 on the surface is a public health crisis but, as demonstrated over the past two years, needs to be addressed by entire communities not just public health agencies. This and other large-scale events have elevated some emergency management agencies to lead multiorganizational responses and even to become standalone agencies within their states.

Second, on the academic side, many studies have been conducted, new methods and frameworks have been developed, and knowledge, skills, and abilities have been transferred. The next steps that sometimes are skipped are testing and implementation. In Rhode Island, the opportunity to test a new Predictable Surge framework proved helpful to the Providence Emergency Management Agency. Examples like this provide opportunities to find new ways to manage future problems.

Third, in the field, managing a crisis can become almost routine. For example, outbreaks of avian influenza in various parts of the world have provided many real-world lessons on how to dispose of large quantities of animal carcasses via composting methods. Researchers understand, though, that many factors (e.g., size of each animal, quantity of carcasses) must be taken into account to find the safest disposal method for each circumstance. As such, research projects are actively looking for new ways to address new and emerging threats.

Fourth, sometimes creating a new model requires a team effort across public and private organizations. Decisions made before or during a crisis can lead to more lives either saved or lost as well as lower or higher recovery costs. When many lives and properties are at stake, finding an effective model to mitigate the effects is crucial. An Open-Source Equitable Decision Intelligence Model is being developed to address various community needs that may otherwise be overlooked.

A slightly different combination of factors for any specific threat and hazard can have vastly different results. As such, remember lessons from the past, explore current research, create new models, and continue to look for new ways to manage future events and disasters.

# The Evolving Status of
# Emergency Management Organizations

*By Kyle Overly*

*The proliferation of climate change, political strife, and general societal divisiveness is changing the nature of the work of emergency managers. The (ongoing) COVID-19 global pandemic, devastating hurricane and wildfire seasons, tenuous political situations, and broad unrest impact local communities in significant ways. Emergency managers are those who officials trust to lead response and recovery to this growing list of emergencies and disasters. They facilitate multi-agency responses to complex incidents, often serving in silence while providing critical backbone services.*

Until recently, many elected officials, public administrators, and even citizens were unfamiliar with the services that emergency managers provide. This changed drastically when faced with COVID-19, where emergency management agencies across the nation coordinated the core community response activities. From building hospital surge capacity, developing testing sites, completing bulk purchases of personal protective equipment (PPE), then eventually rolling out the largest domestic vaccination effort in modern history, emergency managers executed in ways not possible in single-discipline agencies. Their unwavering commitment to mission in 2020 and 2021 was the ability to couple the COVID response with a relentless onslaught of natural disasters, civil unrest, and an attack on democracy.

Until this past year, emergency managers have sometimes been referred to as the *hurricane people* who were thankfully there when something bad happened. Although this is a past perception, the reality is that modern emergency management agencies are highly sophisticated organizations that combine the collective talents of multidisciplinary staff to solve complex problems. They also are forward thinking, trying to create ways to augment government missions rather than taxing them, because taxing them would be an additional stressor for social and economic resilience.

## The Uniqueness of Emergency Management Agencies

The reality is that modern emergency management organizations operate differently than typical public agencies. They rely on mission-oriented teams that sacrifice holidays, nights, and weekends to serve the community. Although they exist within traditional public organizational structures, many find ways to be nimble enough to meet the demands of a disaster where other rigid organizations may fail. Disasters require swift, decisive action, flexible organizational approaches to problem solving, innovation, and focus on customer-driven outcomes.

Governor Larry Hogan signs SB658/HB990 establishing the Maryland Department of Emergency Management (*Source:* Joe Andrucyk, Patrick Siebert, MD Governor's Press Office, 18 May 2021).

Across the nation, there is a changing perception about what emergency managers do and what their capabilities are. Despite the field's roots in civil defense and the tendency to view emergency management jobs as a job that one takes after a first retirement from the emergency services, the reality is the new generation of emergency managers are coming from diverse backgrounds, educational programs, and from paths that depart from the status-quo mono-demographic that has plagued this field for years.

This has enhanced the services that emergency managers provide and adjusted their approaches to problem solving. No longer are emergency managers making decisions based primarily on gut feelings, rather they are leveraging young talent from diverse academic and professional backgrounds. These individuals bring new and innovative perspectives to the multitude of threats that are a consequence of the progress and innovation of modern society. This changing environment is significant and is leading to significant reforms and recognition from elected officials about the capabilities of these often-forgotten agencies.

