

TMI@35

The Three Mile Island Nuclear Crisis in
Perspective: Analyses, Stories, Policies



Conference Report

In this conference, organized by Penn State Harrisburg Homeland Security Programs, several Penn State units joined forces with external experts to address the historic Three Mile Island (TMI) accident and the complexity of catastrophic events, in the nuclear sector and beyond – and which lessons were learned, or missed. Penn State Harrisburg’s Schools of Public Affairs and Behavioral Sciences and Education partnered with the Hershey College of Medicine and Penn State World Campus to organize an event on the 35th anniversary of the crisis, centered on challenges for civil security and the ways complex catastrophic events have been and continue to be attended to by industry experts, scholars, activists, and the public. The conference included a total of 36 speakers from eight U.S. states and three countries, and attracted an audience of 111, as well as considerable regional, state, and national media attention. The conference covered global and cross-disciplinary perspectives. It addressed important questions about how TMI set a precedent for nuclear security and safety, how it informed research, and how the event provided a catalyst for social change. Conference participants engaged in analyses of the event and its ramifications from the point of view of different fields of expertise, their personal stories of how they experienced the TMI crisis of 1979, and the ways that policy has been shaped since the crisis to mitigate, prepare for, respond to, and recover from complex catastrophic events.

TMI@35 Conference proceedings website – This conference report as well as the conference program brochure, conference presentations, videos, photos, and news clips from media coverage are available on: sites.psu.edu/tmi35.

About this conference report – The TMI@35 Conference included opening remarks, keynote speeches, presentations, panels and roundtables, with ample space for discussion among participants and with the audience. This report does not represent chronological or comprehensive proceedings of the TMI@35 conference but focuses on highlights and outcomes, with necessary selections to be made. This conference report was made possible through the work of the scribe team lead by *Andrea Jerković*, Director of the CEUSS | Center for European Security Studies at Sigmund Freud University Vienna, Austria. The team included *Anju Singh* and *Michael Passiment*, Research Assistants at Penn State Harrisburg’s School of Public Affairs. *Alison Shuler*, Penn State Harrisburg School of Public Affairs, provided editorial support.

Opening remarks and program overview



Chancellor *Mukund Kulkarni* of Penn State Harrisburg welcomed the honorable speakers and the audience. He recalled how the Three Mile Island accident of March 28, 1979 thirty-five years ago reverberated across the nation and throughout the World. In the words of the Nuclear Regulatory Commission, Kulkarni reminded the audience, the TMI accident was “a combination of personnel error, design deficiencies, and component failures.”¹ He also emphasized the far-reaching effects of the accident, which changed nuclear industry everywhere in the world, as fear

and distrust of nuclear power increased substantially in the minds of the public. Welcoming opening keynote speaker Governor Thornburgh – who had just assumed the office of the Governor of Pennsylvania in January 1979, for little more than two months when the incident took place – Kulkarni pointed out the multiple responsibility that was placed on the Governor to assure and calm the nervous public, to protect the people of the Commonwealth of Pennsylvania, and to coordinate with the federal government and various agencies, as well as provide support to the technical experts from around the country that had come down to take care of the damaged reactor from further deterioration.



Steven A. Peterson, Director of the School of Public Affairs, pointed in his welcoming address that the comprehensive schedule of the TMI@35 Conference gave a platform for government representatives, experts, students, stakeholders, students, media representatives, and the interested public to reflect the incident in a larger perspective and that the conference gives us a perspective of understanding future emergency management.

Catherine A. Surra, Director of the School of Behavioral Sciences and Education, emphasized how the TMI@35 program had grown out as an interdisciplinary project of multiple schools and colleges of Penn State, addressing dimensions of history, sociology, medicine, energy policy, engineering, and comprehensive security.



Alexander Siedschlag, Penn State Harrisburg School of Public Affairs and Chair of Penn State's Homeland Security Programs, as well as Chair of the TMI@35 Organizing Committee, then introduced the main objective of this program: to take the Three Mile Island nuclear crisis of 1979 as a point of departure to explore the complexity of catastrophic events, in the nuclear sector and beyond, which lessons were learned, and what the perspectives are in the era of homeland security – with homeland security based on

an all-hazards approach, its mission space including emergency management, and its ultimate goal being to deliver security to the citizens. Concepts such as preparedness and resilience being at the center of homeland security policies and strategies, Siedschlag explained, the TMI@35 Conference was also going to explore ways that policy has been shaped since the TMI

¹ United States Nuclear Regulatory Commission: Backgrounder on the Three Mile Island Accident. December 12, 2014. Retrieved December 16, 2014, from <http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/3mile-isle.html>.

crisis of 1979 to mitigate, prepare for, respond to, and recover from complex catastrophic events. Siedschlag added that the conference included global and cross-disciplinary perspectives: how TMI set a precedent for nuclear security and safety, how it informed research, and how the event provided a catalyst for social change.

As Siedschlag further mentioned, the conference was obviously not going to rewrite the history of TMI crisis of 1979, since it was even inspired – as already indicated by its title – by the seminal contribution of J. Samuel Walker, *Three Mile Island. A Nuclear Crisis in Historical Perspective*.² Sam Walker was a guest speaker at TMI@35 and shared his personal experience in writing his book. Siedschlag then recognized the eminent group of officials of 1979 that were present at TMI@35 Conference: Governor Dick Thornburgh; Robert Reid, former Mayor of Middletown Borough; Kevin Molloy, Dauphin County Civil Defense Director at the time of the accident; Harold Denton, President Carter’s personal adviser during the TMI accident; and Congressman Robert Walker.



Siedschlag went on to acknowledge the existing seminal revisits of the TMI accident, including by Penn State Scholars. For example in 2004, Bonnie Osif and colleagues published *TMI 25 Years Later: The Three Mile Island Nuclear Power Plant Accident and Its Impact*.³ That book highlighted the impact of TMI in terms of changing perception of the risks vs. the benefits of technology, and the need for comprehensive technology assessment. In an era of homeland security, Siedschlag reminded, we are confronted with similar questions regarding the field of security technologies, from body scanners to Unmanned Aerial Systems (commonly known as drones) etc.; and as homeland security today happens in the context of an all-hazards approach that among other things includes emergency management. Siedschlag said TMI was an important case to consider in homeland security studies.

He concluded by citing the 2007 *Governor’s Guide to Homeland Security* from the National Governors Association. That guide focused on the all-hazards approach and on comprehensive incident response, regardless of the character and source of the incident, as an important part of the joint responsibility to deliver security to citizens and foster a resilient nation. The guide starts with a section on the challenge of homeland security governance, citing the multiple challenges Governor Thornburgh was facing in the TMI crisis of 1979:

“Just 71 days into his term, Governor Thornburgh found himself in the national spotlight and was expected to serve expertly as the leader in a litany of complicated duties: commander-in-chief of the state forces responding to the incident, chief executive officer of the government, chief communicator to a worried public, and chief liaison to the governors of neighboring states and to the federal government.”⁴

² Walker, J. Samuel: *Three Mile Island: A Nuclear Crisis in Historical Perspective*. Berkeley, CA; Los Angeles, CA: University of California Press, 2004.

³ Osif, Bonnie A., Anthony J. Baratta & Thomas W. Conkling: *TMI 25 Years Later: The Three Mile Island Nuclear Power Plant Accident and Its Impact*. State College, PA: Penn State University Press, 2004.

⁴ The National Governors Association (NGA): *A Governor’s Guide to Homeland Security*. [Washington, DC:] National Governors Association Center for Best Practices, 2007. URL: <http://www.nga.org/files/live/sites/NGA/files/pdf/0703GOVGUIDEHS.PDF>, p. 10.

