THE VOLCANIC ASH CRISIS: TOWARD A NEW PARADIGM OF RISK MANAGEMENT?

The less heralded consequence of globalization is the emergence of crises of expanding magnitude which test our ability to coordinate and swiftly execute a response. Truly global institutions such as the World Health Organization govern only specific domains and in most areas of human activity such bodies exist little, if at all. We are stuck with the question of how to respond to the new reality and it was with these stakes in mind that HEC Paris convened a workshop last November to discuss the way forward following the paralysis of European airspace in April 2010 as a result of volcanic activity in Iceland.

Revisiting the facts as they unfolded, in March 2010 the Eyjafjallajoekull volcano began to erupt, an event that would mount in scale until April 14 when magma boiled over and into the glacier covered caldera. The melting ice created an enormous plume composed of water vapor, gases, and ash that was swiftly carried by the prevailing winds to Scandinavia, northern Great Britain, and eventually continental Europe. The ash posed a direct threat to aircraft engines through potential damage caused by tiny particles of extremely abrasive materials such as silica which made up 58% of the matter contained in the cloud. Identifying an ash cloud is beyond the capabilities of on-board radar, which made the immediate response to shut down the airspace and cancel flights in affected areas until April 20 justifiable in the eyes of many considering the well understood dangers of the threat. As the crisis ran its course it went on to paralyze or seriously limit air traffic in 23 countries around the EU and its periphery bringing 300 airports to a standstill and cancelling 100,000 flights, representing three-quarters of all European traffic. Ten million individuals were affected and had to cancel their trips or find alternative travel arrangements at serious economic cost for the passengers, carriers, and insurers involved.

From the moment it began the crisis elicited polemics on the hardships passengers were forced to endure. The resulting media frenzy bled into the policy arena as frantic discussions arose inside regulatory bodies and in their dialogue with representatives from transportation agencies, governments, and private carriers. What began as a question over how to best respond to the needs of millions of stranded passengers quickly evolved into a broader discussion over the lack of flexibility and responsiveness operating at the heart of regulatory bodies. Would not the interests of all have been better served through targeted closures and a more rapid return to normal service? How and by whom were decisions made? What criteria were employed? Was it really necessary to impose such draconian restrictions on air travel?

It was from this starting point that a fresh look was taken at the way the crisis unfolded when the 1st HEC Workshop on Regulation was convened under the direction of Alberto Alemanno (HEC Paris) and Vincent Brannigan (University of Maryland). With the benefit of hindsight, and under conditions of relative tranquility, various stakeholders were invited to contribute to the creation of a shared vision on how to better regulate and orchestrate the approach taken toward crisis management. Scientists from various fields (volcanology, meteorology, law, political science) were invited to the talks, in order to found the dialogue on objective reality and better comprehend the logic of decision making when conducted under the constraints of an emergency situation. The multi-disciplinary approach aimed to dispel the myth of a one-size-fits-all solution to any crisis. To prepare for future events we must draw from multiple sources if we are to truly appreciate the complex nature of the world we live in today.

History is littered with textbook cases that provide fertile ground for an investigation into the analysis of decision making at times of crisis, explains Cliff Wirajendi (research assistant – HEC Paris), evoking the heated arguments over how to handle the bird flu crisis in 2007. Yet in most cases, only partial features have been studied and the workshop discussion was a novelty. Furthermore, the European volcanic ash crisis provides a perfect case, for many reasons including the multiplicity of actors involved, the central role of regulatory bodies, the magnitude of the economic impact, and the fuzziness of the scientific information on which decisions were based.

Indeed, can shortcomings in scientific knowledge provide a partial explanation for the crisis? Before going any further and opening up the cracks in the meteorological models we can view the problem from an engineering perspective. Only a few weeks previous to the crisis, under the auspices of the International Civil Aviation Organization (ICAO) and the World Meteorological Organization, the 5th International Workshop on Volcanic Ash was held in Chile. Alberto Alemanno reminded attendees of the final report which states, “There continues to remain no definition of a ‘safe concentration’ of ash for different aircraft, engine types or power settings. In order to give a reliable and justifiable ‘all clear’ once a plume has dispersed enough to be undetectable, clear limits of ash content are required from both the manufacturers and aviation licensing authorities.” VolcanologistDavid Pieri (CalTech et NASA) extended the idea, pointing to the critical need for an independent program of testing for engines, with publication after a thorough process of peer review. Such a program would provide more sophisticated standards for regulators to work from.