### New Complex Problems

Society's modern problems are complex, multidisciplined, and multijurisdictional. COVID certainly exposed many societal problems and illustrated the fact that communities do not start from the same baseline before a disaster. For example, food scarcity, which is already an issue, emerged as a major problem during COVID. In Montgomery County, Maryland, officials leaned on emergency managers to solve complex supply chain and distribution problems. After the pandemic subsided, the

Maryland General Assembly called on emergency managers to lead a workgroup to establish long-term fixes to this issue.

Elected officials had previously called upon emergency managers to solve complex problems such as the opioid crisis and homelessness, as well as to address the challenges of civil unrest and geopolitical strife. In these cases, officials recognized the unique skills and capabilities of emergency managers. Many also call for emergency managers to lead in other areas such as preparing for the impacts of cyberattacks.

Compounding the situation are surging disasters resulting from climate change, which bring rising costs and increased complexity. The news gets worse, as proceedings from COP26 suggest that changes are accelerating and countries are falling short on policies aimed at reducing impacts. When there is a climate-fueled disaster, emergency managers will take the lead on community coordination for response and recovery, despite expanded responsibility in other areas.

### From Marginalized to Mainstream

During the COVID response, many emergency management agencies emerged as trusted leaders in their communities. Not only are emergency management agencies being entrusted with typical duties, but they often are leading nontraditional projects that require complex multiorganizational coordination efforts. From risk reduction to food resilience, or even leading efforts to address other complex societal challenges, stakeholders recognize the potential of tapping emergency managers to solve problems.

*With modern problems that are complex, multidisciplined, and multijurisdictional, emergency management organizations are being elevated to meet the challenge.*

This demonstration of trust also is leading emergency management agencies to emerge as stand-alone departments, with elevated status within organizational charts, and reporting to the chief elected official in a community.

In 2021, Maryland joined a handful of other states by elevating its state emergency management agency to a cabinet-level department, reporting directly to the governor. Previously an agency within the Maryland Military Department, the move established the Maryland Department of Emergency Management and moved statewide 911 responsibility under the new department. This move has benefits not only during disasters, but also established the department on equal footing with other stakeholders, which improves preparedness and disaster risk-reduction activities. On the other side of the country, the Oregon Legislature took similar action, establishing the Oregon Department of Emergency Management, an independent department in state government. The elevation of emergency management to principal or stand-alone departments is not just happening at the state-level.

In December 2021, county officials elevated the San Mateo Office of Emergency Management to a standalone department with an expanded role and more responsibilities. On the east coast, in 2019, the City of Annapolis established an independent Office of Emergency Management, which was once a component of the Annapolis Fire Department. Like many other elevated offices, this move coincided with an expanded scope and focus on other activities such as hazard mitigation and resilience.

The fate of federal emergency management and the Federal Emergency Management Agency (FEMA) remains unclear. A long and spirited debate continues about whether FEMA should return to its pre-911 independent status, or if it should stay in a subservient role to the Department of Homeland Security. What is also unclear is if independent status would have improved the initial months of the federal COVID response, when FEMA was unclear on its role and statutory authority for response to a pandemic. There are many vocal proponents of independence, such as Dr. Samantha Montano who points to past failed independence efforts and more broadly the need for comprehensive emergency management reform in the United States. Only time will tell if the Biden Administration takes this issue on as they place greater emphasis on FEMA risk-reduction efforts as part of broader efforts to improve the nation's infrastructure.

### *Conclusion*

Emergency managers are mission-driven public servants who deserve to stand on equal footing with their colleagues in other cabinet-level departments. The last few decades of increasingly complex disasters have illustrated how emergency managers accomplish tasks when others cannot. The trend is clear, more agencies are being anointed as stand-alone departments, reporting directly to the chief elected official. This is not happening by chance, rather, it is based on past performance, increasingly complex disasters, and a recognition that very few problems are constrained to one discipline. To solve a complex problem, the preferred agencies are those that are experts at stakeholder engagement, multidiscipline problem solving, and critical thinking. This is clear to those who work in this field and increasingly has become apparent to elected officials.

