

# Emergency response and disease control – a discussion of alternative objectives for zoning in the age of agricultural bioterrorism

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## Summary

Emergency planning activities in most developed countries have increased as a result of such events as the September 11, 2001 terrorist attacks and the emergence of the highly pathogenic Asian strain of avian influenza, H5N1. The threat of terrorist activities, combined with advances in science and technology, have resulted in an expanded spectrum of threat for humans, animals, plants and the environment. It is possible that an attack or disease incursion could be so catastrophic and devastating that the resources to combat it would be rapidly overwhelmed. In these cases, it may be necessary to develop an alternative strategy. The author discusses the concept of protective zoning. Protective zoning is a strategy to salvage or protect a smaller segment of an agriculture sector or geographic area when resources are insufficient to protect the entire sector or area. This change in orientation will be extremely controversial and the exact criteria to determine when the situation warrants a change in objective, as well as the precise activities to be performed, must be determined by all stakeholders well in advance. Changes to other activities in current emergency plans may be required. The impact on the recovery phase plans will be significant.

## Keywords

Agroterrorism, Animals, Bioterrorism, Diseases, Emergency planning, Plants, Response, Zoning.

## Risposta alle emergenze e controllo delle malattie – discussione di possibili obiettivi alternativi alla zonizzazione nell'epoca del bioterrorismo agrozootecnico

### Riassunto

*Nei paesi sviluppati eventi quali gli attacchi terroristici dell'11 settembre 2001 e l'emergenza di un ceppo asiatico di influenza aviaria altamente virulento, l'H5N1, hanno comportato un aumento di tutte le attività finalizzate al controllo delle emergenze. La principale conseguenza della minaccia legata ad attività terroristiche, associata a sviluppi in campo scientifico e tecnologico, è stata un allargamento dello spettro dei possibili pericoli per la salute umana, gli animali e l'ambiente. E' infatti possibile che un attacco o l'incursione di una malattia possa assumere dimensioni così catastrofiche e devastanti da sopraffare rapidamente le risorse allocate per combattere tale minaccia. In questi casi può rendersi necessario sviluppare strategie alternative. Nel presente lavoro l'autore discute il concetto di zonizzazione protettiva. La zonizzazione protettiva è una strategia finalizzata al recupero o alla protezione di un segmento limitato di un settore agricolo od area geografica nel caso in cui le risorse sono insufficienti a proteggere l'intero settore od area. Un cambiamento di questo genere può essere estremamente controverso e necessita che i rigidi criteri di scelta per definire*

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*quando la situazione richiede un cambiamento degli obiettivi, come pure le attività da implementare, siano definiti con largo anticipo da tutti coloro che vengono potenzialmente coinvolti dall'emergenza. Potrebbe inoltre sorgere la necessità di modificare altre attività previste dai piani di emergenza correnti. E' lecito attendersi anche un significativo impatto sui piani di gestione della fase di recupero.*

#### **Parole chiave**

Agroterrorismo, Animali, Bioterrorismo, Malattie, Piani di Emergenza, Piante, Risposta, Zonizzazione.

## **Introduction**

The statement that the world has changed since 11 September 2001 has become almost trite. No one will deny that security, intelligence and emergency preparedness have become extremely important elements in the mandates of governments. Personal security and safety are issues that most individuals, even those in peaceful, stable countries, think about on a regular basis.

With respect to agroterrorism, a discussion paper prepared by Public Safety and Emergency Preparedness Canada (PSEPC), concludes that agroterrorism is unlikely to cause famine or malnutrition, although there may be other direct and indirect costs to the agriculture sector and economy through 'disruption of domestic or/and international markets for livestock, crops and food products' (3). Terrorist events could, however, cause widespread social disruption and loss of confidence (3).

It is conceivable that agroterrorist activities could disrupt or threaten specific production components of the agriculture sector and that these events may in fact constitute a threat to food security. For example, foot and mouth disease purposefully distributed across Canada in all susceptible species could disrupt the red-meat market in a manner not previously considered in response plans. Although highly improbable, it may be appropriate to consider some aspects of these scenarios for planning purposes.