Governor Thornburgh's opening keynote speech: Three Mile Island revisited



Dick Thornburgh, former Governor of Pennsylvania (1979-1987) and former Attorney General of the United States, delivered the opening keynote speech. He shared some of the lessons learned by the government – and his biggest concern back in March 1979 as Pennsylvania's then newly elected Governor just sworn in two month before the accident: not knowing how to deal with a nuclear crisis and making strategic decisions, while “nuclear jargon was a foreign language” to him. He also remembered how it was not clear in the beginning what active, civilian role the

Governor was going to have in resolving the TMI nuclear crisis. Thornburgh explained his initial crisis management approach: to try to keep to “business as usual,” or at least “the impression thereof,” while attending to the crisis on hand in order to prevent panic among the community. In lieu of a crisis management bureaucracy capable of handling the emergency comprehensively, Thornburgh remembered how he established a “trusted ad-hocracy,” consisting of persons he knew and he had confidence in – while his background as a lawyer and an engineer helped him understand some important aspects about what was happening, or could be happening.

However, Thornburgh also remembered how the Three Mile Island nuclear power plant holding company in 1979 neglected to release crucial information for inclusion in public statements from the government of Pennsylvania, and to judiciously admit that the emergency safety system had failed. As he recalled, this informational vacuum was soon being filled by “self-appointed experts” who began to influence the flow of information. While, Thornburgh further reminisced, the accident turned out worse than first indicated but there was emerging political pressure from the federal government to tout the facility's stability to contain risk of panic. He began to look to outside sources for more credible information about the possible catastrophe, which would have been a meltdown, releasing massive amounts of radioactive material. He remembered that the public faith in and credibility of public officials was already starting to erode. One of Thornburgh's main lessons learned was that in such a complex emergency, a Governor's office must maintain its credibility and check any potential breakdown in civil security, and it must get actively involved in and committed to getting to the facts. Thornburgh mentioned one day in March 1979 where not only media but even some authorities started reporting that he was going to order an evacuation, while not even having thought or discussed about this at that point.



Later on, as Thornburgh explained, he carefully considered the risk posed to citizens by the TMI accident against the risk that an evacuation would pose, in particular to vulnerable populations like the elderly and infants in hospitals. However, also considering an alarm that was triggered accidentally and communication about a possible evacuation by local civil defense authorities, Thornburgh said he officially advised pregnant women and preschoolers to leave the area – and asked President Carter to send a representative to Harrisburg to help and

answer questions. This representative turned out to be Harold Denton, Director of the Office of Nuclear Reactor Regulation at the U.S. Nuclear Regulatory Commission.

Thornburgh, a Republican, explained that during the crisis, there was bipartisan commitment to competence at all levels of government involved, including the White House and President Carter, a Democrat. Carter's nuclear engineering background, Thornburgh and also Denton

remembered, was good to have and made a difference to the dealing with the crisis since he was well versed in nuclear power operations, malfunctions and specifics to the issue taking place at TMI. Thornburgh comment that Denton communicated admirably with the science and engineering experts, public officials, media and the public. Thornburgh's own degree in engineering gave him some versatility with the physics of the accident as well, which he said helped him in his role in the crisis.

Thornburgh recalled President Carter's visit to the TMI accident site, sending a sign to the public that that if it was safe for the President of the United States, it was safe for everyone. Thornburgh's lessons learned from his TMI crisis management among some other items included: expect the unexpected; consider that an acquainted ad-hoc can form a team "trusted ad-hocracy" and be more effective than a bureaucracy; do not be afraid of "scrambling the organizational chart" if necessary; avoid emergency actions; do not overreact by always holding news conferences; get on-site representatives; do not try to resolve the emergency away from its site; collect and evaluate facts, and communicate them carefully; involve the public and recognize that there is no partisan divide in resolving a crisis; value and learn from history; appreciate the "it ain't over till it's over" model; and prepare for the likely need to be preoccupied with questions after crisis.

Harold Denton's keynote speech: Crisis communication



Harold Denton was, as already mentioned, President Carter's personal representative for the Three Mile Island accident. At the time of the accident, he was Director of the Office of Nuclear Reactor Regulation at the United States Nuclear Regulatory Commission (NRC). Denton described how he took charge of the federal response to the TMI accident and finally became President Carter's direct reporting contact. Denton recalled Carter was very supportive throughout the TMI crisis and promised all resources of the federal government would be available, including Army and Air Force, and that the President wanted to be kept fully informed.

Denton then briefly summarized some direct improvements towards comprehensive emergency management that were implemented as a result of the TMI crisis: establishment of the Federal Emergency Management Agency (FEMA); establishment of the Institute of Nuclear Power Operations (INPO) with the mandate to ensure public safety; technical support such as adding of nuclear data links to power plant control rooms; involvement of technical experts in and training operators for roles in crisis management and communication, including accumulating data to support timely crisis decision-making. Denton also shared his lesson from TMI as to what a good crisis communicator needs. He said such a person needed competence and cognizance skills: Competence requires staying fully informed, having the ability to convey the known facts, and being comprehensible of your audience; cognizance means to actually be at the scene and address real and potential off-site consequences.

Robert Walker's keynote speech: An historical retrospective on the Three Mile Island accident



Robert Walker, former Member of Congress, Pennsylvania 16th Congressional District, shared his recollection of the TMI crisis perspective from the viewpoint of a Member of Congress serving at the time of the accident. He clearly recalled “two days of really bad information” and the reporters’ knowledge being based on the movie “China Syndrome” that just had started playing in regional cinemas one week before the accident. The movie’s fictional story is based on a core melting-down accident in a nuclear power plant in California and a political plot to

cover it up. Walker remembered how well local officials as well as Harold Denton managed the case and how Denton organized a Congressional trip to the site. He also called to mind how welcome President Carter’s visit was and that Carter was always referred to by press as nuclear engineer, since he had received that training when he served as an officer in the Navy.

Walker as well reminisced about his personal involvement in crisis management, successfully fighting TMI’s plan to dump contaminated water that they considered safe into Susquehanna River. He mentioned that at that time, this was the scientifically recommended course of action but that decisions in crisis management sometimes needed to be made against the scientific advice. Walker emphasized Harold Denton’s eminent role and achievement to put the facts together and to weigh science against public expectations and concerns when someone was desperately needed to do so.

Mark S. Singel's keynote speech: The TMI accident 1979 and enhancements to the Commonwealth's emergency preparedness and response capabilities post-TMI



Mark S. Singel, The Winter Group, was Lieutenant Governor of Pennsylvania from 1987 to 1995, and provided an assessment of the accident and its lessons learned from the point of view of his former responsibility for the Commonwealth of Pennsylvania. Those included: anticipate and get prepared; when an event occurs, communicate to the public in order to reassure them; and learn from your experience. Singel pointed out that Governor Thornburgh and his team were a phenomenal example of leadership under duress, and that

Pennsylvania has evolved from the experience. He emphasized that Pennsylvania’s Emergency Operating Commission (EOC) was the finest in the country, delivering to the crucial goal of having a real-time connection to all important resources. Singel concluded with his main lesson learned: the need to always deliver to citizens’ need for straight information in crises.