*Kyle R. Overly is an accomplished emergency management practitioner and educator. He has held many roles throughout his career including serving as the director of Disaster Risk Reduction with the Maryland Department of Emergency Management. In addition, he has traveled internationally, providing emergency management services and speaking. With over 10 years of experience, he has responded to major disasters including Hurricane Irene, Hurricane Sandy, the Baltimore City civil unrest, Ellicott City flash flooding (2016 and 2018), and the COVID-19 global pandemic. He is also an educator, with over 10 years of teaching experience, primarily at the University of Maryland Global Campus. He holds a Doctor of Public Administration from West Chester University, a Master of Science in Fire and Emergency Management Administration from Oklahoma State University. He is a graduate of the National Emergency Management Executive Academy and the Executive Leaders Program at the Center for Homeland Defense & Security – Naval Postgraduate School. Finally, he is a Certified Emergency Manager.*

# Predictable Surge: A Pilot in Providence

*By Sara Kelly*

*Collaboration between public entities and private companies is essential to prepare for disasters. However, current partnerships can be formal and cumbersome to the point of detriment, or impromptu and do little to achieve their goals. This unmet need to find appropriate partnership mechanisms could be addressed by the Harvard National Preparedness Leadership Initiative (NPLI)'s Predictable Surge framework, a model presented in Domestic Preparedness Journal in August 2019. It aims to inform an emergency manager's understanding of the response ecosystem and productively engage potential private partners. This model has been further developed through a pilot with the Providence Emergency Management Agency (PEMA), located in Providence, Rhode Island, in the summer of 2021.*

The Predictable Surge framework categorizes public-private coordination and collaboration into four groups: formal, semi-formal, informal, and disengaged partnerships. Each structure has its own costs and benefits, and partnerships within all four categories are critical to foster community preparedness, response capacity, and resilience. Additionally, the framework describes six domains of community needs that must be met during emergency response and recovery (see Table 1).

The Predictable Surge framework encourages public emergency management entities to engage with potential and current collaborators using the various partnership structures across all community need domains. Through this approach, partners can recognize points of intersection and identify response actions they can take to complement the others' programs, reducing the risk of duplicated efforts and increasing efficacy of response. Ultimately, these networks will guide a disaster response that fosters efficient and effective collaboration and maintains space for flexibility.

### An Opportunity to Pilot

After the Predictable Surge model was presented in 2019, a subsequent opportunity to pilot this in the field arose with the Providence Emergency Management Agency (PEMA). The pilot used the Predictable Surge framework to analyze PEMA's private-public partnership ecosystem for disaster preparedness to identify clusters, gaps, and overlaps.

The first step of the project was to define the community need domains described by the Predictable Surge framework in the PEMA context. This process involved identifying which businesses in the Providence area might be able to provide emergency response and recovery support in a given domain, for example:

- Local hardware stores could provide resources in the resilience/fast rebound area.

- The Rhode Island Community Food Bank could support needs in the logistics/materiel surge category.

- National Grid, a gas and electricity company, could contribute to the information surge domain.

**Table 1.** Summary of the Community Needs Domains

| Community Need | Organization Characteristics |
|---|---|
| Resilience/Fast Rebound | Can resume their pre-emergency operations for public use (e.g., hardware stores providing materials to rebuild) |
| Logistics/Materiel Surge | Have existing ability to distribute and transport goods (e.g., trucking or shipping companies) |
| Capacity Surge | Can create a surplus of goods/services, amplifying a service that the public partner already has the ability to do |
| Capability Surge | Provide a specialized service that the public partner cannot or has limited capability to do |
| Information Surge | Can quickly gather or disseminate information (e.g., companies with private emergency alert systems) |
| Communications Surge | Can increase the communications network of the partner (e.g., telecommunications companies) |

The next step was to conduct a thorough document review to catalogue existing partnerships that PEMA maintains with private entities. This included documents such as the PEMA Emergency Operations Plan, Recovery Plan, Shelter Plan, Fox Point Hurricane Barrier Coordination Guide, and various memorandums of understandings (MOUs). Based on this review, the team conducting the pilot identified private partner activities to bolster emergency preparedness and response, which were then stratified into the various community need domains to create a partnership matrix. The PEMA team was consulted throughout the review process, and the final partnership matrix was reviewed in a collaborative effort to identify areas of surplus partnerships and domains in which there were gaps in coverage from private partners.

All named activities that PEMA committed to complete to support the private partners should a disaster occur were stratified by the community need domains as well. Special attention was paid to note named potential private partners that were not yet engaged in any emergency preparedness or response activities with PEMA, yet with potential as future partners.