The concept of catastrophic events leading to worldwide threats to food security is not new.

In response to this threat, on 19 June 2006, on an island near the North Pole, a cornerstone was laid for a 'fail-safe seed vault that could prove to be a major hedge against catastrophe – part of a global strategy to ensure the long-term survival of the world's food crops' (2). Prime ministers from all the Nordic countries participated. This new seed bank is expected to be available and begin building the seed collection in 2007 and it 'will protect the world's food supply by conserving critical seed collections originating from the tropics to the highest latitudes' (2). This kind of repository for animals is not practical at this time. However, some thought concerning salvaging components of the animal population may be worthwhile.

We must ask if 11 September 2001, and all the potential global terrorist events that we now imagine can occur, have changed our thinking in terms of emergency preparedness and response. Are we preparing to respond to new threats in the traditional manner? May we need to respond in different ways to these new potential threats? Are our preparedness activities appropriate to all potential situations? These questions are particularly germane to animal and plant disease/pest events.

Zoning is a well recognised strategy for the control of disease and the resumption of trade. This paper will discuss an approach to zoning which is designed to protect specific areas of animal or plant production in the face of overwhelming challenge or catastrophic events. The overall goals for zoning in these situations will differ somewhat from the traditional goals of zoning and will require a fresh look at emergency response plans.

## **Background**

Prior to September 11, 2001, the primary emergency-response objectives for animal and plant disease outbreaks were eradication if possible or control of the agent and/or disease. Agriculture authorities perceived, rightly or wrongly, that disease incursions were likely to occur because of accidental or unintentional activities. This may have been naive to a

certain extent but it was the prevailing opinion.

Most disease scenarios, developed for planning purposes, were single pathogen or agent events, often originating from the introduction of one or a few diseased animals or materials. After all, this was the global experience (recent examples include avian influenza in Canada, bovine spongiform encephalopathy [BSE] in Canada and the United States, foot and mouth disease in the United Kingdom and The Netherlands, Nipah virus in Malaysia, emerald ash borer and plum pox in Canada). Preparedness and response planning focused on this type of event. The goal was to eradicate the agent if possible and prevent spread. The major driving force was often trade resumption and, if the agent was zoonotic in nature, public health was of primary importance.

Today, the potential scenarios include the old variety but also others which are widely recognised to be quite different. Purposeful introduction of multiple agents at multiple sites, affecting both animals and humans and positioned to do the maximum possible damage, are now recognised as real possibilities. The list of potential pathogens for humans and animals and the technology to prepare and disseminate them is growing so rapidly that a list of potential bioterror agents could be out of date in a matter of months. The Institute of Medicine and National Research Council of the National Academies publication, *Globalization, biosecurity, and the future of the life sciences* states that the capacity to engineer new pathogens is recognised as a real threat. In fact, the pace of research discovery in the life sciences is so rapid that a list of prioritised biological threats would be out of date in six months. Such is the nature of what this report terms the 'expanding threat spectrum' (1).

These situations may far exceed our ability to respond in traditional ways. Diagnostic capacity and capability, manpower, equipment and information management may be overwhelmed early in the crisis. Financial resource demands may be impossible to meet. Zoonotic agents add a level of complexity

which may make situations much more complex and difficult to manage.

It may be necessary to modify the emergency management strategy from control of disease spread and eradication of agents to protection of specific sectors and geographic areas in order to protect and maintain food security and the viability, in the long term, of a specific industry. In other words, it may be a shift from defeating the disease intruder, to salvaging a portion of the sector – a shift from offence to defence.

Other emergency management strategies in these new situations may also have to be developed. For example, there may be a need to consider protection of the response teams from circumstances not previously anticipated. The scenes of chaos during the Katrina hurricane in Louisiana were appalling. 'Doctors were threatened. Patients fought. Helicopters evacuating the sick were fired upon. One man stole a National Guardsman's M-16 and shot him. The small force protecting the Bay Area team at its makeshift medical clinic left to help with crowd control' (4). There is little doubt that if a situation arises in which decisions must be made to protect some areas but not others, the environment will be extremely volatile.

