

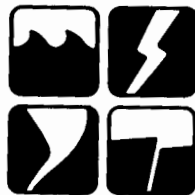
Natural Hazard Research

GLOBAL TRENDS IN NATURAL DISASTERS
1947-1973

by

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Working Paper #26

PREFACE

This paper is one in a series on research in progress in the field of human adjustments to natural hazards. It is intended that these papers will be used as working documents by the group of scholars directly involved in hazard research as well as inform a larger circle of interested persons. The series is now being supported from funds granted by the U.S. National Science Foundation to the University of Colorado and Clark University. Authorship of papers is not necessarily confined to those working at these institutions.

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While the number of major natural disasters has been dropping over the last twenty-seven years, the number of disasters covering large areas has been increasing during the same time period. Deaths have also been rising steadily from 1947 to 1973. Finally, those countries with the highest number of deaths/million are located in unstable geologic areas, where earthquakes and volcanoes are common, or zones of frontal interaction, where tropical cyclones are frequent. This paper is an attempt to take another look at global trends since the Hewitt and Sheehan Working Paper No. 11, A Pilot Survey of Global Natural-Disasters of the Past Twenty Years, which was completed six years ago.

In order to be able to easily follow those trends which were traced from 1947 - 1967 this paper's methodology is consistent with that used in the Hewitt and Sheehan paper:

A major disaster was defined as one which satisfied at least one of the following operational conditions:

- i) At least \$1,000,000 damage
- ii) At least 100 persons dead
- iii) At least 100 persons injured

The data was compiled from:

- i) New York Times Index (with reference to original reports where necessary)
- ii) Encyclopedia Britannica Yearbook
- iii) Collier's Encyclopedia Yearbook
- iv) The American People's Encyclopedia Yearbook
- v) Keessing's Contemporary Archives
- vi) Miscellaneous collections of data on particular hazards contained in our own library (these were generally used as checks).

In the presentation of the data we adopted a convention of locating in terms of 10° (latitude by longitude) square units.

There are a number of limitations to this methodology. First, the classification of one hundred people dead, or one hundred people injured, or one million dollars damage is crude at best. In going through the data one sometimes had to include as a major disaster 100 persons ill from heatwave, while excluding a disaster where 99

persons had died in a flood. Second, the data sources used gave an incomplete global picture. Whole subcontinental areas were unrepresented: much of northern Europe, most of western, middle, eastern, and southern Africa, and the USSR did not appear in the reporting. Since the study has been limited to post-World War II years communication patterns were assumed to be pretty stable, however, there was at least one exception: China. Since the early fifties, reporting on China has continued to decrease and in the past six years there were no reports of natural disasters at all. Third, the classification system as well as the data sources used gave a strong US bias to the number of major disasters reported. Thus, many US events were included because of economic damage estimated at the \$1,000,000 mark, while the same relative intensity disaster would not be included in the reporting for example of Canadian news.

Droughts could not be included in the analysis of the data because of the special nature of the disaster. As noted by Hewitt and Sheehan, reporting practices did not distinguish between a continuing drought and a new drought; a real differentiation between droughts and the territorial boundaries of droughts were also unclear.

The total number of disasters for the twenty-seven years was 833 giving an average of 31 per year. The number in any given year was fairly consistent with this figure, while the number of large-area disasters, those covering more than one 10^6 - square unit has been increasing.

TABLE 1

<u>Year</u>	<u>Disasters</u>	<u>Large Area Disasters</u>
1947	30	3
1948	45	3
1949	31	2
1950	35	3
1951	33	4
1952	28	9
1953	45	5
1954	35	4
1955	33	3
1956	28	6
1957	34	2
1958	25	6
1959	31	10
1960	34	9
1961	25	4
1962	24	1
1963	32	4
1964	28	8
1965	26	7
1966	29	3
1967	30	2
1968	38	10
1969	25	8
1970	24	8
1971	26	5
1972	33	9
1973	29	10

The five-year running averages of these figures along with the five-year running averages of deaths/million population are shown in Graph 1.