***Implications for Practice***

This Predictable Surge analysis found PEMA's private-public partnership ecosystem to be robust with 18 formal partnerships, many of them spanning multiple community needs domains (see Figure 1). There was a high volume of partnerships in the Capability Surge domain, which included groups that ranged from the Roger Williams Park Zoo to the Sodexo catering company, all of which provide a specialized service outside of PEMA's internal capabilities. The analysis also identified opportunities for growth,
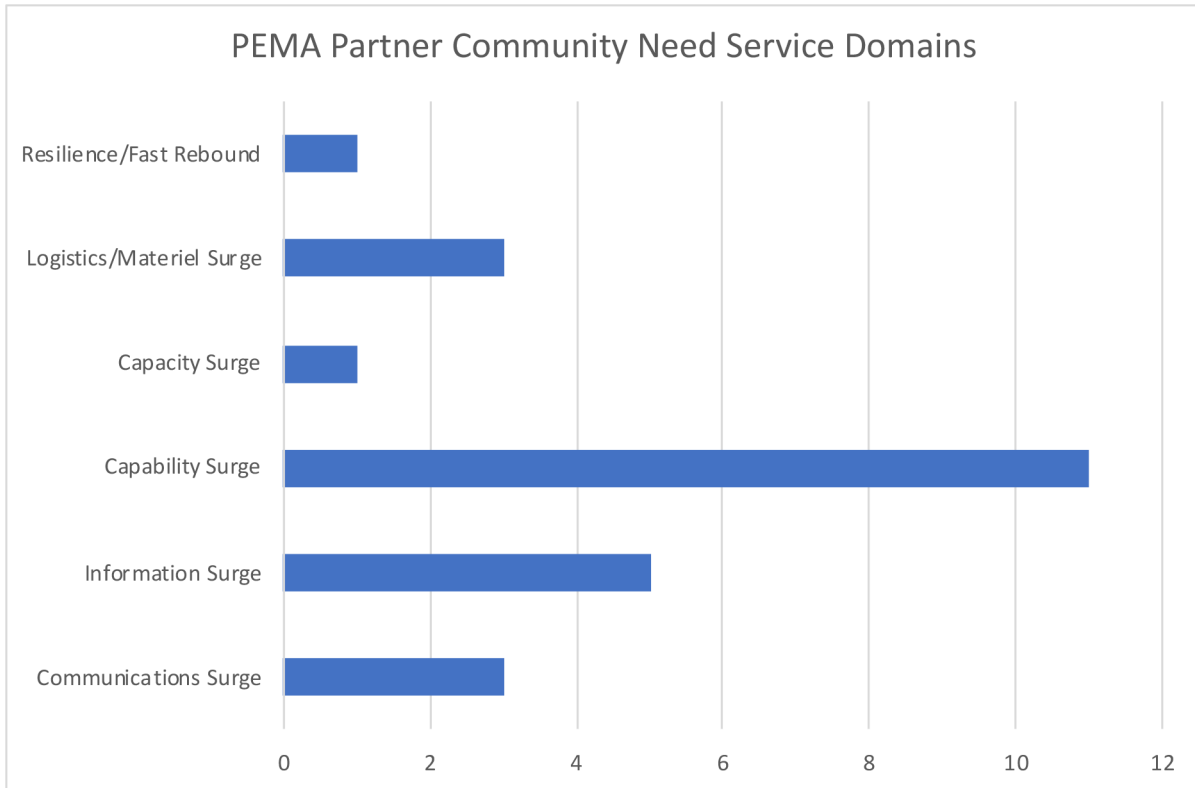
**Fig. 1.** Number of PEMA's private partners by the Predictable Surge framework's community need domains (*Source:* Sara Kelly, 2021).

namely in the Resilience/Fast Rebound and Capacity Surge domains, which only had one partner each. According to Dr. Clara Decerbo, Director of PEMA:

> *Evaluating PEMA's public-private partnerships enabled our team to reflect not only on our capabilities but also on what work remains in order to engage new partners to improve disaster response and recovery in our community. This work is especially important as we enter the third year of response to the COVID-19 pandemic, which has had significant impacts on our city's public and private sectors.*

Providence is a small city with a population of less than 200,000 people, but it is a popular destination with an active private sector. The findings in Providence provide an example of predictable surge for communities that have similar profiles and partnerships as PEMA. The Predictable Surge framework could help other emergency management agencies evaluate their own private-public partnership ecosystems.

The NPLI's Predictable Surge framework was successfully applied to PEMA's response ecosystem and can be used to identify current partners' value-add, as well as areas of surplus and scarcity in the various community need domains. The following broad steps should be used for organizations who want to apply this framework to evaluate their own current private-public partnership ecosystems:

Feeding San Diego COO Alicia Saake came to Houston as a volunteer shift leader, and wraps up this shift of individual, group, and company volunteers from Go Daddy, Maxim, Chevron, Phillip 66, LyondellBasell, BASF, Dow Chemical, and EDP Renewables. *Source:* U.S. Department of Agriculture, Public domain, via Wikimedia Commons (2017).