The implications for the recovery stage will also be very significant. If sacrifices are made or imposed on some individuals, then a mechanism to compensate them will have to be developed. This is not the kind of policy which can be made in the face of a disaster.

In situations which involve zoonotic disease which is significant in terms of morbidity and mortality, extensive consultation and planning with public health professionals will have to occur in advance of the event. Dual goals and objectives need to be articulated and accepted.

## Separation zoning versus protective zoning

The World Organisation for Animal Health (OIE: Office International des Épizooties) states that a zone 'means a clearly defined part of a country containing an animal subpopulation with a distinct health status

with respect to a specific disease for which required surveillance, control and biosecurity measures have been applied for the purpose of international trade' (5).

Using this definition, 'distinct health status' may mean that a disease is present or that a disease is absent in the 'clearly defined part of a country'. This paper will refer to these distinct parts, or zones, in a country as 'diseased' or 'disease-free', respectively.

This interpretation of the OIE definition will be used in this discussion and will refer to a zoning approach which will be termed 'separation zoning' – the traditional approach to zoning. It is a strategy to define a country as having two or more distinct areas which are recognised to be separate in terms of disease status. Disease surveillance activities continue

to be conducted in the disease-free zone and the diseased zone; and disease control activities are performed in the diseased zone.

In 'protective zoning', there are two or more clearly defined parts of a country. However, both may be infected initially. Boundaries are established to distinguish the two zones. In one zone, the protected zone, disease eradication or control activities are performed. The goal is to eliminate or control the disease in that zone to the greatest extent possible. Outside the protected zone or zones, it may be necessary to allow a disease, in the most extreme situations, to run its course due to lack of resources to combat it.

Table I compares the different aspects of separation zoning and protective zoning.

Table I  
A comparison of different characteristics of separation zoning and protective zoning

Element	Separation zoning	Protective zoning
Definition	The creation of zones based on the OIE definition of zoning: a clearly defined part of a country containing an animal subpopulation with a distinct health status with respect to a specific disease for which required surveillance, control and biosecurity measures have been applied for the purpose of international trade	The creation of zones based on criteria (which need to be developed through consultation with stakeholders) which: outline a zone or zones where disease control activities and surveillance will be conducted in order to create a disease-free or controlled zone In extreme situations, the area outside the protected zone will not be subjected to disease control activities
Application	Applied when it is possible to differentiate a subpopulation inside the disease-free zone Disease control activities continue outside the disease-free zone	Applied when it is impossible to allocate resources to all areas where disease is present with the reasonable expectation that the control or eradication activities will be successful
Objectives	Protect public health, animal health, plant resources and the environment Control disease Document status of zone Restore trade	Protect public health, animal health, plant resources and the environment Concentrate response resources to salvage a portion of the industry in a specific area Food security
Names of zones	<ul style="list-style-type: none"> <li>▪ Disease-free</li> <li>▪ Diseased</li> </ul>	<ul style="list-style-type: none"> <li>▪ Protected</li> <li>▪ Non-protected</li> </ul>
Stance	Offensive: eradication of disease both inside and outside the disease free zone is anticipated, or maintenance of a specific disease-free zone is planned	Defensive: establishment of a disease-free zone is the goal; disease is left to follow its own course outside the protected zone if necessary
Relative sizes of zones	Zones may vary in size both in relation to each other and in absolute dimensions	By definition, the protected zone will be smaller (usually significantly smaller) than the non-protected area
Criteria for zone boundaries	<ul style="list-style-type: none"> <li>▪ Geographic, natural</li> <li>▪ Logistic</li> </ul>	Similar to separation zoning but other factors, such as economic value and genetic significance, may come into play
Movement control	<ul style="list-style-type: none"> <li>▪ Movement controls in diseased zones</li> <li>▪ Movement controls into the disease-free zone</li> </ul>	Movement allowed out but never into the protected zone, except under very strict surveillance

OIE Office International des Epizooties (World Organisation for Animal Health)

## Next steps

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The concept of protective zoning will be extremely controversial. It will be difficult to elicit agreement amongst stakeholders on the specific decision-making process on when and how to implement it. As is the case for all emergency response strategies, the actual plans and activities involved will have to be developed and practised well in advance.