David Allard's keynote speech: TMI – Lessons learned for emergency response from the radiation protection point of view



David Allard, Director of the Bureau of Radiation Protection of Pennsylvania's Department of Environmental Protection, explained the Bureau's responsibility which includes, but is not limited to, environmental surveillance, nuclear safety, radiological emergency response, radioactive materials, nuclear facility decommissioning and site clean-up, as well as low-level waste and radon programs within the Commonwealth. Allard also explained his role as the Governor's official liaison to the U.S. Nuclear Regulatory

Commission. He also looked back on his involvement in the various aspects of governmental, industrial, reactor, medical and academic radiation protection for 36 years. Allard then reviewed the TMI 1979 accident from the environmental protection point of view and described how the Bureau of Radiation Protection was involved in the response. He argued that offsite doses of radiation always need to be put in context and cannot be regarded in isolation. Reviewing lessons learned from the accident, Allard stressed that Pennsylvania was now one of the best, if not the best, prepared U.S. state for nuclear or radiological incidents, accidents, or events.

Oral history panel – Personal recollections of the TMI accident and its implications

Expanding on the keynote speeches, an oral history panel interactively explored the – sometimes quite different – memories and recollections of those personally affected by the TMI accident of 1979, either as responders or as citizens of the area. The panel was convened by *Betsy Hancock*, lecturer in Penn State Harrisburg's School of Public Affairs undergraduate program on homeland security. The oral history panel underscored that what is believed to be facts of a crisis do not speak for themselves, not even after 35 years, and that different perspectives need to be reconciled in dialogue in order to assign meaning to crisis events, their management, and balanced critique thereof.

Kevin J. Molloy, Dauphin County Civil Defense Director at the time of the TMI accident and retiree of the Federal Emergency Management Agency (FEMA), remembered how he had come under fire for making the decision to order an evacuation in his county, but recalled that at the time, he had only two choices: either to do nothing and prepare for a potential death toll, or to declare an evacuation and prepare for the risks that come with it. He said he chose the latter and did not regret it. From a county perspective, Molloy explained major challenges in TMI crisis management in 1979 included insufficient communication skills, plans, and systems; lack of local emergency management plans and lack of practical skills following lack of participation in training; unclear duties and responsibilities; lack of understanding of radiation (with some people including first responders believing radiation was contagious); need for coordination at all levels of government and decision-making; continuity of government at state, county and local levels in case of an evacuation that would include evacuating government buildings; and lack of business continuity, such as shutting down of economy and facilities during the crisis. Lessons learned highlighted by Molloy included: preparedness begins at local level, but emergency management leadership is required at all levels; planning must not take place in a vacuum and needs to be based on an understanding of available resources that among other things include the private sector, risk assessment and management plans, and a crisis information program for the public.





Samuel Walker, historian of the Nuclear Regulatory Commission (NRC) and author of the book *Three Mile Island: A Nuclear Crisis in Historical Perspective* mentioned above, emphasized that an evacuation is a life and death situation and not an easy call to make. The suspected highly explosive hydrogen bubble in the TMI reactor building turned out to be a false alarm, but Walker said it was a possibility and needed to be investigated. He concluded it was the right thing to do although it might have contributed to reflective fear in the

public. Walker recollected how the Nuclear Regulatory Commission came under fire for “scaring” citizens through its investigating the bubble issue during the accident and described how his book sought to elaborate how the Commission’s activities in fact helped to inform, to prevent an information vacuum, and thereby to contain the risk of public panic.

Catherine A. McCormick, Penn State Harrisburg, School of Humanities, pointed out quite differently that in her memory there was no leadership experience for citizens to have in the TMI accident. She recalled that the public did not know for long what in fact was going on, which she thought was mainly because of misleading information from the media. She reminded panelists and audience that “things were already out of control” by the time Governor Thornburgh ordered a limited evacuation. McCormick vividly recollected the chaos on the roads, traffic on the wrong side of the road, and even on the grass next to the road. She remembered banks empty or closed, and no money to draw. According to her memory, everyone was in “panic mode,” there was chaos everywhere, and the government did not seem to know what was going on. McCormick left the Harrisburg area after the TMI accident to stay away for three weeks, and returned to later become a vigorous anti-nuclear activist, doing a lot of public speaking, making a film on the TMI nuclear crisis, and starting an awareness campaign in the form of a TMI newsletter. She summarized her engagement with the TMI accident in a well-honed sentence: “I went from being a neighbor to victim to activist to skeptic scholar, and back to being a neighbor.”

Todd Bacastow and *Dennis Bellafore* of the College of Earth and Mineral Sciences at Penn State University Park, both from the Geospatial Intelligence Option in Penn State’s Intercollege Master of Professional Studies program in Homeland Security (iMPS-HLS), stressed the importance of analyzing crisis like TMI in a geographically way, based upon knowledge of the danger and perception of danger, including following cognitive representations of its geographical location and reach. Applying this framework to their own behavior as residents of the area during the 1979 accident, Bacastow and Bellafore presented a side-by-side picture of their physical geographical locations at the time, their perceptive “cognitive geography,” and how that influenced their actual crisis behavior. Bacastow stayed because he perceived he was “far away” from TMI, being in Hershey at that time. Bellafore, however, left because he perceived he was “too close.”

Paula Kinney, CM&W: Concerned Mothers and Women, shared her personal experience with the audience, which was realizing that officials had no knowledge about the accident or even seemed to be lying. She said educating and empowering people during the crisis and including women in the decision process would have been a better solution. She remembered:

“[A]t the time of the TMI accident, I was a stay-at-home mother. I trusted the government. Even when family from far away called and advised me to evacuate, I did not because I trusted what Governor Thornburgh said, it was a false alarm. However, by day three, panic had struck. There was chaos on the streets, banks were closed, phones were busy, chaos at school. We went to our in-laws’ house, they

asked us to take off our clothes and take a shower as soon as we entered their house, because of the fear of contamination. Yes, bad things happen, but when they do, say something, tell us the truth. Give us the opportunity to make an informed decision. I lost trust when the same question generated a different answer depending who was asked the question. Which to me meant one of two things: They were either lying or they didn't know what the hell was going on. I then became a proactive activist. They promised a health study, but there was no follow-up. It looked like a cover-up. [...] I have since then moved 18 miles upwind from TMI.”

Heidi N. Abbey, Penn State Harrisburg Library, among other things curates a TMI special collection to which she received a couple of donations during the conference. She lived in the area as a school child when the accident happened and emphasized how TMI affected her family's consciousness:

“I was nine years old at the time of the accident. I remember we went to the Washington, DC zoo after the TMI general emergency was declared because my parents wanted to get out of the area without scaring me. However, I too have been affected by the TMI accident. My work brought me back to the area and I saw we barely have ephemera and documents from the 1979 TMI accident. I have since then worked to organize what we have and have acquired more for our library.”

Arnie Gundersen's keynote address: Thirty-five years and five meltdowns later – The real lessons of Three Mile Island



The oral history panel with its sometimes very different recollections of the same event was followed by a keynote address from one of the leading activist experts of the anti-nuclear community, *Arnie Gundersen* of Fairewinds Energy Education. He set TMI 1979 into the broader context of nuclear power plant accidents across the world and across time, comparing it to Chernobyl and Fukushima. Gundersen highlighted the following critical lessons learned: several systems failure is a reality; human beings are not infallible, even if they happen to be

engineers, and need to expect the unexpected; political systems fail, and policy-makers should be entirely informed and inform the public adequately; evacuation plans will always fail because of people's fear that does not take orders; radiation knows no borders; alternative technologies should replace nuclear technology in future; since centralized facilities such as nuclear power plants can destroy the very fabric of community when they fail; and risk is grossly underestimated. Regarding the latter, Gundersen mentioned that Nuclear Regulatory Commission data indicate that a reactor failure is estimated to happen once every 2,500 years. However, Gundersen said, historical data showed that a total of five of such failures have happened within a period of 35 years, thus evidence suggested a reactor will fail every seven years.