- Identify the context in which to evaluate and engage emergency management stakeholders in key organizations of interest.
- Collect relevant data to analyze (e.g., review key documents, conduct interviews with stakeholders).
- Apply the Predictable Surge framework to stratify existing partnerships along the community needs domains and identify areas of surplus and deficit.

With major disasters such as the December 2021 tornados in Kentucky and the Midwest, there are many contexts in which the Predictable Surge framework would be a valuable addition to the emergency management toolkit. The process and results of applying this framework should provide a way to prompt conversations with partners and potential partners about resources, needs, constraints, etc. It is a beneficial way for each partner to better understand the other and find leverage points to facilitate collaboration. The outcome should be a more robust ecosystem that is better positioned to serve the community when it matters most.

*Sara Kelly is a graduate student at the Harvard T.H. Chan School of Public Health. She has a background in emergency medical services (EMS) and public health and is studying how emergency management can be informed by population health strategies. She is currently a teaching fellow and special projects intern with the National Preparedness Leadership Initiative, a joint program of the Harvard T.H. Chan School of Public Health and the Center for Public Leadership at Harvard's John F. Kennedy School of Government.*

# Preparing the U.S. for an Outbreak of
# African Swine Fever
*By Gary A. Flory*

*Responding to outbreaks of transboundary animal diseases is just one of the many challenges emergency planners and responders in rural localities face. Unfortunately, the infrequent nature of these events makes it easy to put off the planning, training, and research needed to fully prepare for animal disease outbreaks.*

The highly pathogenic avian influenza (HPAI) outbreak of 2015 is a reminder of the impact that animal disease outbreaks can have on local economies and resources. This outbreak impacted 211 commercial poultry farms and 21 backyard flocks from California to Indiana and tasked responders with the disposal of 50 million birds carcasses. Disposing of so many carcasses without further spreading the disease or causing significant environmental harm was no easy task.

In August 2018, another animal disease caught the attention of agricultural first responders when African Swine Fever (ASF) was detected in the northeastern Chinese province of Liaoning. It quickly spread across the country. Since then, ASF has moved rapidly throughout Asia and Europe. Fortunately, ASF is not a zoonotic disease and, therefore, does not cause sickness in humans. However, it devastates economies and destroys the livelihoods of small farmers.

During the disease outbreak, researchers and emergency planners began working to improve the level of preparedness for a potential outbreak within the United States. Among the areas of focus was carcass disposal. Despite the animal carcass management experience that agricultural first responders had from the HPAI outbreak of 2015, not all of the lessons learned from the disposal of 5-pound laying hens transferred well to the disposal of 450-pound sows.

The need for an effective ASF response strategy is not just about avoiding disease transmission and environmental impacts. An outbreak of ASF in the United States would have catastrophic economic implications. A new study conducted by agricultural economists from Iowa State University and the Universidad de la Republica in Uruguay estimates that an ASF outbreak in the United States could have an economic impact of $50 billion.

## Wake Up Call

In July 2021, the Dominican Republic reported to the World Organisation for Animal Health (OIE) that they had a confirmed case of ASF. This was the first reported case of ASF in the Western Hemisphere in almost 40 years. Although the Ministry of Agriculture made aggressive attempts to control the outbreak, the disease quickly spread throughout the country and into neighboring Haiti. With only 60 miles separating the Dominican

**Fig. 1.** Composting poultry carcasses infected with highly pathogenic avian influenza in the Midwestern United States in 2015 (*Source:* Gary Flory).



**Fig. 2.** Grinding prior to composting demonstration in North Carolina in 2019 (*Source:* Gary Flory).

Republic and Puerto Rico, efforts to prepare for and prevent an outbreak within the United States intensified with an urgency not seen since the 2015 HPAI outbreak.

## Mortality Management Research

Composting has become a preferred method to manage poultry carcasses during disease outbreaks and natural disasters. In fact, 85% of the 50 million birds impacted by the 2015 HPAI outbreak were composted, and the generated compost was beneficially used as a soil amendment (see Figure 1). Because of that success, it is natural to assume that emergency responders would look to composting to manage disease outbreaks and natural disasters impacting livestock.

Unfortunately, the size of each animal and the sheer volume of carcasses on a typical livestock operation add complexity to the composting process. While poultry can be composted in 28 days, livestock can take 3 to 6 months to compost. Additionally, composting livestock requires a considerable amount of carbon



**Fig. 3.** Air monitoring at a grinding and composting site in North Carolina in 2019 (*Source:* Gary Flory).

material, such as woodchips or corn stover. To address these challenges, researchers initiated a number of projects to make the composting process more efficient for pigs and other livestock.