However, if there is agreement on the plausibility of these types of situations arising, stakeholders must begin discussions on how they will approach planning for them.

There are three essential activities which must be initiated amongst all stakeholders to begin to prepare for these new situations, as follows:

- determine the decision criteria under which disease eradication or control (an offensive stance) would cease to be the immediate goal, with protection of sectors and specific geographic areas (a defensive stance) becoming the primary goal; this step involves a thorough threat assessment in advance of planning – the threat spectrum must be defined (1)
- determine if data and information in emergency plans are sufficient and appropriate to effectively make this transition and to support the activities which will be performed; intuitively, it makes sense that the same data (geographic information system, farm location and type, other industry data such as location of abattoirs and sales markets, transportation routes, etc.) would be required; it is imperative to verify this
- practise scenarios which are defensive in nature; there may be significant modifications in strategy and therefore mind-set which need to be identified and understood.

## References

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1. Institute of Medicine and National Research Council of the National Academies 2006. Globalization, biosecurity, and the future of the life sciences. Committee on advances in technology and the prevention of their application to next generation biowarfare threats. The National Academies Press, Washington, DC, 318 pp.
2. Laird J. 2006. Arctic vault to safeguard future food. *Geneflow '06*, 5 pp ([www.bioversityinternational.org/publications/Pdf/1144.pdf](http://www.bioversityinternational.org/publications/Pdf/1144.pdf) accessed on 6 January 2007).

## Conclusion

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Most developed countries are building and implementing extensive emergency response plans. Events such as the terrorist attacks in New York, the threat of the highly pathogenic Asian strain of avian influenza, H5N1, and devastating natural events, such as hurricane Katrina and the 2004 tsunami in Asia, have led to the implementation of these activities.

Traditionally, emergency plans to combat disease outbreaks in animals and plants have had an offensive perspective – the disease or pest would be eliminated or at least controlled. A country could seek to establish specific zones where disease was controlled and trade could resume. The concept of switching from an offensive stance to a defensive stance in order to save a fraction of an industry or geographic area will be extremely controversial.

If after a full threat assessment, however, stakeholders reach an agreement that catastrophic events which overwhelm traditional emergency plans and resources could occur, alternative plans must be developed. These plans must be developed well in advance of any situation which may initiate them. Although this discussion was centred on animal and plant disease situations, there are many other situations which may require this type of planning.

Many aspects of the emergency plan may need to be redesigned, in addition to those associated with disease control; these should be identified as early as possible.

3. Roberts S. 2006. Agricultural bio-terrorism: an analysis of American and British thinking on preparedness and response, a discussion paper. Science and Technology Policy Division, Emergency Management and Policy Directorate, Emergency Management and National Security Branch, Public Safety and Emergency Preparedness Canada, Ottawa, 1 p.
4. Simerman J. 2007. Agents work to keep disaster teams safe. *Contra Costa Times*, posted on Wednesday 3 January 2007 ([www.contracostatimes.com/mld/cctimes/news/16372950.htm](http://www.contracostatimes.com/mld/cctimes/news/16372950.htm) accessed on 4 January 2007).
5. World Organisation for Animal Health (Office International des Épizooties: OIE) 2006. Terrestrial animal health code, Fifteenth Ed. OIE, Paris ([www.oie.int/eng/normes/Mcode/en\\_sommaire.htm](http://www.oie.int/eng/normes/Mcode/en_sommaire.htm) accessed on 10 January 2007).