Thinking back on his own involvement in the TMI case, as a panel expert, he said only in 1993 did he realize that TMI operators had not told the Nuclear Regulatory Commission the truth in 1979. He added that he then felt he had been wrong in reassuring the public in his expert role after the accident. He concluded: “After seeing the records and documents, I realized that at 7 a.m. on day one, evacuation should have been ordered. From a legal standpoint the radiation levels required an evacuation order.” In the questions & answers session, Gundersen added that a lot had been done to increase accountability. He particularly noted improvements in infrastructure protection and protective security advising covering a lot of different sectors such as agriculture, transportation, etc.

Presentation: The great un-escape: Three Mile Island, Fukushima, and beyond



Hannah Spector, School of Behavioral Sciences and Education, Penn State Harrisburg, presented a critical thinking-informed view of the accident and its lessons learned. One of those lessons Spector underlined was: “We are at the mercy of the gadgets we create. We can tear down the fabrics of our humanity and planet. The only ways we can escape lethal effects of nuclear threat are: if we relocate to Mars, or clone planet Earth, or enforce banning of all nuclear plants and nuclear energy.” Spector mentioned that after Fukushima – with 300 tons

of radioactive water poured into the Pacific – Japan passed a state secret law to allow officials to not provide certain information on disasters of such kind. She added that claims of contamination of the food chain, lack of education for children in Japan about the accident, and children’s high susceptibility to the risk of cancer persist. Fukushima, Spector concluded, should therefore engage deliberative talk and action on the nuclear predicament. She explained that this deliberation would include criticism of the “macho” view that nuclear energy entails, and renewable energies do not: The field of nuclear energy is over-represented by men, thus lacking the sensitivity women could bring into this industry, Spector said, also criticizing the “energy addiction” in the U.S. that she felt added to the need to bring the feminine values to the enterprise so to weigh the political objective of energy independency with the risks involved.

Presentation: TMI and anti-nuclear activism



The TMI crisis of 1979 was an important event in the evolution of anti-nuclear activism. *Holly Angélique*, School of Behavioral Sciences and Education, Penn State Harrisburg, and *Marci Culley*, Department of Social Sciences, College of Coastal Georgia, expanded on the need for realistic risk assessment, the importance of the public’s realistic risk perception, and the important role the idea of activism had to play there. Their presentation centered on long-term TMI activism, focusing specifically on women, participation, power, the role of community

psychology in environmental disputes, media framing of dissent, and some insights from Fukushima. Key findings according to Angélique and Culley include that long-term activism is transformative (i.e., it has the power to change personal commitment, political activity, and roles of leadership). They added that while activists were often misrepresented and marginalized, they did make important contributions to policy and community: by developing important skills (e.g., organizational, professional, media relations, and public speaking); by teaching about positive aspects of being involved in communities; by using a language of “planting seeds” (people should never forget), thus facilitating community involvement; and by supporting historic shifts in policies, such as in the case of the 2005 Energy Policy Act.

Roundtable: TMI 1979 in perspective – Changes and challenges in nuclear security and safety



A roundtable hosted by *Andrea Jerković*, Director of the CEUSS | Center for European Security Studies, Sigmund Freud University Vienna, Austria, brought together perspectives from the emergency managers and the activist community. It put the TMI 1979 nuclear crisis into the broader perspective of challenges and changes in nuclear security and safety. In her summary of the panel, Jerković concluded that in the wake of the TMI accident and the criticism of its management, all levels of government improved their plans for emergency management to ensure better co-ordination and communication.

Kevin J. Molloy, retiree of the Federal Emergency Management Agency (FEMA), who spoke earlier in the conference on his memory of his role as Dauphin County Civil Defense Director at the time of the TMI accident, mentioned that back then, politics and public safety were not tied together, and they still did not always mesh. TMI 1979, he emphasized, showed that accidents did happen and that we needed greater coordination of communication between levels of government, as well as among the state level of government. Molloy concluded that emergency management was the biggest beneficiary from the TMI experience: It had saved many lives in other emergencies since 1979 and unmistakably demonstrated the value of cooperation, for example by joint investment in training.

Thomas F. Minton, III, Director of the Governor's Office of Homeland Security, Harrisburg, PA, highlighted the importance of an all-hazards approach to homeland security: to know how to be ready for natural hazards, technological problems, terrorist attacks, etc. As in the TMI case of 1979, he said fusion of information was still key to success today, in an effort to identify the various hazards to the different sectors of homeland security. Information on accidents and disasters today, "is integrated from federal level to grassroots level. We have eyes and ears looking for disasters and emergencies whether natural, criminal, technical, or terrorist. We have established an all-hazards fusion center here in Pennsylvania. There is intelligence and information sharing," said Minton.

Scott Portzline from Three Mile Island Alert, an activist organization formed after the accident, contended the TMI accident had not been unavoidable. Portzline said that the threat was known well in advance, and the TMI nuclear power plant in 1979 was seriously understaffed. He also maintained TMI was not entirely frank about reactor leak rates, in order to avoid financial losses. At the same time, Portzline said the TMI accident was still difficult to assess from the perspective of today because we even now do not exactly understand what happened: "No one knows exactly how the accident began. No one knows how much radiation was released; all published amounts are only estimates."

Robert Jacobs, Hiroshima Peace Institute, Hiroshima City University, Japan, joined the panel via Skype to introduce "The Global Hibakusha Project" on the social and cultural legacies of radiation exposures in families and communities. He underlined that exposure to radiation could have longer impacts over time than simply the medical impact. Those he said included forced removal from land, temporary housing, alteration of diet, or ending of lifestyles in an economy (effects of radiation contamination). Further, another important impact he said was the emergence of a sense of betrayal among people who were told it is safe to live near nuclear power plants. Jacobs added that people often felt they were not provided with full information, given conflicting inaccurate information, as it happened in the case of TMI 1979 as well. When

people are removed from homes, Jacobs cautioned, “you begin breaking cultures: people lose their connection to the land. We need to take account for all of the loss that has happened in people’s lives that isn’t measured in medical terms.” Therefore, Jacobs concluded it was important to study emotional and other aspects of communities affected by radiation. He added that this was a challenge because these aspects were not as easily measurable as others, whereas they could be of more severe impact than medical aspects. He also criticized typical disaster preparedness plans for rarely including thoughts about emotional or mental health and how those affect the fabric of community.

Panel: TMI and the comprehensive approach to crisis management – Cross-disciplinary perspectives



This panel explored how the TMI crisis informed the development of the comprehensive approach to crisis management and emergency response as it is known today, in an era of homeland security, or what such an approach could – or should – still learn from the TMI case. The panel was chaired by *Hannah Spector*, Penn State Harrisburg, School of Behavioral Sciences and Education.

Ken Miller, Hershey Medical Center, was appointed the Radiation Safety Manager at the Hershey Medical Center in 1979. Miller recalled that there had been a simulation of an emergency at TMI by the Medical Center before the actual accident. The program at Hershey was intended to handle between one to three radiation-exposed individuals at a time. The scenario was that TMI was going to meltdown and there would be high release of radiation. The simulation results indicated that Hershey could not really handle a response to radiation issues and that much improvising was necessary. During the actual TMI accident, Miller said the Hershey Medical Center in fact only received one person who was believed to be contaminated by radiation, but this was many days later, and the reason for the contamination was assumed to be heat exhaustion. He further mentioned emergency response procedures developed during the TMI accident were later used during 9/11 rescue efforts in 2001.