## Grinding and Composting

In 2018, researchers conducted a proof-of-concept project in Virginia to evaluate the effectiveness of grinding swine carcasses with a horizontal bed grinder before composting. Based on the results of this project, the team conducted a series of operational scale research and demonstration projects in North Carolina and Minnesota (see Figure 2). These

**Fig. 4.** Above Ground Burial trench prepared for the disposal of fifty 450-pound sows in Oklahoma in 2019 (*Source:* Gary Flory).

projects evaluated the methodology's throughput, the carbon material requirements, the potential for pathogen aerosolization, and the impact on the composting process. These evaluations suggest that grinding carcasses prior to composting can significantly reduce composting times, making the procedure similar to the process used during the 2015 HPAI outbreak in poultry.

An ongoing area of research is the evaluation of air emissions from the grinding process. With the use of air monitoring stations around grinding sites, researchers from the United States Environmental Protection Agency's Office of Research and Development are working to determine if it is possible for the grinding process to spread dust particles containing the ASF virus (see Figure 3). They are also evaluating mitigations such as the use of shrouds and misters to minimize dust emissions from the grinding process.

### ASF Inactivation Through Composting

Although composting has been shown to inactivate a variety of pathogens, studies had not been conducted to confirm its effectiveness for inactivating the ASF virus. To address this uncertainty, a team of U.S. and Vietnamese researchers, with funding from the National Pork Board, conducted a research project on the campus of the

Vietnam National University of Agriculture in Hanoi, Vietnam. In the study, pigs from local farms presenting typical ASF symptoms were collected and confirmed to be positive for ASF by laboratory testing. Each of the pigs was placed in compost piles from which tissue samples were collected to test for viable virus particles. Compost pile temperatures were monitored daily. Although data analysis has not been finalized, initial results suggest that composting can quickly and effectively inactivate the ASF virus in swine carcasses.

### Above Ground Burial

In 2015, researchers in Virginia began evaluating the effectiveness of Above Ground Burial (AGB) as a carcass disposal method. AGB is a hybrid of traditional deep burial and composting, designed to increase carcass decomposition and minimize environmental impacts. Since then, AGB research projects have been conducted in Virginia, North Carolina, Texas, Oklahoma, and Minnesota, looking at carcass decomposition, scavenger activity, nutrient migration, insect activity, and pathogen inactivation (see Figure 4).

> *For managing disease outbreaks and natural disasters, the size of each animal, and number of carcasses add complexity to the composting process.*

Based on this work, AGB appears to be a viable carcass disposal option during large livestock mortality events. When conducted following USDA's standard operating procedures, AGB minimizes the vertical migration of contaminants, prevents scavenger activity, and enhances carcass decomposition.

AGB has also been shown to inactivate a variety of pathogens, including the swine pox virus and Seneca Valley virus. Because the U.S. is currently ASF-free, it is difficult to conduct research on the virus domestically. However, research to confirm that AGB will inactivate the ASF virus has begun on the campus of the Vietnam National University of Agriculture in Hanoi. Results from this project will inform the future use of AGB during ASF outbreaks.

### Use of AGB During an Agricultural Emergency

The AGB disposal method has mainly been implemented at a small-scale during research projects. It was first used as a disease management tool in Tunisia to dispose of sheep testing positive for the Foot and Mouth Disease (FMD) virus, Peste des Petits Ruminants Virus (PPRV), and Bluetongue Virus.

Its first use in the U.S. as an emergency mortality management tool was in May 2021 in response to a barn fire at a 5,000-head sow farm in Minnesota. Tragically, the fire resulted in the deaths of 3,000 sows and 8,000 piglets. Traditional deep burial was not an option due

to the shallow groundwater table common in Minnesota and many other places across the U.S. The farmer considered landfilling the carcasses, but ruled it out due to costs and instead chose to implement AGB.

### Training First Responders

Animal mortality management can be a complex process. Effectively implementing disposal methods such as composting and AGB is both an art and a science. Mortality management subject matter experts (SMEs) who oversee the carcass disposal process typically have a combination of classroom and field training. To build regional capacity in the event of an outbreak of animal disease such as ASF, the United States Department of Agriculture, Animal & Plant Health Inspection Service (USDA, APHIS) sponsored a series of mortality management training programs focused on creating new mortality management SMEs. These training courses teach the skills necessary to implement both composting and AGB. The courses have been held in Maine, North Carolina, and Iowa, with additional courses scheduled for Oklahoma and California.

### Where to Go From Here

The U.S. has made significant strides in increasing its readiness for the possibility of an ASF outbreak. Although much research has been completed, there is still more to learn about how to effectively control outbreaks of this devastating disease.

