Chapter 3 – Mitigation Ideas

            A major objective in disaster management is the reduction of damage (mitigation) associated with natural or manmade disasters.  One determination involves analysis of the ideas dealing with mitigation and related terms. This analysis considers ideas presenting mitigation as the primary term with a related term, thus completing the definition of an idea. The ideas are presented in two ways.  The first is the declaration of facts detailing what has been studied.  The second considers possible research designs by arranging the ideas in ways not previously considered.  The reader is challenged to interpret the results in terms of effective or less than effective management.  In addition, the reader is challenged to estimate the additional knowledge acquired.

This analysis involved 493 documents linking mitigation with related terms to yield 2608 ideas. They were entered in PubMed during 1990 - 2016. Table 1 contains a partial listing of the terms linked with the primary term. The full vocabulary is given in the Appendix. That array also shows the classification of ideas within the dimensions.

Table 1. Partial List of Terms Linked with Mitigation 1990-2016

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **mitigation** | **Freq** | **mitigation** | **Freq** | **mitigation** | **Freq** |
| **Total** | **2608** | **Total** | **2608** | **Total** | **2608** |
| **disaster** | **134** | **prevent** | **19** | **framework** | **13** |
| **response** | **70** | **recover** | **19** | **future** | **13** |
| **hazard** | **58** | **consequence** | **18** | **hurricane** | **13** |
| **health** | **56** | **recovery** | **18** | **loss** | **13** |
| **management** | **44** | **cause** | **17** | **policies** | **13** |
| **planning** | **34** | **education** | **17** | **problem** | **13** |
| **event** | **33** | **research** | **17** | **radiation** | **13** |
| **flood** | **33** | **effect** | **16** | **action** | **12** |
| **strategies** | **33** | **exposure** | **16** | **disease** | **12** |
| **emergency** | **28** | **intervention** | **16** | **earthquake** | **12** |
| **climate** | **26** | **change** | **15** | **government** | **12** |
| **nation** | **26** | **communities** | **15** | **injury** | **12** |
| **public** | **26** | **formation** | **15** | **process** | **12** |
| **mental** | **25** | **natural** | **15** | **economic** | **11** |
| **community** | **24** | **hospital** | **14** | **medical** | **11** |
| **damage** | **24** | **stress** | **14** | **occurrence** | **11** |
| **provide** | **23** | **benefit** | **13** | **resilience** | **11** |
| **development** | **20** | **exist** | **13** | **social** | **11** |

The earliest document entered into PubMed dealing with mitigation was 1990. The author was Executive Director of the Commission on Geosciences, Environment and Resources National Research Council. The importance of mass media in disaster management was stressed but not how that process would work or the research findings supporting that effort.

**Exhibit 1. 1990 Announcement by the US Government.**

[Rattien S](https://www.ncbi.nlm.nih.gov/pubmed/?term=Rattien%20S%5BAuthor%5D&cauthor=true&cauthor_uid=20958692)1. **The role of the media in hazard mitigation and disaster management.** [Disasters.](https://www.ncbi.nlm.nih.gov/pubmed/?term=20958692) 1990 Mar;14(1):36-45. doi: 10.1111/j.1467-7717.1990.tb00970.x. PMID: 20958692

The International Decade for Natural Disaster Reduction, which began in January 1990, will embrace efforts to reduce death, injury and property losses stemming from rapid-onset natural disasters. Our expanding science and technology base makes possible this concerted cooperative international effort, and communications is a central part of that effort - for public education, early warning, evacuation and coordination of post-disaster relief. Mass communication is inextricably entwined with disasters and hazard mitigation. Reflecting the public's great interest and concern, the electronic and print media extensively cover natural disasters and significantly affect how and what the public learns about and how it perceives natural hazards. Improving the linkages between the media and disaster-mitigation researchers and practitioners could prepare the public to act promptly on warnings, helping to mitigate disasters. This could also accelerate the shift of the societal emphasis from post-disaster relief toward pre-disaster initiatives.

Exhibit 2 describes an appeal for a renewed emphasis on mitigation in risk management. The author states that all segments of the population, and especially, the poor, benefit from this. However, the author doesn’t cite the most important feature. That would be research into mitigation procedures making that efficient. The current situation relies on opinions from politicians and subject specialists. While these opinions may or may not be best and closely held for numerous reasons, they are not facts. Instead, they summarize a position held by the individual using private and/or public reasons.

Exhibit 2. An Appeal for Renewed Attention to Mitigation.