Stephen Couch, Penn State Schuylkill, emphasized that a comprehensive approach to crisis management included appropriate addressing and inclusion of social processes, as well as considering the nature of long-term disasters and chronic technological disasters that have various deeply entrenched effects. He introduced two models of crisis management: expert intervention as a top-down solution and empowering of people and communities as participatory crisis management. Couch strongly argued in favor of the latter model because crisis management and its decision-making should be seen as a process. That process he underscored needed to involve communities seriously and from the beginning, in order to build trust and address social justice issues throughout the process.



Alexander Siedschlag, School of Public Affairs, Penn State Harrisburg, spoke about the comprehensive approach to crisis management from the homeland security point of view, which he again emphasized was based on an all-hazards perspective. Seen from that point of view, Siedschlag argued, it became clear that homeland security started long before 9/11. An all-hazards perspective he explained looked at the whole range of threats related to a crisis, addressing the whole crisis management cycle (mitigation, preparedness, response, and

recovery), investigating security cultures, and following the idea of creating security as a public good and delivering it to the citizens as the ultimate end-users. A comprehensive approach to crisis management, Siedschlag explained, not also was all-hazards based but also included security governance and crisis governance. He said that while arguably, and as some panelists had illustrated, a nuclear crisis in fact is never over, crisis governance may include symbolic acts of crisis termination that may bear protracted political, organizational, social, and cultural effects. As an example, Siedschlag mentioned President Carter's visit to the TMI accident scene that terminated the crisis in terms of symbolizing that everything was safe and secure enough for the President to go there, and also put an end to massive media attention on TMI. Further, Siedschlag said a comprehensive approach needed to include resilience and the resources needed for citizen resilience to develop in different social and cultural contexts. Siedschlag argued resilience from a comprehensive approach point of view was ultimately rooted in people rather than infrastructure or technological systems. He explained crisis management needed to make sure people received the resources, including information and communication, they were feeling they required, irrespective of emergency management plans.

Richard Young, School of Business, Penn State Harrisburg, presented an extensive analysis of supply chains that flow through the Central Pennsylvania area and how a TMI incident would impact them today, for example in terms of supply chain disruptions following an evacuation. Key vulnerabilities yielded by the analysis include certain U.S. industry clusters, electrical connectors, state government, and distribution network hubs. Young concluded it was important to consider the implications of a worse accident at TMI and its impact on the millions of people in the surrounding area, as well as those relying on the supply chains.

Sandra Prince-Embury, The Resiliency Institute of Allenhurst, LLC, spoke on identifying psychosocial conditions in the community after the TMI accident, and on how to give stressful information to an already upset community. She presented at the TMI Public Health and Environmental Information Series that she led in the 1980s. This was a series of educational sessions designed to provide information to community members in a manner that they could understand, delivered by experts that they considered credible. Prince-Embury said reports of incidents during and following the TMI accident suggested that the situation had lent itself to cognitive contradiction in that area residents were given contradictory messages during and after the accident: local radio stations had reported safe conditions, cable stations at a distance were reporting warnings; and officials were offering reassuring messages to be followed by emergency evacuation instructions. She reminded that at the time, lack of consistent and accurate information was interpreted as intentional omission or falsification of information for vested interest of the information conveyers and not in the best interest of the public. Studies in the TMI Public Health and Environmental Information Series found most public interest expressed in information about cancer detection and treatment: More than half of the studies interviewees expressed interest in radiation monitoring, as well as in epidemiology of cancer. Prince-Embury concluded TMI showed the essential roles that psychological research had to play in identifying the public's information needs, designing responsive communications and evaluating their success. Fulfilling these roles she said required policies that treated two-way (government-to-citizens and citizens-to-government) communication as central.

Student panel: Policy of nuclear energy supply – History and developments since TMI



A Penn State Harrisburg student panel addressed history and developments in the policy of nuclear energy supply since the TMI nuclear crisis of 1979. *Andy Dessel*, senior undergraduate student in Penn State Harrisburg's Bachelor of Science program in Public Policy and Schreyer Honors student, provided the context for the panel with a summary of the TMI accident from the younger generation's point of view that did not witness the events of 1979. He also addressed environmental justice and said TMI had been built where it was because of

Middletown being an economically depressed area with people eager for jobs. He concluded it would always be difficult to balance considerations of environmental justice with those of economic and social justice. *Michael Passiment*, Graduate Research Assistant at Penn State Harrisburg's School of Public Affairs, gave a short introduction of nuclear energy history, pointing out advantages and disadvantages of nuclear energy as well as current efforts – such as the Nuclear Energy Research Initiative; the Advanced Fuel Cycle Initiative; and the Nuclear Waste Administration Act of 2013. *Xun (Ella) Fang*, graduate student in Penn State Harrisburg's Master of Public Administration (MPA) program, emphasized the role of operational commercial nuclear power in the U.S. She addressed challenges and recommendations regarding cost (i.e., actions to improve the economic viability), safety (i.e., growing concern about the transportation of nuclear materials), waste (i.e., implementing final disposition of spent fuel of high level radioactive waste streams), and proliferation (i.e., possible misuse of commercial or associated nuclear facilities), including acquiring nuclear power for terrorist activity.

Holly Angélique, School of Behavioral Sciences and Education, Penn State Harrisburg and *Marci Culley*, Department of Social Sciences, College of Coastal Georgia, and *Katie Taylor*, Pennsylvania Coalition Against Rape, served as discussants for the student panel. During discussion, it was pointed out that the TMI accident led to a new regulatory regime endorsed by the Nuclear Regulatory Commission that has made significant progress in the past years. Discussants also said that shifting focus and minds regarding nuclear power had to be considered, as well as political and budgetary pressure, with some subordination of regulatory bodies by financial agenda. Financial constraints however, it was concluded, may also motivate politics and industry to think outside the box and invest time and money in alternative energy, as well as in conserving energy, while it was also said that power companies produced more energy and earned more money – so that they were not interested in energy conservation.

Outlook keynote speech: Constant change demands resilience

The outlook keynote speech was given by *James M. Loy*, Chairman of the Penn State Homeland Security Advisory Council, former Deputy Secretary of Homeland Security, former Transportation Safety Authority (TSA) Administrator, and former Coast Guard Commandant. Speaking about how constant change in threats and risks demanded a resilience-centric approach, he stressed the natural human resistance to change as an absolute reality. That reality, Loy stressed, limited collective learning from the kind of experience the TMI crisis of 1979 presented, and it also limited establishing of appropriate guidelines. He said this made it even more important that to recognize the



requirements that the country had in educating the people about such events, the change they brought about, and the resilience that they required. Loy concluded that change was about four things: structure, process, ideas, and people; and that the today's National Response Framework helps us be better prepare and plan for crisis, and to foster a resilient nation in an all-hazards context.

Concluding roundtable: Challenges ahead – What we did (not) learn from TMI for the era of Homeland Security



The concluding roundtable discussed the takeaway from the conference for the era of homeland security, including which lessons were not learned or failed to learn. Chair and discussant was *Goktug Morçöl*, Penn State Harrisburg School of Public Affairs, Public Administration Program. In his introduction, he put the task of the panel in the context of research on complex systems and contributed an in-depth analysis of “normal accidents” (Charles Perrow), including nuclear accidents such as the TMI accident in 1979. *Morçöl* explained that nuclear accidents were also

complex, and we should not attempt to simplify the circumstances or our responses to them. One relevant aspect of complexity that *Morçöl* emphasized was the proliferation of public policy, and the related failure to bridge the gap between departments in planning for, responding to, and learning lessons from emergencies. The appropriate response to this failure, he said, was to build and share relationships locally. Today, *Morçöl* added, it was particularly important to foster collaborative integrated efforts to understand and protect the interdependent infrastructure of our cities, which are very vulnerable.