Another possible way forward would be to improve the weather forecasting system. As early as 1987 nine Volcanic Ash Advisory Centers (VAAC) had been established and a complete risk detection system is already effectively in place thanks to efforts made by the ICAO. Since 2006 the VAAC responsible for Europe has implemented its own emergency response plan, also conducting regular exercises using its alert system. Nevertheless, Doug Johnson of the British Met Office has pointed out the limited capabilities of the current system. The meteorological software employed by the VAAC is based on Lagrangian mechanics. They calculate particle dispersion through aNumerical Atmospheric-dispersion Modeling Environment (NAME). Hugely complex, this model is able to integrate variations of mass and volume of particles with wind, gravity, and even the irregular movements resulting from atmospheric turbulence. Where NAME is most useful is in estimating the horizontal extent of an ash plume and the variations within it. Where it falls short is in evaluating the vertical structure and extent of a plume. Validation experiments using unmanned aircraft equipped with instruments to provide usable data to the scientists on the ground could play a decisive role as they would provide real time verification of predictions based on mathematical models. “Currently we are without objective means to determine the vertical height of an ash cloud. We have no choice but to rely on a comparison between simulations and satellite images”, explained David Pieri, pleading the case for a more coordinated approach. Our ability to provide a more sophisticated explanation and prediction of various phenomena may also depend on better coordination between volcanologists and meteorologists.

In the days following the crisis Giovanni Bisignani, director general of the International Air Transport Association (IATA) expressed dissatisfaction with the response stating: “Europe was using a theoretical mathematical approach and this is not what you need. We needed some test flights to go into the atmosphere and assess the level of ashes and take decisions.” A point of view that is somewhat colored by his position as a representative for the interests of commercial carriers but which also supports the view of many scientists who advocate a more hands-on approach to the problem.

Were higher quality information provided, would officials be able to use it? Rémi Jouty of theFrench directorate for safety of civil aviation pointed out the lack of preparation of the European air system managers in April 2010, which translated into a total inability to adequately process the data being provided by the VAAC as the crisis unfolded. The question of how to manage large amounts of scientific information provides impetus for further investigation into the logic of crisis management. Drawing from recent experience it is clear that while part of the solution lies in refining our ability to evaluate data, the real crux of our power to respond to emergency situations rests on creating a mechanism to efficiently channel information to those most qualified to evaluate it and make decisions based on the broader picture.

In the current atmosphere of “zero tolerance” Alain Jeunemaître (École Polytechnique) makes the case for moving beyond the traditional conservative safety position where in the absence of reliable scientific data regulations impose a blanket ban on take-offs. Many would agree that the EU Denied Boarding Regulation is in need of a thorough review. Currently it is deployed on a case by case basis and was never intended to provide a management template for handling a systemic crisis spread over a wide geographical region. Morten Broberg (University of Copenhagen) weighed in on the legal foundations of the regulatory environment and recommended a more measured approach to decision making. A detailed understanding of the aircraft vulnerabilities as well as a more in-depth look at the actual composition of ash clouds would allow us to discard the all or nothing approach and identify which aircraft could fly and which routes could remain open. The result would be an enhanced ability to determine the acceptable levels of risk for any given situation.

With risk comes responsibility which is why it is all the more necessary to develop a coherent arbitration strategy that takes into account all the different criteria and parameters that could inform successful decision making and limit the inevitable risk of making a critical mistake. How do we limit the risk without returning to the “zero tolerance” model? One possibility has been suggested byChad Briggs (Air University, US Air Force) who recommends addressing plausible scenarios in advance. Meanwhile, Vincent Brannigan described how scientific and technical uncertainty affects the regulatory process in emergency situations and why it is essential to anticipate and understand uncertainty prior to an actual crisis in order to successfully surmount it. Under both scenarios, the need for competent management assumes the creation of new bodies charged with formulation and implementation of sound governance policies for the future. For the task at hand we need management that can lay claim to more than mere technical or administrative competence.

This thorny issue is of particular relevance to the European experience where national boundaries are as firmly in place as they ever were. Francisco Lopez-Jurado (University of Navarra) noted that large scale systemic crises demand an integrated approach rather than the costly ad hoc approach of individual actors bumping up against each other in a scramble to define responsibility. One alternative is the ~~methodology~~ developed at the UK’s Risk and Regulation Advisory Council which favors an acknowledgement that risk actors represent a wide range of interests and views. This would allow a crisis to unfold less as an opaque and nebulous cloud and more as a series of discrete decisions, taken as perception of risk evolves, and made operational at various stages over the course of a given event. As Rémi Jouty was quick to remind attendees, the multiplicity of actors involved in the events of 2010 included institutions such as the European Commission, Eurocontrol, EASA, and ICAO, as well as various national actors, where there has traditionally existed little overlap. In such a complex system it is

imperative to provide strong leadership for the coordination of actions. But it is also useful to create open channels of exchange and communication to ensure that with the arrival of the next disaster decisions can be made and implemented without delay.