In addition, additional mortality management SMEs need to be trained to ensure rapid control of the disease and prevention of environmental contamination from decomposing animal carcasses. There are already several training opportunities planned. A half-day mortality management workshop is being held as part of the U.S. Composting Council's COMPOST2022 conference scheduled for 24-27 January 2022 in Austin, Texas. Another learning opportunity is the 7th International Symposium on Animal Mortality Management to be held 27-30 June 2022 in Raleigh, North Carolina.

As infrequent as animal disease outbreaks may be, there must be continual investment in the training and research needed to ensure an effective and efficient response.

*Gary Flory is the agricultural program manager for the Virginia Department of Environmental Quality and an independent global consultant, trainer, and speaker in the areas of emerging infectious diseases, counter-agroterrorism, One-Health, and animal carcass disposal. He has conducted training, given presentations, and deployed on animal disease outbreaks to a number of countries including the Dominican Republic, Vietnam, Tunisia, Korea, Cambodia, Laos, Malaysia, and Azerbaijan. He supports a variety of organizations including the United States Department of Agriculture, the Food and Agriculture Organization of the United Nations (FAO), and the World Organization for Animal Health (OIE). He currently serves on FAO's African Swine Fever Global Pool of Expertise. In addition to numerous other articles, reports, and guidance documents, he was a lead author of FAO's recently released, "Carcass management guidelines – Effective disposal of animal carcasses and contaminated materials on small to medium-sized farms" and USDA's "Catastrophic Livestock Composting Protocol and Mortality Composting Protocol for Avian Influenza Infected Flocks." He can be contacted at garyaflory@gmail.com*

# The First Open-Source Equitable Decision Intelligence Model

*By Eric Kant, Joel Thomas, Chauncia Willis, Sarah K. Miller, Nissim Titan, Tzofit Chen, Brian Kruzan, Camila Tapias & Alexa Squirini*

*When incidents are catastrophic and/or happen in compromised environments, complexity can increase rapidly and dramatically, compromising response objectives and resulting in catastrophic failure. The cost of these failures is measured in destruction and human lives, making even minimal reductions in capabilities untenable. A rapidly changing environment requires that the modern emergency manager is capable of quickly understanding community needs, including the needs of underserved populations and traditionally underrepresented groups.*

Only if properly oriented to the conditions of four key environments could the modern emergency manager deliver equitable decisions before, during, and after disasters. This requires understanding pre-existing conditions of the natural, social, built, and economic environments. To do that, the following is needed: good data, good data processing, the ability to make sense of that data, and the ability to derive recommendations that are sensitized to the needs of the real people that live, work, and play in a community.

To disrupt inequity, four steps assist in the process:

- Step 1: Acknowledge the hidden bias
- Step 2: Understand and assess outcomes of bias
- Step 3: Design equitable approaches
- Step 4: Develop, test, and evaluate for equity practices

## Current Decision-Making Process

Currently utilized technologies and protocols do not enable effective real-time, distributed, artificial intelligence (AI), machine learning, and other advanced analytics that encourage decision intelligence. Decision intelligence is the use of data from multiple sources to make quick and informed decisions that will support organizational effectiveness, response time, efficiency, and equity. To achieve this, a diverse pool of AI talent will be included to contribute to value sensitive design and training sets representative of social groups and their needs. Equity is intentional and must be prioritized early and often. AI should be beneficial to all of humanity, not harmful to the most marginalized. Diversity must be present in all phases of development to ensure proper perspective.

Currently, many decisions are being made based on frameworks, systems, policies, and programs that do not explicitly incorporate equity into their process. Information modeling, when applied to decision support, can provide recommendations on course of actions, in addition to playing out scenarios during the planning process. Understanding equity and unintended biases in AI model-making processes is critical to developing an