(See Graph 1) Deaths/million was calculated by taking the total number of deaths over the twenty-seven year period and dividing by the 1973 population. Large-Area Disasters are listed in Appendix 1. For each year the natural agent, location, month of occurrence and number 10° squares of latitude x longitude are listed. Floods, hurricanes, and tornadoes are the most common causes of large area disasters.

The repetitive mention of East Pakistan and the Philippines is in part due to their location as these countries happen to lie on the boundary between two different 10° (latitude x longitude) square units.

(See Appendix 1)

The number of major disasters due to flood continued to be the greatest by far, especially if you include damage due to flooding occurring from other type natural disasters.

TABLE 2

<u>Agent</u>	<u>No. of Disasters</u>
Floods	269
Typhoons, hurricanes, cyclones	169
Earthquakes	115
Tornadoes	95
Thunderstorms	35
Snowstorms	31
Heatwaves	21
Coldwaves	13
Volcanoes	13
Landslides	21
Rainstorms	21
Avalanches	11
Tidal waves	5
Fogs	3
Frost	2
Sand and Dust storms	2

The Loss of Life from Disaster Impacts are listed in Appendix 2 by country, and by deaths/million population. Deaths vary greatly between countries in the same continent and between continents. In some areas such as parts of Africa scanty reporting has meant only a few disasters which means that deaths/million is a less reliable figure. (See Appendix 2)

Loss of Life by Disaster Type indicates deaths by continent and by natural agent. Those continents with large populations, like Asia, have very high losses, but when these losses are corrected for population these differences become less clear. (See Appendix 3)

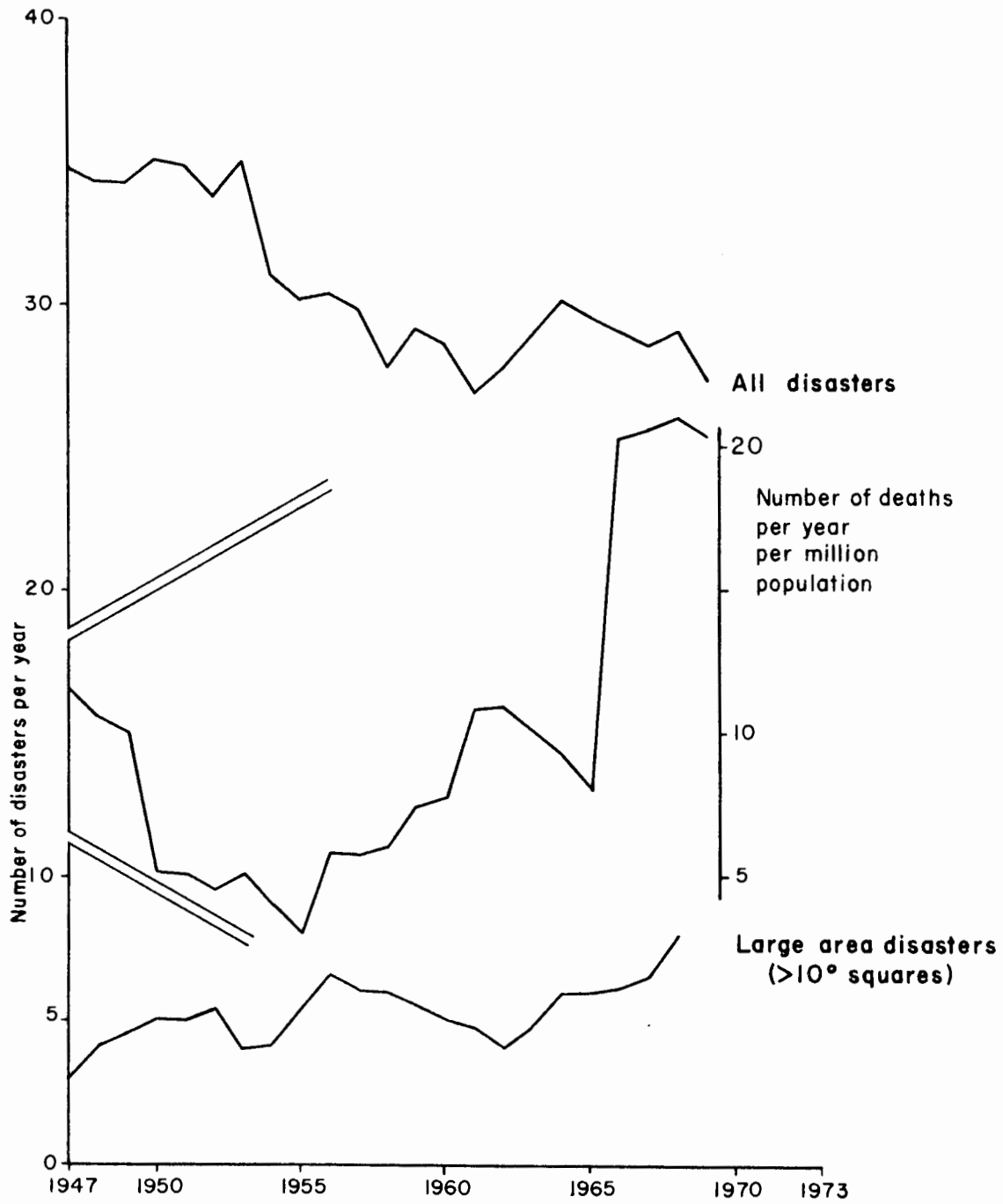
Finally when one ranks the countries by deaths/million population one finds that the top seventeen countries are all located in areas of high earthquake, volcanic, or tropical cyclone activity: Bangladesh, Nicaragua, New Guinea, Iran, South Korea, Ecuador, Hong Kong, South