Valentin Nikonov and Lorenza Jachia, of the United Nations Economic Commission for Europe, argue that crisis – like the Ash cloud crisis – can best be managed when the regulatory system as a whole functions effectively. To ensure this, they argue for a framework model that allows stakeholders – including regulators, business operators and enforcement bodies – to work cohesively to identify and prioritize risks, and develop strategies to manage them effectively, including by devising contingency plans that can kick in in case of emergencies.

In the absence of trust between stakeholders our proposals have little chance for success and Sweta Chakraborty (Oxford) presented some useful guidelines on how risks should be communicated in an emergency regulation scenario. Creating strong ties between organizations will count for little if there is no solid infrastructure where decision making can proceed according to strictly defined guidelines on the role of each actor.

Additionally, communication must be channeled intelligently in order to provide a coherent message to outside observers. A strong message would be of immense benefit to affected individuals as well as the wider public and will serve to replace the cacophony of voices that surrounded the last crisis with an authoritative one. According to Adam Burgess (University of Kent) the media furor surrounding the European ash crisis did not in fact provoke a public outcry over safety as would have been expected under predictions on the social amplification of risk. Regulators were however placed on the defensive through massive pressure to get planes in the air quickly.

Clearly, there are compelling reasons for building a system that facilitates the ability to identify and respond to a wide range of interests as well as understand the underlying logic that motivates them. The position of regulatory bodies is rather delicate in this regard and contributes to what Jonathan Wiener (Duke Law School) has defined as the "tragedy of the uncommons", in reference to rare, extreme catastrophic events of the type we are dealing with here. Using as a namesake the classic Garrett Hardin penned article ("Tragedy of the Commons", 1968) he goes on to explore the political economy of precautions against uncommon risks noting that those charged with preparing for such risks are in an especially weak position as there is little public support for their responsibilities. The unfortunate paradox as noted by Nick Bernard (Queen Mary University) is that the most visible actors in any crisis situation, in this case the passengers, are often those with the least say in its eventual outcomes. Occupying ourselves with their

security in the moment is all well and good but will the fundamental shortcomings of the current regulatory framework look after passenger interests when the cameras are switched off?

Using experience gleaned from the earthquake that shook the picturesque Italian town of Aquila in 2009, Alfredo Fioritto (University of Pisa) emphasized the need to formulate policy through the participation of a wide range of stakeholders in order to establish levels of risk acceptable to society as a whole. Adrien M. Viens (Queen Mary University) insisted on the necessity of establishing a dialogue where each participant feels validated if there is to be any hope of a consensus based on cooperation and shared action that rises above the narrow preferences and interests of the few.

The need for decision makers to look inward toward their own motivations is indispensible when assessing some risks. Through econometric modeling that can be used to assess the financial impact of ash related disruption on the European airline industry Maddalena Ragona (University of Bologna) clearly illustrates this point. Giuliano Castellano (École Polytechnique) takes a similar approach by proposing ex ante policy action through harnessing the power of insurance and reinsurance techniques. Christopher Lawless (LSE) takes matters a step further by demonstrating the ways in which organizations and individual actors create an identity through their perception of risk. A chance encounter between different organizations during an emergency could in this way precipitate a kind of identity crisis as divergent, or indeed opposing viewpoints come into conflict with each other. What is essential in such encounters is for those concerned to understand that risk is impossible to define as a singular entity but rather is the result of a series of different events that can be conceptualized to represent a complex stew of scientific factors and social concerns. With this in mind we can step back and better comprehend the broader economic, political, and cultural implications of our relationship to risk.

The panels of the 1st HEC Paris Workshop on Regulation fulfilled their promise and what emerged was a consensus that the best path forward was the technological approach and the creation of a centralized institution capable of rapidly producing and responding to data as catastrophes unfold. This would permit cooler heads to prevail during decision making on matters that could be politically sensitive. The EU has already taken steps in this direction by ordering the immediate creation of a crisis coordination cell made up of all the primary stakeholders and capable of mobilizing resources without delay. Yet this step will primarily serve as way of encouraging dialogue between actors and as important as it is to bring greater transparence to the modalities of decision making we need to go a step further. In order to be truly effective in times of crisis it will be necessary to constantly anticipate where the next crisis will arise, to really live in the future and use the shared experience to create a body of knowledge and a culture of deliberation that will serve in times of emergency and assure benefits for all.

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