[Christoplos I](https://www.ncbi.nlm.nih.gov/pubmed/?term=Christoplos%20I%5BAuthor%5D&cauthor=true&cauthor_uid=11570333)1, [Mitchell J](https://www.ncbi.nlm.nih.gov/pubmed/?term=Mitchell%20J%5BAuthor%5D&cauthor=true&cauthor_uid=11570333), [Liljelund A](https://www.ncbi.nlm.nih.gov/pubmed/?term=Liljelund%20A%5BAuthor%5D&cauthor=true&cauthor_uid=11570333). Re-framing risk: the changing context of disaster mitigation and preparedness. [Disasters.](https://www.ncbi.nlm.nih.gov/pubmed/?term=11570333) 2001 Sep;25(3):185-98. PMID: 11570333

This issue of Disasters explores the roles of NGOs and other actors in disaster mitigation and preparedness and also reviews broad international trends in risk management and disaster prevention. The need to address risk, and with that the motivation to improve disaster mitigation and preparedness, has tended to fall between the cracks of grander frameworks of development co-operation and humanitarian assistance. Despite the seemingly glaring need to reduce the horrific impact of floods, droughts and wars, disaster mitigation and preparedness have neither the allure of directly 'saving lives', nor of providing an 'escape from poverty'. There are, however, signs that risk management is becoming a mainstream concern. Factors such as the need to address factors that do not fit into traditional slots on the relief-development continuum, the rising economic costs of disasters and a growing acknowledgement that aid will never cover more than a small fraction of the costs of disasters are all leading to new approaches, priorities and institutional configurations. A realisation that dealing with risk and insecurity is a central part of how people develop their livelihood strategies has begun to position disaster mitigation and preparedness within many poverty alleviation agendas. A number of long-standing challenges remain; most of all, the complexities of maintaining the political will that is needed to ensure that risk management becomes more than a passing fad.

Exhibit 3 shows an analysis of food and waterborne disease before and after Hurricane Sandy in New York City. The classic epidemiologic design was employed in comparing the hospital discharges due to food and waterborne disease from hospitals before and after Hurricane Sandy. The authors indicated that discharges following the Hurricane was less than before. They stated that mitigation procedures were involved in protecting the population although none of the specifics were cited.

Exhibit 3. Food and/or Waterborne Disease following Hurricane Sandy in New York City.

[Bloom MS](https://www.ncbi.nlm.nih.gov/pubmed/?term=Bloom%20MS%5BAuthor%5D&cauthor=true&cauthor_uid=27181600)1, [Palumbo J](https://www.ncbi.nlm.nih.gov/pubmed/?term=Palumbo%20J%5BAuthor%5D&cauthor=true&cauthor_uid=27181600)1, [Saiyed N](https://www.ncbi.nlm.nih.gov/pubmed/?term=Saiyed%20N%5BAuthor%5D&cauthor=true&cauthor_uid=27181600)2, [Lauper U](https://www.ncbi.nlm.nih.gov/pubmed/?term=Lauper%20U%5BAuthor%5D&cauthor=true&cauthor_uid=27181600)1, [Lin S](https://www.ncbi.nlm.nih.gov/pubmed/?term=Lin%20S%5BAuthor%5D&cauthor=true&cauthor_uid=27181600)1. Food and Waterborne Disease in the Greater New York City Area Following Hurricane Sandy in 2012. [Disaster Med Public Health Prep.](https://www.ncbi.nlm.nih.gov/pubmed/?term=27181600) 2016 Jun;10(3):503-11. doi: 10.1017/dmp.2016.85. Epub 2016 May 16. PMID: 27181600

#### OBJECTIVE:

We aimed to evaluate residence in evacuation areas (storm areas) as a risk factor for food and waterborne disease (FWBD) associated with Hurricane Sandy flooding.

#### METHODS:

We captured 9601 incident outpatient and inpatient FWBD hospital discharge diagnoses for residents of the greater New York City area. We used Poisson or negative binomial regression models to compare the covariate-adjusted risk for a FWBD diagnosis, pre-Sandy (10/28-11/09, 2001-2011) vs. post-Sandy (10/28-11/09, 2012), for residents of "storm" and "non-storm" areas.