Scott Portzline, Three Mile Island Alert, Harrisburg, PA, maintained that we must remain critical of nuclear industry and challenged the scientific study of Three Mile Island by his own year-long experiential analysis. He also challenged Perrow’s concept of “normal accidents,” saying he himself had proven that Perrow was wrong and accidents such as TMI could relatively easily have been avoided.

Dane Egli, Johns Hopkins Applied Physics Lab, Washington, DC, shifted the focus again to the important cross-cutting aspect of resilience, and the need to really apply the lessons we have learned from TMI. Egli reminded us that all national security and homeland security begins at home and we should focus on the importance of independent critical infrastructure. The cost to harden nuclear facilities, he argued, clearly demonstrated the limits of a perimeter approach to security, because limited resources did not allow for that, and public policy failed to close the gap between levels of government. Egli further underscored the need to map interdependencies in homeland security and said a still valid lesson of TMI was that different experts and officials and levels of government should not gather information independently but that crisis decision-making should focus on “specific ligaments” that reflect critical interdependencies of systems, strategies, and communication, and specifically the impact on economy.

Marci Culley, Department of Social Sciences, College of Coastal Georgia, pointed out that there were many aspects of the TMI crisis and nuclear accidents in general that are difficult to measure. One of such aspects she emphasized was that of community psychology and the culture of ignoring risks. Culley concluded that one lesson to be still clearly learned from the TMI crisis was that risk analysis needed to include those cultural aspects that are easily overlooked in quantitative risk and security assessment.



Thomas F. Minton, III, Director of the Governor's Office of Homeland Security, Harrisburg, PA, put the TMI crisis and its lessons into the perspective of the evolution of the U.S. Department of Homeland Security, which includes FEMA and has developed a capabilities-based framework in order to be as prepared as possible. Regarding critical infrastructure protection, he echoed *Morçöl's* and *Egli's* points about focusing on interdependencies and the importance of incorporating lower levels of government into national policymaking. Minton also summarized the

main ways the creation of the U.S. Department of Homeland Security has changed the scene for emergency management, and how emergency management had evolved since the time of the TMI accident: regional resources are now better identified, information outreach between public and private sector has increased, and federal grants support preparedness at state level. Minton also reminded the audience of those factors that did not change much: We cannot exactly predict how people are going to behave in a particular emergency, and we still do not have a master plan for how to communicate to the public in a timely manner in homeland security crisis, including industrial accidents.

Kevin J. Molloy, (ret.) Federal Emergency Management Agency (FEMA), National Integration Center, Incident Management System Integration Division, and Dauphin County Civil Defense Director at the time of the TMI accident, emphasized the importance of continuity of government in his take on lessons learned from TMI. Molloy also reminded how the TMI accident taught us that preparedness begins at the local level, and that we need to effectively manage resources in emergency management, including establishing a good crisis information program. He further said TMI 1979 had shown how building good relationships with the media and other non-governmental entities can help in times of crisis. However, Molloy also pointed out some lessons he believed we had not learned. Those included that there is no room for politics in times of crisis, while it still persists at times; financial resources are limited and we cannot continue to take a reactive approach; and awareness is not always at the level of should be – too many people still believed emergencies “could not happen here,” Molloy concluded.

Alexander Siedschlag, Chair of Penn State Homeland Security Programs and Chair of the TMI@35 Organizing Committee, pointed out in his summary that we have learned a couple of lessons, both academically and practically. Those he said included the following: there effectively is no single point of responsibility for crisis communication and management, even if our books say so, because we live in an age of complex information flow and have to take into account emerging norms and roles in crisis, such as citizen journalism. Further, a disaster is not just an event, but we have to see the broader organizational, social, and cultural context, as well as to appreciate the fact that disaster events are not out there but we act on how we and others perceive them. Moreover, an event as such is not a disaster because only the multiple contexts in which it happens makes it one. An industrial accident in the desert means something different than an accident in a community, so event and accident scales as such tell us little about the actual disaster quality of an event.

Mostly, as TMI taught us, an event will become a disaster due to failure in communication and evidence-based action. We also learned that we need to accept to work with known and unknown unknowns in our crisis management efforts, and apply a comprehensive, system of systems approach. Siedschlag then echoed previous speakers' remarks that some important lessons were not learned from the TMI accident and its decade-long analysis. For example, he said, notwithstanding the focus on preparedness in homeland security and emergency management and Unites States' National Preparedness Goal, we still have to acknowledge that complex systems limit the ability of preparedness in homeland security governance.

In addition, Siedschlag pointed out that some lessons previously drawn from the TMI accident of 1979 even needed to be unlearned. Those he said included the untenable assumption that citizens do not understand complex information, systems, and emergencies. The truth rather is, Siedschlag said, that citizens need accurate and timely information to make sense of their individual situation and rationally act on it, and that the risk of reflective fear and panic to result from appropriate dissemination of information has been overestimated. He added that the assumption that citizens needed close direction in times of crisis has also been learned to be an overstated one: Citizens are capable of self-organized crisis response but again the quality and rationality of that response depends on the information they are able to use. Siedschlag ended his concluding remarks by saying that



“[t]he conference showed how important emergency management and crisis communication such as in the TMI accident 35 years ago continue to be in the era of homeland security. We need to be aware that homeland security is based on an all-hazards approach, and that it needs to be geared towards meeting the demands of the citizens, beyond abstract analyses of risk. The citizens are the ultimate end users of homeland security policy, practice, and research output.”

Summary: The meaning of TMI@35 in the era of homeland security

Summarizing the main take-away messages from the TMI@35 conference, the following can be noted in particular:

- (1) The TMI accident of 1979 and its ramifications set a precedent for nuclear security and safety because it showed the importance to think and act across the safety-security continuum. For example, the safety issue of a malfunctioning valve at TMI initiated what then evolved into the well-known accident, but this was amplified by false response from the operators, who acted in a perceptual framework that did not correspond to what was actually going on in the plant. Thus, there was an issue with the security culture of TMI key staff at this time. Moreover, the technological safety crisis that the accident was (including emission of radioactive steam into atmosphere) was amplified by a security crisis, since TMI's information policy towards the public at that time was flawed.
- (2) Today, in an era of homeland security that is rooted in an all-hazards approach and, among other things, includes the mission space of emergency management, it cannot be emphasized enough that crisis response cannot happen in silos: There is no effective incident management if the dimensions of safety and security are not addressed in their interconnections, and if the dimension of security does not include citizens, and

their perceptions and needs, as the final “end-users” of efforts to ensure safety and deliver security.

- (3) Emergency response must be based on risk management and on facing the fact that risk management includes accepting certain levels of risk that cannot be eliminated at rational efforts and costs. This is then where resilience comes in: resilience includes seeing citizens as a security resource, rather than an irrational mass of people prone to panic. We learned from TMI that any emergency management plan that does not include citizens and responsible action taken by citizens as part of the solution (as opposed to as part of the problem) will be incomplete.
- (4) In the era of homeland security after 9/11, the whole-of-community approach to fostering a resilient nation plays a prominent role. TMI tells us that homeland security to that extent in fact started in 1979. TMI made experts think of crisis, as well as response to crisis, as a system of systems, where technologies, expert communities, different levels of government and different agencies and groups of first responders must work together to serve citizen communities.