Vietnam, Morocco, Chile, Reunion Island, Pakistan, Ryuku Islands, Turkey, Japan, Philippines, and Taiwan. When correlated with GNP per capita in dollars (US) one finds that the world can be divided into four quadrants with the dividing lines at 200 deaths/million and \$1000 GNP/capita. All the countries fall into one of three categories: High Incomes - Low Deaths, characterized by the industrialized nations, Low Incomes - Low Deaths, characterized by the underdeveloped nations, and Low Incomes - High Deaths, characterized by those underdeveloped countries who are located in geologically or meteorologically unstable areas. The only nation which falls into the category of High Incomes - High Deaths is Japan. (See Graph 2)*

In summation, the trends which Hewitt and Sheehan observed in their Working Paper No. 11 have continued through the next six years. Numbers of disasters have been dropping, while the area which these disasters encompass and the deaths which occur has been increasing. Finally, those areas with extremely high death rates can be correlated quite well with a combination of geological conditions, coastal location, and low to moderate income.

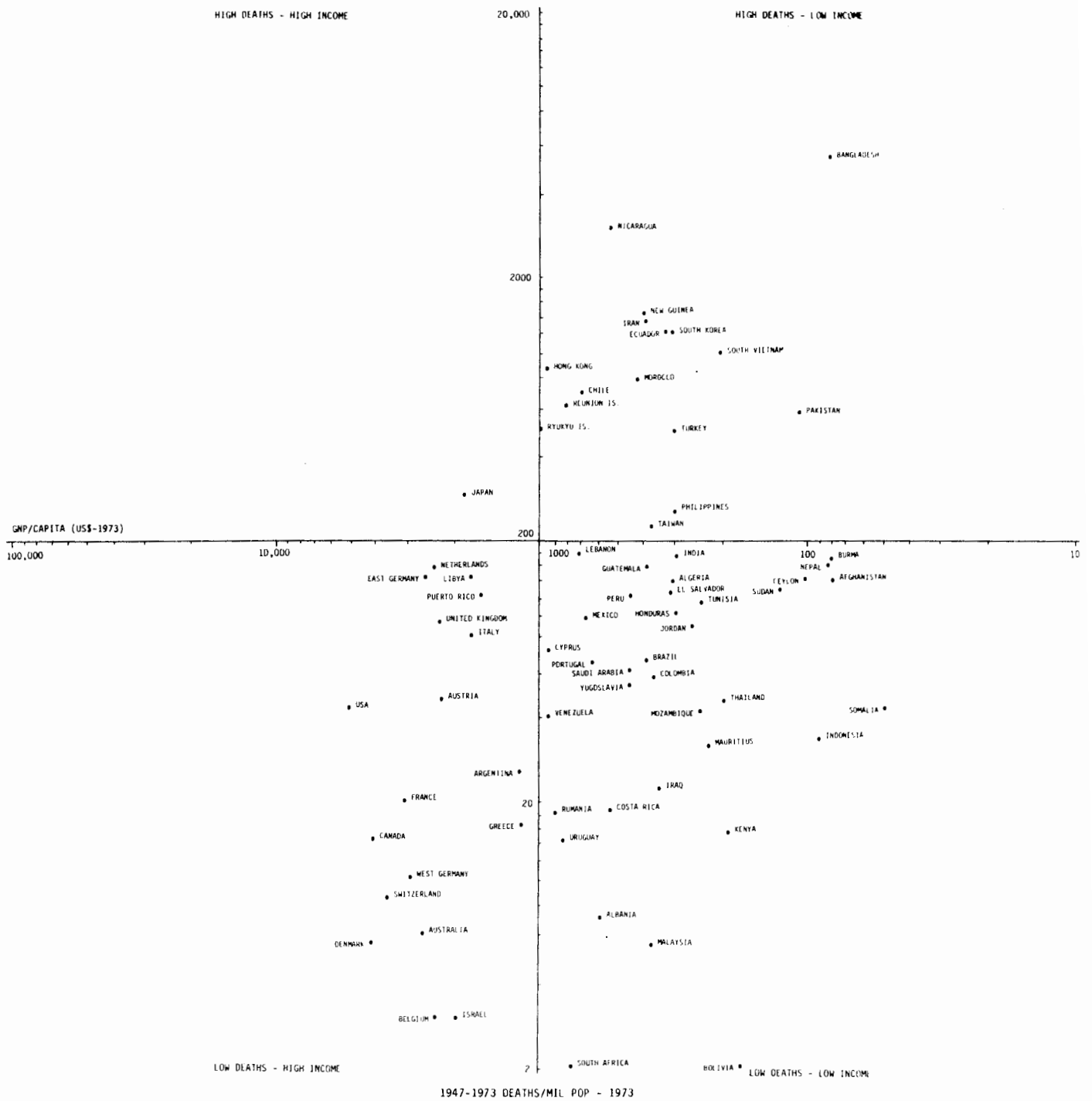
* Much gratitude is given to K. David Pijawka for conceptualizing this material in graph form.