#### RESULTS:

Outpatient FWBD risk was lower for storm area residents after Hurricane Sandy (risk ratio [RR]=0.58, 95% confidence interval [CI]: 0.46-0.74), and varied by age, sex, and county. However, storm area residents 65 years of age or older experienced higher risk after Hurricane Sandy (RR=2.16, 95% CI: 1.11-4.19), albeit based on few cases. Inpatient FWBD risk was lower for non-storm area residents after Hurricane Sandy (RR=0.79, 95% CI: 0.66-0.95), and varied by age, race, and county, although there was no significant change for storm area residents (RR=0.86, 95% CI: 0.69-1.08). Those ≥65 years of age were also at lower risk for inpatient FWBD diagnosis, yet the effect was weaker for storm area (RR=0.89, 95% CI: 0.67-1.18) than for non-storm area residents (RR=0.68, 95% CI: 0.52-0.89).

#### CONCLUSIONS:

Hurricane preparation, mitigation, and response activities in the greater New York City area may have led to "protective" effects for FWBD. (Disaster Med Public Health Preparedness. 2016;10:503-511).

Research Designs Possible?

The ideas involving – mitigation – as the primary term, may be used as independent building blocks. This fact raises the possibility that new research designs might be identified. Table 3 lists the terms linked with mitigation, classified into dimensions. The dimensions (Chapter 1) are organized from Personal 🡪 Methods.

# Table 3A. Possible Research Designs using Mitigation Ideas as

Building Blocks – Personal, Environmental, Subject Dimensions.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Personal** | **Freq** | **Environment** | **Freq** | **Subject** | **Freq** |
| **behavior** | **10** | **climate** | **26** | **disaster** | **134** |
| **vulnerability** | **9** | **nation** | **26** | **hazard** | **58** |
| **age** | **8** | **public** | **26** | **flood** | **33** |
| **perception** | **8** | **community** | **24** | **emergency** | **28** |
|  |  | **communities** | **15** | **damage** | **24** |
|  |  | **natural** | **15** | **cause** | **17** |
|  |  | **economic** | **11** | **education** | **17** |
|  |  | **social** | **11** | **hurricane** | **13** |
|  |  | **environment** | **10** | **disease** | **12** |
|  |  | **global** | **10** | **earthquake** | **12** |
|  |  | **international** | **10** | **injury** | **12** |
|  |  | **people** | **8** | **knowledge** | **10** |
|  |  | **population** | **7** | **pandemic** | **10** |
|  |  | **coastal** | **5** | **crisis** | **9** |
|  |  |  |  | **danger** | **6** |
|  |  |  |  | **injuries** | **6** |
|  |  |  |  | **drought** | **5** |
|  |  |  |  | **illness** | **5** |

Table 3B. Possible Research Designs using Prevention Ideas as Building Blocks – Interventional, Outcome, and Methods Dimensions.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Intervention** | **Freq** | **Outcome** | **Freq** | **Methods** | **Freq** |
| **management** | **44** | **response** | **70** | **planning** | **34** |
| **prevent** | **19** | **health** | **56** | **strategies** | **33** |
| **intervention** | **16** | **mental** | **25** | **provide** | **23** |
| **hospital** | **14** | **recover** | **19** | **development** | **20** |
| **policies** | **13** | **recovery** | **18** | **research** | **17** |
| **radiation** | **13** | **effect** | **16** | **framework** | **13** |
| **government** | **12** | **exposure** | **16** | **problem** | **13** |
| **medical** | **11** | **change** | **15** | **process** | **12** |
| **policy** | **9** | **stress** | **14** | **structure** | **11** |
| **service** | **8** | **benefit** | **13** | **access** | **10** |
| **clinic** | **7** | **loss** | **13** | **model** | **9** |
| **prevention** | **5** | **occurrence** | **11** | **strategy** | **9** |
| **vaccine** | **5** | **resilience** | **11** | **studies** | **9** |
|  |  | **risk** | **9** | **support** | **9** |
|  |  | **adaptation** | **8** | **training** | **8** |
|  |  | **reduce** | **8** | **assess** | **7** |
|  |  | **morbid** | **6** | **construction** | **7** |
|  |  | **contamination** | **5** | **demonstrate** | **7** |
|  |  | **outcome** | **5** | **analysis** | **6** |
|  |  | **reduction** | **5** | **communication** | **6** |
|  |  | **responder** | **5** | **evidence** | **6** |
|  |  |  |  | **measure** | **5** |
|  |  |  |  | **mechanism** | **5** |
|  |  |  |  | **planner** | **5** |
|  |  |  |  | **significant** | **5** |
|  |  |  |  | **skill** | **5** |

Table 4 shows some of the research designs. Each design shows one term from each of the dimensions. The selection is based on the most frequently cited, then the next most frequently, etc. The ideas can be combined because of their independence. The challenge is to determine the potential benefit in terms of increased knowledge. To do that, one approach would be based on the hypothesis or problem statement addressed. To construct those descriptive statements, the dimensions are considered from right to left, beginning with the outcome dimension. Some of these are shown in Exhibit 4. The Appendix displays the terms linked with – Mitigation – classified into dimensions.