Exhibit: “Nuclear Expressions: The 1979 Nuclear Crisis Mirrored in Popular Culture”



During the conference, the exhibit “Nuclear Expressions: The 1979 Nuclear Crisis Mirrored in Popular Culture” was opened in the Penn State Harrisburg Library. This exhibition displayed 35 carefully selected ephemera and documents from the 1979 TMI accident, as well as from its consequences in emergency management and local public culture. The exhibit stayed open until August, when it provided case study material to graduate students on a residential short course on “Homeland Security: An update in Research and Trends” that was as well organized by Penn State Homeland Security Programs.

The objects displayed at the exhibit, several of which were produced around Middletown or within Pennsylvania, reflected the response to the accident by public authorities and the public at large. Several items capture the psychological anxiety and anguish that the accident created locally and worldwide, while other objects, such as the “Original Canned Radiation” and the “React-or” board game, provide a glimpse into the various ways that people tried to cope with and make sense of the worst nuclear power accident in U.S. history. In commemoration of the 35th anniversary of the TMI crisis, this archival exhibit comprised of thirty-five objects on loan from private collectors, and included materials donated to the Penn State Harrisburg Library’s Archives and Special Collections. During the TMI@35 Conference, 22 new donations were received that were included in special collection on TMI. Documentation of the exhibit, including a video tour with Governor Thornburgh, is available on the TMI@35 Conference proceedings website.



TMI@35 Conference proceedings website

This conference report as well as the conference program brochure, conference presentations, videos and photos from the conference, documentation of the “Nuclear Expressions” exhibit, and some news clips from the conference’s media coverage are available on the TMI@35 Conference proceedings website: sites.psu.edu/tmi35. Further, a TMI@35 collection is available on *Penn State ScholarSphere*: <https://scholarsphere.psu.edu/collections/sf268f97w>.

Suggestions for further reading

Selected books

- Cantelon, Philip L. & Robert C. Williams: *Crisis Contained: The Department of Energy at Three Mile Island*. Carbondale, IL: Southern Illinois University Press, 1982.
- Casamayou, Maureen Hogan: *Bureaucracy in Crisis: Three Mile Island, the Shuttle Challenger, and Risk Assessment*. Boulder, CO: Westview, 1995.
- Ford, Daniel: *Three Mile Island: Thirty Minutes to Meltdown*. Harmondsworth, Middlesex; New York, NY: Penguin Books, 1982.
- Goldstein, Raymond L. & John K. Schorr: *Demanding Democracy After Three Mile Island*. Gainesville, FL: University of Florida Press, 1991.
- Gray, Jack & Ira Rosen: *The Warning: Accident at Three Mile Island: A Nuclear Omen for the Age of Terror*. New York: W.W. Norton and Company, Inc., 1982. Published as Norton paperback with a new preface, 2003.
- Houts, Peter S., Paul D. Cleary & Teh-Wei Hu: *The Three Mile Island Crisis: Psychological, Social, and Economic Impacts on the Surrounding Population*. State College, PA: Penn State University Press, 1988.
- Keisling, William: *Three Mile Island: Turning Point*. Seattle, WA: Veritas Books, 1980.
- Lusted, Marcia A.: *Three Mile Island Nuclear Disaster*. Minneapolis, MN: ABDO Publishing Company, 2012.
- Martin, Daniel: *Three Mile Island: Prologue or Epilogue?* Cambridge, MA: Ballinger Pub. Co., 1980.
- Moss, Thomas H. & David L. Sills: *The Three Mile Island Accident: Lessons and Implications (Annals of the New York Academy of Sciences, vol. 365)*. New York: The New York Academy of Sciences, 1981.
- Neal, Arthur G.: *National Trauma and Collective Memory: Extraordinary Events in the American Century*. Armonk, NY: Sharpe, 2005, Chapter 9: “Technological Accidents,” “Three Mile Island” (152-156).
- Osif, Bonnie A., Anthony J. Baratta & Thomas W. Conkling: *TMI 25 Years Later: The Three Mile Island Nuclear Power Plant Accident and its Impact*. State College, PA: Penn State University Press, 2004.
- Perrow, Charles: *Normal Accidents: Living with High Risk Technologies*. Princeton, NJ: Princeton University Press, 1999.
- Perrow, Charles: *The Next Catastrophe: Reducing our Vulnerabilities to Natural, Industrial, and Terrorist Disasters*. Princeton, NJ: Princeton University Press, 2007.
- Rees, Joseph V.: *Hostages of Each Other: The Transformation of Nuclear Safety Since Three Mile Island*. Chicago, IL: University of Chicago Press, 1994.
- Sills, David L., C.P. Wolf & Vivien B. Shelanski (eds.): *Accident at Three Mile Island: The Human Dimensions*. Boulder, CO: Westview Press, 1982.
- Spector, Hannah: *The Primacy of the Ethical in a Cosmopolitan Education: Fukushima Daiichi and other Global Risks*. Vancouver: University of British Columbia, Ph.D. thesis, 2012. URL: <https://circle.ubc.ca/handle/2429/44350>.
- Stephens, Mark: *Three Mile Island*. New York: Random House, 1980.
- Thornburgh, Dick: *Where the Evidence Leads: An Autobiography*. Pittsburg, PA: University of Pittsburg Press, 2003, Chapter 8: “A Rough Start: Three Mile Island” (105-124).
- Thoth, L.M., A.P. Malinauskas, G.R. Eidam & H.M. Burton (eds.): *Three Mile Island Accident: Diagnosis and Prognosis*. Washington, DC: American Chemical Society, 1986.
- Tredici, Robert Del: *The People of Three Mile Island*. San Francisco: Sierra Club Books, 1980.
- Walker, J. Samuel: *Three Mile Island: A Nuclear Crisis in Historical Perspective*. Berkeley, CA; Los Angeles, CA: University of California Press, 2004.