GLOBAL DISASTERS 1947 - 1973
5-year moving average



GRAPH 2

DEATHS PER MILLION BY NATIONAL INCOME



APPENDIX 1
LARGE - AREA DISASTERS*
1947 - 1973

Year	Month	Natural Agent	Location	Number of 10° squares
1947	Apr-May	Flood	USA	2
1947	June-July	Flood	USA	2
1947	August	Heatwave	USA	2
1948		Flood	East Pakistan	2
1948	Jan-Feb	Cold Wave	S. USA	4
1948	May-June	Flood	N.W. USA	2
1949	Jan-Feb	Blizzards	N.W. USA	6
1949	June-July	Flood	China	2
1950	Feb	Flood	Mid-west USA	4
1950	Apr-May	Flood	Mid-west USA	2
1950	Nov	Flood	N.W. USA	2
1951	Jan-Feb	Cold Wave	USA	3
1951	Feb	Cold Wave	Mexico	3
1951	Apr-July	Flood	Mid-west USA	2
1951	Dec	Typhoon	Philippines	2
1952	Jan-Feb	Flood	Ohio R., USA	2
1952	Jan	Storms	W. USA	2
1952	Apr	Flood	Mississippi R., USA	2
1952	June	Flood	Australia	2
1952	June	Flood	S.W. USA	2
1952	July	Earthquake	W. USA	2
1952	Sept	Flood	Mexico	2
1952	Sept	Hurricane	Mexico	2
1952	Oct	Typhoon	Philippines & Indochina	2
1953	May	Tornado	S. USA	2
1953	Feb	Flood	N. Sea Area	2
1953	June	Flood	N.W. USA	2
1953	Aug	Flood	Chile	2
1953	Sept	Blizzards	Mexico	2

*not including droughts

Year	Month	Natural Agent	Location	Number of 10° squares
1954	Jan	Cold Wave	Europe	4
1954	Sept	Hurricane	N.E. USA	2
1954	Oct	Hurricane	USA, Haiti, Canada	3
1954	Oct	Floods	N.C. USA	2
1955	Aug-Sept	Flood	India, E.Pak, Assam	2
1955	Sept	Heatwave	W. USA	2
1955	Sept	Hurricane	Mexico, Caribbean	3
1956	Feb	Cold Wave	Europe	5
1956	Feb	Tornado	N. Cent. USA	2
1956	Apr	Cyclone	Mozambique	2
1956	June-July	Flood	Iran	2
1956		Flood	E. Pakistan	2
1956	Sept	Hurricane	S. USA	2
1957	Apr-May	Flood	S.W. USA	2
1957	July	Earthquake	Mexico	2
1958	Jan-Mar	Storms	W. USA	2
1958	June	Storms	Mexico	2
1958		Rains	W. USA	2
1958	Sept	Typhoon	Japan	2
1958	Oct	Typhoon	Philippines	2
1958	Nov	Storms	E. Pakistan	2
1959	Jan	Flood	N.W. USA	3
1959	Jan	Tornado	S.W. USA	2
1959	Mar-Apr	Flood	Madagascar	2
1959	Apr	Flood	Braz, Urug, Argen.	2
1959	May	Flood	S. Africa	2
1959	Aug	Typhoon	Taiwan, China	2
1959	Sept	Typhoon	S. Korea and Japan	2
1959	Sept-Oct	Hurricane	E. USA	2
1959	Oct-Nov	Storms	E. Pakistan	2
1959	Dec	Typhoon	Philippines	2

Year	Month	Natural Agent	Location	Number of 10° squares
1960	Jan	Heatwave	S.E. Australia	2
1960	Jan	Coldwave	Europe	4
1960	Mar-Apr	Flood	Mid-west USA	3
1960	May	Typhoon	Philippines & China	2
1960	June	Heatwave	N.W. India	2
1960	August	Tidal Wave	E. Pakistan	2
1960	Sept	Hurricane	Caribbean, S. USA	3
1960	Oct	Typhoon	Philippines	2
1960	Oct	Cyclone	E. Pakistan	2
1961	Mar	Typhoon	E. Pakistan	2
1961	May	Typhoon	E. Pakistan	2
1961	Sept	Hurricane	E. and S. USA	4
1961	Dec	Cold Wave	India	3
1962	Dec	Typhoon	Philippines	2
1963	Jan	Blizzards	W. Europe	4
1963	Feb	Earthquake	Libya	2
1963	Sept	Flood	India	2
1963	Oct	Hurricane	Cuba, Haiti	2
1964	Jan	Flood	Brazil	2
1964	Apr	Duststorms	USA	2
1964	July	Typhoon	Philippines	2
1964	June	Flood	E. Pakistan	2
1964	Aug	Hurricane	Caribbean, S. USA	3
1964	Sept	Hurricane	USA	2
1964	Dec	Flood	N.W. USA	2
1964	Dec	Cyclone	Ceylon, S.E. India	2
1965	April	Tornadoes	Mid-west USA	2
1965	May	Tornadoes	Mid-west USA	2
1965	May	Cyclone	E. Pakistan	2
1965	June	Heatwave	India	2
1965	August	Hail	Mid-west USA	2
1965	Sept	Hurricane	S. USA	2
1965	Dec	Cyclone	E. Pakistan	2
1966	Feb	Blizzards	S & E USA	2
1966	July	Heatwave	Mid-west USA	2
1966	Oct	Hurricane	Carib, Mex, S.USA	4