Table 4. Possible Research Designs based on Frequency of Citation.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Personal** | **Environment** | **Subject** | **Interventional** | **Outcome** | **Methods** |
| **behavior** | **climate** | **disaster** | **management** | **response** | **planning** |
| **Vulnerability** | **nation** | **hazard** | **prevent** | **health** | **strategies** |
| **Age** | public | flood | Interventional | mental | provide |

**Etc. Etc**.

Exhibit 4. Hypotheses or Problem Statements Associated with the Different Research Designs in Table 4.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **First Design:** |  |  |  |  |  |
| **Personal** | **Environment** | **Subject** | **Interventional** | **Outcome** | **Methods** |
| **behavior** | **climate** | **disaster** | **management** | **Response** | **Planning** |
| **First Hypothesis:** | |  |  |  |  |
| **Outcome** | **Intervention** | **Subject** | **environment** | **Personal** |  |
| **Response** | **management** | **disaster** | **climate** | **Behavior** |  |
| **Statement:** |  |  |  |  |  |
| **Mitigation is intended to protect response to disasters by proper management** | | | | | |
| **control of climate.** | |  |  |  |  |
| **Second Design:** | |  |  |  |  |
| **Personal** | **Environment** | **Subject** | **Interventional** | **Outcome** | **Methods** |
| **Vulnerability** | **nation** | **hazard** | **prevent** | **Health** | **Strategies** |
| **Second Hypothesis:** | |  |  |  |  |
| **Outcome** | **Intervention** | **Subject** | **environment** | **Personal** |  |
| **Health** | prevent | hazard | nation | vulnerability |  |
| **Statement:** |  |  |  |  |  |
| **Mitigation procedures are intended to preserve health by preventing hazards and minimize vulnerability.** | | | | | |
| **Third Design:** |  |  |  |  |  |
| **Personal** | **Environment** | **Subject** | **Interventional** | **Outcome** | **Methods** |
| **Age** | Public | flood | Interventional | Mental | Provide |
| **Third Hypothesis:** | |  |  |  |  |
| **Outcome** | **Intervention** | **Subject** | **environment** | **Personal** |  |
| **Mental** | Intervention | flood | public | Age |  |
| **Statement:** |  |  |  |  |  |
| **Mitigation procedures preserve mental health by introducing appropriate** | | | | |  |
| **interventions to combat flood conditions and preserve all age segments.** | | | | |  |
| **The relevant methods provide procedures in meeting disaster conditions.** | | | | |  |

Exhibit 4 shows three of the research designs and their associated statements. Each of the terms in the vocabulary can be selected for inclusion in a design. Not all combinations will be considered informative in terms of new knowledge. Many will. The interesting feature of this construction process is that both qualitative and quantitative designs may be formulated. Accordingly, the design process is simplified by using this algorithm. The creative path leading to the hypothesis/problem statement is clear. The particular arrangement of ideas used in the design may be based on frequency of citation (see Table 4) or on the human analyst’s preferences (see Appendix). In either case, the selection can be made transparent and human creativity/intelligence are maintained in a world where artificial intelligence is intriguing. The assistance in developing effective research designs is clear.

Table 5 illustrates that process by selecting the least frequently cited ideas from the dimensions.

Table 5. Formulation of the Hypothesis for a Research Design involving the lowest frequency ideas.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Last Design:** |  |  |  |  |  |
| **Personal** | **Environment** | **Subject** | **Interventional** | **Outcome** | **Methods** |
| **behavior** | **coastal** | **illness** | **vaccine** | **responder** | **skill** |
| **First Hypothesis:** | |  |  |  |  |
| **Outcome** | **Intervention** | **Subject** | **environment** | **Personal** |  |
| **Responder** | **vaccine** | **illness** | **coastal** | **Behavior** |  |
| **Statement:** |  |  |  |  |  |

**The administration of vaccine is designed to modify the illness and protect the responders. Individuals living on coastal lands face dangers from both wind and water events.**

Subject specialists will have to decide the merits of each design. Even the lowest frequency organization of ideas may have merit.