Selected articles

- Angélique, Holly & Aja Binette: "Introducing Three Faces of Community: Responding to International Nuclear Disasters," *The Community Psychologist*, vol. 44, no. 3 (2011): 15-18.
- Angélique, Holly & Marci R. Culley: "To Fukushima with Love: Lessons on Long-term Anti-nuclear Citizen Participation from Three Mile Island," *Journal of Community Psychology* (2013). URL: <http://www.wileyonlinelibrary.com/journal/jcop>; doi: 10.1002/jcop.21605.
- Angélique, Holly & Ken Cunningham: "Media Framing of Dissent: The Case of Initial Anti-nuclear Protests Following the Three Mile Island Accident," *The Australian Community Psychologist*, vol. 18, no. 2 (2006): 42-57.
- Baum Andrew, Robert J. Gatchel & Marc A. Schaeffer: "Emotional, Behavioral, and Physiologic Effects of Chronic Stress at Three Mile Island," *Journal of Consulting and Clinical Psychology*, vol. 54, no. 4 (1983): 565-72.
- Cable, Sherry, Edward J. Walsh & Rex H. Warland: "Differential Paths to Political Activism: Comparison of Four Mobilization Processes After the Three Mile Island Accident," *Social Forces*, vol. 66, no. 4 (1983): 951-969.
- Culley, Marci R. & Holly Angélique: "Women's Gendered Experiences as Long-term Three Mile Island Activists," *Gender & Society*, vol. 17, no. 3 (2013): 445-461.
- Culley, Marci R. & Holly Angélique: "Participation, Power and the Role of Community Psychology in Environmental Disputes: A Tale of Two Nuclear Cities," *American Journal of Community Psychology*, vol. 48, no. 3/4 (2011): 410-426.
- Cunningham, Ken & Holly Angélique: "Meltdown of the Public Interest and the Need for an Engaged Public Sphere: A Critical (Re-)interpretation of the Nuclear Accident at Three Mile Island," *Humanity & Society*, vol. 34, no. 1 (2010): 64-89.
- Malmsheimer, Lonna M.: "Three Mile Island: Fact, Frame, and Fiction," *American Quarterly* 38 (Spring 1986): 35-52.
- Mercuri, Anne & Holly Angélique: "Children's Responses to Natural and Technological Disasters," *Community Mental Health Journal*, vol. 20, no. 2 (2004): 167-175.
- Mileti, Dennis S., Donald M. Hartsough, Patti Madson & Rick Hufnagel: "The Three Mile Island Incident: A Study of Behavioral Indicators of Human Stress," *International Journal of Mass Emergencies and Disasters*, vol. 2, no. 1 (1984): 89-113.
- Milspaw, Yvonne J.: "Folklore and the Nuclear Age: 'The Harrisburg Disaster' at Three Mile Island," *International Folklore Review*, vol. 1 (1981): 57-65.
- Prince-Embury, Sandra & James F. Rooney: "Psychological Adaptation of Residents Following Restart of Three Mile Island," *Journal of Traumatic Stress*, vol. 8, no. 1 (1985): 47-58.
- Prince-Embury, Sandra & James F. Rooney: "Life Stage Differences in Resident Coping with Restart of the Three Mile Island nuclear generating facility," *Journal of Social Psychology*, vol. 130, no. 6 (1990): 771-778.
- Prince-Embury, Sandra: "Information Seekers in the Aftermath of Technological Disaster at Three Mile Island," *Journal of Applied Social Psychology*, vol. 21, no. 7 (1990): 569-584.
- Prince-Embury, Sandra & James F. Rooney: "Perception of Control and Loss of Faith in Experts Among Residents in the Vicinity of Three Mile Island," *Journal of Applied Social Psychology*, vol. 17 (1987): 11.
- Siedschlag, Alexander: "Bevoelkerungszentrierte Kommunikation im Katastrophenmanagement: Wahrnehmung und Wirklichkeit" (Citizen-entered Communication in Disaster Management: Perception and reality), in Hans-Juergen Lange, Christian Endress & Michaela Wendekamm (eds.): *Versicherheitlichung des Bevoelkerungsschutzes*. Wiesbaden: Springer VS, 2014, 147-172.
- Siedschlag, Alexander & Wolf R. Dombrowsky: "Sozialwissenschaftliche Katastrophenforschung und Sicherheitsdiskurs" (Social Science Disaster Research and Security Discourse), in: Alexander Siedschlag (ed.), *Methoden der sicherheitspolitischen Analyse*. 2nd ed. Wiesbaden: Springer VS, 2014, 223-236.
- Spector, Hannah: "Fukushima Daiichi: A Never-ending Story of Pain or Outrage?," *Transnational Curriculum Inquiry*, vol. 9, no. 1 (2012): 80-97.
- Stallings, Robert A.: "Evacuation Behavior at Three Mile Island," *International Journal of Mass Emergencies and Disasters*, vol. 2 (1984): 11-26.
- Thornburgh, Richard: "The Three Mile Island Experience: Ten Lessons in Emergency Management," *Industrial Crisis Management*, vol. 1, no. 1 (1987): 5-13.

- Walker, Samuel J.: "Documenting Three Mile Island," *Bulletin of the Atomic Scientists*, Web Edition, March 18, 2009. URL: <http://thebulletin.org/documenting-three-mile-island-0>.
- Walker, Samuel J.: "From the 'Atomic Age' to the 'Anti-Nuclear Age': Nuclear Energy in Politics, Diplomacy, and Culture," in Roy Rosenzweig & Jean-Christophe Agnew (eds.): *Blackwell Companion to Post-1945 America*. Malden, MA: Blackwell, 2002, 501-518.
- Walker, Samuel J.: "Regulating Against Nuclear Terrorism: the Domestic Safeguards Issue, 1970-1979," *Technology and Culture*, vol. 42 (2001): 107-32.
- Zorpette, Glenn: "From Three Mile Island to Fukushima Daiichi: How IEEE Spectrum Covered two of the Biggest Nuclear Disasters in History," *IEEE Spectrum*, blog post, February 28, 2014. URL: <http://spectrum.ieee.org/energy/nuclear/from-three-mile-island-to-fukushima-daiichi>.

Selected government reports

- Pennsylvania. Governor's Commission on Three Mile Island: *Report of the Governor's Commission on Three Mile Island. Presented To: Honorable Dick Thornburgh, Governor, Commonwealth of Pennsylvania*. Harrisburg, PA, February 26, 1980. URL: <http://www.threemileisland.org/downloads//199.pdf>.
- Pennsylvania. Governor's Office of Policy and Planning, in cooperation with the Department of Agriculture: *Socio-economic Impacts of the Three Mile Island Accident: Final Report*. Harrisburg, PA: The Office, 1980.
- United States. President's Commission on the Accident at Three Mile Island [John G. Kemeny et al.]: *Need for Change, the Legacy of TMI: Report of the President's Commission on the Accident at Three Mile Island*. Washington, DC: The Commission, 1979. URL: <http://www.threemileisland.org/downloads/188.pdf>.
- United States. President's Commission on the Accident at Three Mile Island. Emergency Preparedness and Response Task Force [Russell R. Dynes et al.]: *Report of the Emergency Preparedness and Response Task Force. Staff Report to the President's Commission on the Accident at Three Mile Island*. Washington, DC: The Task Force, 1979. URL: <http://www.threemileisland.org/downloads//189.pdf>.
- United States. President's Commission on the Accident at Three Mile Island. Public's Right to Information Task Force [David M. Rubin et al.]: *Report of the Public's Right to Information Task Force. Staff Report to the President's Commission on the Accident at Three Mile Island*. Washington, DC: The Task Force, 1979. URL: <http://www.threemileisland.org/downloads/192.pdf>.

Selected videos

- Meltdown and Three Mile Island* (1999). URL: <https://www.youtube.com/watch?v=mlWfQTkR6y8>.
- Three Mile Island Nuclear Accident Documentary Film* (1982). URL: <http://www.youtube.com/watch?v=jeAX5TtuXoY>.
- Inviting Disaster: Three Mile Island Nuclear Power Station Meltdown* (Modern Marvels). URL: <https://www.youtube.com/watch?v=JxZCKKfbLEA>.

Selected websites

- Three Mile Island: An Interdisciplinary Research Guide (Penn State University Libraries). URL: <http://www.libraries.psu.edu/psul/researchguides/enginist/threemileisland.html>.
- Three Mile Island Emergency (Dickinson College) – virtual museum and resource center. URL: <http://www.threemileisland.org>.
- Three Mile Island Alert (activist website). URL: <http://www.tmia.com>.

Miscellaneous

The National Governors Association (NGA): *A Governor's Guide to Homeland Security*. [Washington, DC:] National Governors Association Center for Best Practices, 2007. URL: <http://www.nga.org/files/live/sites/NGA/files/pdf/0703GOVGUIDEHS.PDF>.

In the introduction, "What a New Governor Should Know" (p. 10), the link between homeland security and emergency management, and the Three Mile Island accident, is explained in the context of homeland security governance and delivering to citizens' expectations, with Governor Thornburgh's comprehensive responsibility during the TMI accident used as the example.

TMI@35 Conference report editor

Alexander Siedschlag, Ph.D.

Professor of Homeland Security and Public Health Preparedness

Chair of Penn State Homeland Security Programs

School of Public Affairs

Phone: (717) 948-4326

E-mail: siedschlag@psu.edu

<http://harrisburg.psu.edu/public-affairs/homeland-security/master-homeland-security>

Photos

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