Year	Month	Natural Agent	Location	Number of 10° squares
1967	Sept	Hurricane	S. USA	2
1967		Typhoon	Philippines	2
1968	Aug	Earthquake	India, Celebes	2
1968	May	Earthquake	Japan	2
1968	May-June	Floods	E. & Mid-west USA	3
1968	October	Hurricane	S. USA	2
1968	May	Tornado	S. & Mid-west USA	3
1968	August	Heatwave	Australia	2
1968	March	Rain	N.E. USA	2
1968	June	Rainstorm	S. USA	2
1968		Typhoon	E. Pakistan	2
1968	Dec	Typhoon	Indonesia	2
1969	Mar	Flood	Brazil	2
1969	Aug-Sept	Floods	Mexico	2
1969	Apr	Floods	N. & Mid-west USA	4
1969	Aug	Hurricane	Caribbean & S. USA	4
1969	Sept	Hurricane	" & Cent. Amer.	2
1969	Feb	Snowstorm	N.E. USA	2
1969	May	Cyclone	India	2
1969		Flood	Algeria	2
1970	Jan	Floods	Argentina	2
1970	July-Sept	Flood	India	4
1970	Mar-Apr	Earthquakes	Turkey	2
1970	Aug	Hurricane	Caribbean & S. USA	2
1970		Flood	Philippines	2
1970	Oct	Cyclone	E. Pakistan	2
1970	Nov	Cyclone	E. Pakistan	2
1971	Nov	Cyclone	India	2
1971	Sept	Flood	India	2
1971	Feb	Tornado	S. USA	2
1971	Feb	Tornado	S. USA	2
1971	Nov	Rainstorm	Indonesia	2

APPENDIX 2

LOSS OF LIFE FROM DISASTER IMPACTS*

1947 - 1973

	No. of Disaster Impacts	No. of Lives Lost	Deaths/Mil Pop
North America			
Canada	11	298	14
USA	276	9017	43
Caribbean & Cen America			
Honduras	3	282	101
Caribbean Is.	4	270	558
Cuba	9	1378	160
Costa Rica	3	34	18
El Salvador	3	430	119
Guatemala	3	802	151
Haiti	7	6870	1272
Mexico	20	4403	84
Jamaica	3	306	153
Nicaragua	3	6475	3083
Puerto Rico	4	347	120
South America			
Argentina	7	586	24
Bolivia	1	8	2
Brazil	17	6165	64
Chile	9	6527	653
Columbia	9	1107	50
Peru	10	1678	120
Uruguay	1	40	14
Venezuala	3	430	39
Ecuador	2	8050	1278
Europe			
Albania	1	15	7
Austria	8	320	43
Belgium	3	22	3
Czechoslovakia	3	10	1
Denmark	1	25	5
Eire	1	--	--
France	10	1022	20
Germany, East	5	2160	139
Germany, West	12	592	10
Great Britain	20	4958	88
Greece	8	140	16