How Can We Build an Equitable DI Model?
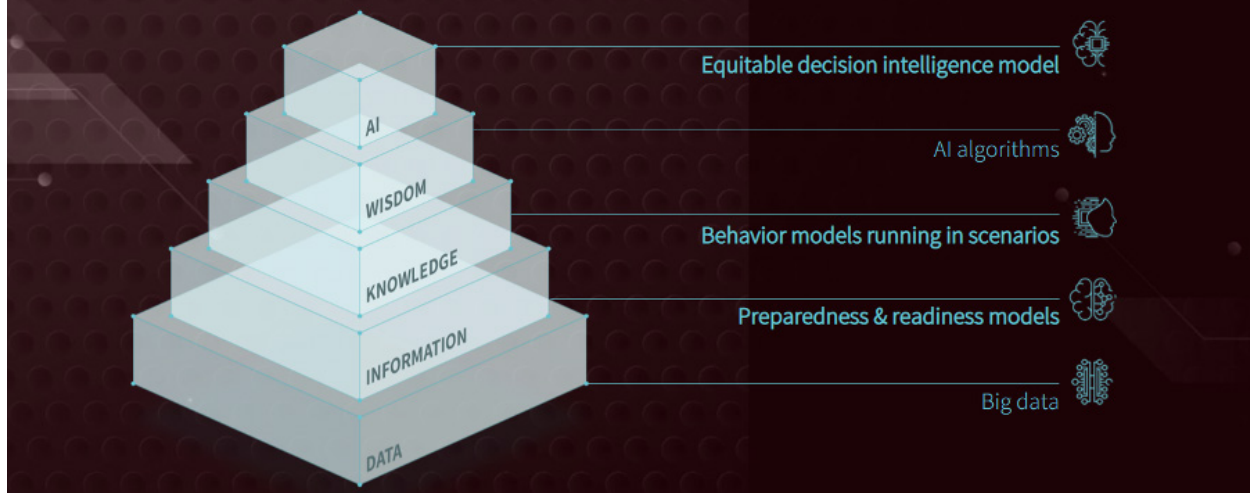
effective and inclusive model. For this collaborative effort, equity is defined by the Federal Emergency Management Agency as "the consistent and systematic fair, just and impartial treatment of all individuals." It is critical to also acknowledge how bias, in some AI efforts has negatively impacted equity, such as seen across the public safety community, and how these lessons learned have directly informed an open-source model approach. Not being able to predict probabilistic scenarios for the event or outcome makes it difficult to design or implement effective interventions. Emergency managers need to mitigate disaster using predictive simulation to understand the outcome of an event.

It is important to understand:

- Predictive modeling should be neutral.
- Data often has bias.
- Algorithms must remove bias.
- Recommendations should provide equitable benefit to the whole community.

In an era where disasters of all kinds are destructive to humans and their daily lives, the programs focused on preparedness, mitigation, and outcomes for disaster survivors are not always equitable, but that can change. It starts with understanding the makeup of communities and the nexus between social and economic vulnerability, social capital, and the impacts of emergency management decisions. This collective effort seeks to reverse industry trends and disrupt the impact of this human-made disaster that many people face and that has proven to exacerbate the impacts of hurricanes, floods, fires, and pandemics.

### Developing a Better Whole Community Model

This equitable model-building process should allow the authors to include in the model an understanding of the actual needs from the whole community, which can lead

to a deeper understanding of the unique and diverse needs of a population – including its demographics, values, norms, community structures, networks, and relationships. The model should include diverse community members, social and community service groups and institutions, faith-based organizations and disability groups, academia, professional associations, and the private and nonprofit sectors, while including government agencies who may not traditionally have been directly involved in emergency management.

During the modeling process, there needs to be an understanding of how human-centric decision intelligence can provide recommendations and courses of actions that assist the decision maker in understanding the current disaster environment. The proper calculation prepares communities for what comes next. The authors, as a group, have come together to design, develop, and implement the first open-source equitable decision intelligence model. The goal of this model is to be sensitive to social and economic vulnerabilities and supportive of advanced planning, preparedness, mitigation, response, and recovery needs. Model building is a team sport, requiring input from a diverse group of stakeholders to truly be effective. Models also need to be local, as are all disasters.

Technology is coded by human beings. If the humans developing the data and technology are introducing bias on the front end, then the back-end recommendations will be biased as well. Many groups that develop AI tend to do it in isolation, claiming they can solve the world's problems while delivering incomplete and unsatisfactory or harmful results. For this reason, the authors have chosen to convene an effort that is fully open, inclusive, and crowd-tested, to develop something that is real, that is lasting, and that earns the trust and confidence of the whole community. This will ensure that both data equity and societal equity considerations are identified and accounted for on the front end of the design and development process, so that the back-end insights and recommendations will serve the whole community. The end goal is to publish an operational equity standard from which future decision making can be based in the context of preparedness, mitigation, response, and recovery.

*The authors of this article are actively working to create and deploy explainable and equitable AI, enabling emergency management to assist in all aspects of decision support. Please contact equity@spinglobal.org with any questions or join the LinkedIn Group at https://www.bit.ly/Equitabledecisionintelligence. To sign up for a pilot in a local jurisdiction, please access this form https://forms.gle/3YGREgJ3znYoHgTS7.*

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