Ample current supplies of medical agents (i.e., vaccines) is a significant component in the war against disasters.

Appendix

The terms linked with mitigation are arranged by dimension and within each by frequency of citation.

|  |  |  |
| --- | --- | --- |
| **mitigation** | **Freq** | **Dimension** |
| **climate** | **26** | **environment** |
| **nation** | **26** | **environment** |
| **public** | **26** | **environment** |
| **community** | **24** | **environment** |
| **communities** | **15** | **environment** |
| **natural** | **15** | **environment** |
| **economic** | **11** | **environment** |
| **social** | **11** | **environment** |
| **environment** | **10** | **environment** |
| **global** | **10** | **environment** |
| **international** | **10** | **environment** |
| **people** | **8** | **environment** |
| **population** | **7** | **environment** |
| **coastal** | **5** | **environment** |
| **management** | **44** | **intervention** |
| **prevent** | **19** | **intervention** |
| **intervention** | **16** | **intervention** |
| **hospital** | **14** | **intervention** |
| **policies** | **13** | **intervention** |
| **radiation** | **13** | **intervention** |
| **government** | **12** | **intervention** |
| **medical** | **11** | **intervention** |
| **policy** | **9** | **intervention** |
| **service** | **8** | **intervention** |
| **clinic** | **7** | **intervention** |
| **prevention** | **5** | **intervention** |
| **vaccine** | **5** | **intervention** |
| **planning** | **34** | **method** |
| **strategies** | **33** | **method** |
| **provide** | **23** | **method** |
| **development** | **20** | **method** |
| **research** | **17** | **method** |
| **framework** | **13** | **method** |
| **problem** | **13** | **method** |
| **process** | **12** | **method** |
| **structure** | **11** | **method** |
| **access** | **10** | **method** |
| **model** | **9** | **method** |
| **strategy** | **9** | **method** |
| **studies** | **9** | **method** |
| **support** | **9** | **method** |
| **training** | **8** | **method** |
| **assess** | **7** | **method** |
| **construction** | **7** | **method** |
| **demonstrate** | **7** | **method** |
| **analysis** | **6** | **method** |
| **communication** | **6** | **method** |
| **evidence** | **6** | **method** |
| **measure** | **5** | **method** |
| **mechanism** | **5** | **method** |
| **planner** | **5** | **method** |
| **significant** | **5** | **method** |
| **skill** | **5** | **method** |
| **response** | **70** | **outcome** |
| **health** | **56** | **outcome** |
| **mental** | **25** | **outcome** |
| **recover** | **19** | **outcome** |
| **recovery** | **18** | **outcome** |
| **effect** | **16** | **outcome** |
| **exposure** | **16** | **outcome** |
| **change** | **15** | **outcome** |
| **stress** | **14** | **outcome** |
| **benefit** | **13** | **outcome** |
| **loss** | **13** | **outcome** |
| **occurrence** | **11** | **outcome** |
| **resilience** | **11** | **outcome** |
| **risk** | **9** | **outcome** |
| **adaptation** | **8** | **outcome** |
| **reduce** | **8** | **outcome** |
| **morbid** | **6** | **outcome** |
| **contamination** | **5** | **outcome** |
| **outcome** | **5** | **outcome** |
| **reduction** | **5** | **outcome** |
| **responder** | **5** | **outcome** |
| **behavior** | **10** | **personal** |
| **vulnerability** | **9** | **personal** |
| **age** | **8** | **personal** |
| **perception** | **8** | **personal** |
| **flood** | **33** | **subect** |
| **disaster** | **134** | **Subject** |
| **hazard** | **58** | **Subject** |
| **emergency** | **28** | **Subject** |
| **damage** | **24** | **Subject** |
| **cause** | **17** | **Subject** |
| **education** | **17** | **Subject** |
| **hurricane** | **13** | **Subject** |
| **disease** | **12** | **Subject** |
| **earthquake** | **12** | **Subject** |
| **injury** | **12** | **Subject** |
| **knowledge** | **10** | **Subject** |
| **pandemic** | **10** | **Subject** |
| **crisis** | **9** | **Subject** |
| **danger** | **6** | **Subject** |
| **injuries** | **6** | **Subject** |
| **drought** | **5** | **Subject** |
| **illness** | **5** | **Subject** |
| **Total** | **2608** |  |