* not including droughts

Year	Month	Natural Agent	Location	Number of 10° Squares
1972	April	Tornado	E. Pakistan	2
1972	May	Flood	Mex. & S. USA	3
1972	May	Heatwave	India	2
1972	June	Flood	Carib. & E. & S USA	4
1972	June	Typhoon	Philippines	2
1972	July	Flood	Philippines	2
1972	August	Flood	Philippines	2
1972	November	Snowstorm	W, Mid-west, NE USA	5
1972	December	Rainstorm	Philippines	2
1973	March	Flood	S. USA	3
1973	March	Flood	N.E. USA	2
1973	Apr-May	Flood	Miss. R., USA	4
1973	June	Flood	N.E. USA	2
1973	August	Flood	India, Pak, E Pak.	3
1973	October	Flood	Mid-west USA	3
1973	October	Flood	Spain	2
1973	March	Earthquake	Philippines	2
1973	November	Tornado	S. USA	2
1973	April	Tornado	E. Pakistan	2
1973	April	Hurricane	W. Europe	4

	No. of Disaster Impacts	No. of Lives Lost	Deaths/Mil Pop
Europe (con.)			
Hungary	2	15	1
Italy	5	4324	80
Netherlands	5	1876	143
Poland	4	45	1
Portugal	3	630	66
Rumania	1	377	18
Spain	5	923	27
Switzerland	2	55	8
Yugoslavia	3	1050	50
Africa			
Algeria	3	1933	133
Ethiopia	1	2	-
Kenya	1	170	15
Libya	1	260	137
Madagascar	2	750	106
Morocco	2	12100	742
Mozambique	2	310	39
Mauritius	1	40	33
Nigeria	1	--	--
Somalia	1	200	69
South Africa	1	35	2
Sudan	2	2037	125
Tunisia	2	619	117
Fr. Somaliland	1	--	--
Reunion	2	300	600
Asia			
Afghanistan	4	2310	133
Burma	8	4490	158
Ceylon	4	1625	131
China	28	129520	168
Hong Kong	7	3865	852
India	54	84511	148
Indonesia	5	3686	30
Iran	25	39497	1353
Iraq	1	225	22
Israel	2	10	3
Japan	47	32167	307
Jordan	1	220	92

	No. of Disaster Impacts	No. of Lives Lost	Deaths/Mil Pop
Asia (con.)			
Korea, South	15	39545	1202
Lebanon	4	490	169
Nepal	5	1705	148
Pakistan	11	31986	542
Bangladesh	24	362550	4476
Philippines	30	9621	244
Ryukus	4	490	490
Saudi Arabia	1	500	62
Vietnam, North	1	--	--
Vietnam, South	10	16198	885
Taiwan	10	3095	216
Thailand	3	1410	38
Tibet	3	--	--
Turke	15	17022	466
Malaysia	2	51	5
Cyprus	1	40	67
Australasia			
Australia	11	77	6
New Guinea	2	4100	1366

APPENDIX 3
LOSS OF LIFE BY DISASTER TYPE*
1947 - 1973

	Asia	Australasia	Europe	Africa	S. America	Caribbean & Central Amer.	North America
Floods	160617	60	11120	3377	3471	2355	1270
Typhoons, Hurricanes, Cyclone	453428	240	250	850	--	10792	1948
Earthquakes	47048	--	1839	14232	38350	7532	75
Tornadoes	3657	--	39	535	--	26	2224
Thunderstorms and Gales	20210	--	120	--	60	310	240
Snowstorms	6360	17	1340	--	--	200	1810
Heatwave	4155	100	340	--	135	--	925
Coldwave	1330	--	1440	--	--	--	600
Volcanoes	2630	4000	--	--	440	150	--
Landslides	2016	--	300	--	912	260	--
Rainstorms	1090	--	20	--	130	--	15
Avalanches	105	--	340	--	3840	--	--
Tidal waves	3120	--	--	--	--	--	60
Fog	--	--	3550	--	--	--	--
Sand & Dust Storms	--	--	--	--	--	--	10
Total	706566	4417	20698	18994	47338	21625	9177

* not including droughts