Natural Hazard Research

A PILOT SURVEY OF GLOBAL NATURAL DISASTERS OF THE PAST TWENTY YEARS

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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 Chicago and Clark University. Authorship of papers is not necessarily confined to those working at these institutions.

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> "There were the mass of deaths. There were also the attendant maimed malfunctioning, homeless, lorn. It happens every month in a succession of encounters between groups of living and a congruent world which simply doesn't care. Look at any yearly Almanac under 'Disasters' - The business is transacted month after month after month."
>
> (Thomas Pynchon)

Introductory Remarks

Natural hazards, like any other widely distributed phenomenon may be viewed at both the micro or particulate level and at the macro or aggregate level. Study at the aggregate level can be useful in itself in revealing variations and regularities not apparent at the micro scale and also as a source of empirical generalisations that can guide more detailed work. Natural hazards research in North America has both a theoretical and a practical need to examine the global context and validity of work geared strongly to the Anglo-American framework. This is perhaps more pressing when one's interest is not in one particular natural agent or one particular event or series of events.

The most obvious and disturbing feature of the global perspective, even when restricted to really major natural disasters, is that they cease to appear as rare, or unusual, occurrences. Indeed the "once-in-two-thousand-year" event for a 10,000 square mile area in North America may turn out to have, say, an average global recurrence of several times per year. From the mass-media one forms a pretty clear impression that in the critical realm of loss-of-life and injury, disaster impact is, to a major degree a geographically- and culturally-dependent phenomenon. In human terms, the needs of countries such as Iran, East Pakistan or Tanzania for reduction and alleviation of suffering from natural hazards at all levels, is much greater than in most of North America or Western Europe. We need to investigate the extent to which solutions in the latter areas are applicable to the more vulnerable nations. We need to test and evaluate the theoretical generality behind local solutions to hazard problems in western countries. In turning to overseas areas and different cultures we need to explore the aggregate picture to define some of the broad differences or similarities of which our research designs should take account.

As a first step (in terms of our particular interest) we have attempted to compile an inventory of the type, recurrence and location of all forms of major natural disasters, and whatever information is available on the impact. In view of the obvious limitations of data of this type the work is unlikely to produce more than order-of-magnitude empirical generalisations. It also seems most unlikely that it has not been done already but we failed to find that this was so, and started from scratch.

Sources and Main Limitations of Data

Information was gathered for the twenty-one years 1947 to 1967. This choice was largely one of convenience but it was also hoped that the dependence of the data on changing technology and reportage would be minimised by confining attention to the post-War period.

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 were compiled from:

i) New York Times Index (with reference to original reports where necessary)

ii) Encyclopedia Britannica Year Book

iii) Collier's Encyclopedia Yearbook

iv) The American People's Encyclopedia Yearbook

v) Keesing's Contemporary Archives

vi) Miscellaneous collections of data on particular hazards contained in our own library (These were generally used as checks.)

While details varied widely, there was good agreement on number and incidence between sources. Nevertheless, even for these larger disasters there is certainly a North American bias in reportage of numbers as well as details. The degree of bias has not been evaluated at this time. While the scarcity of data from many sparsely populated regions need not cause concern, there are some areas, notably the Soviet Union and Africa south of the Sahara for which the data are clearly not available in the sources we have used.

In the presentation of the data on maps we have adopted a convention of locating in terms of 10°-square units. On these we represent three types of information:

i) Number of "disastrous impacts": this means number of all disasters reported for the area of the 10° square, but not the number of "unit disasters" (i.e. where a single drought or hurricane had disastrous impacts over two or more squares it was plotted as two or more disastrous impacts). This data should be compared with

Table 1 which catalogues all disasters spread over more than one 10° square.

ii) Total loss of life by 10° squares for all the major disasters reported in the period. For disasters covering more than one square but with only gross estimates of fatalities, the number of deaths was averaged over all squares involved.

iii) The ratio of loss of life to number of disasters, expressed as the average mortality per disaster. This is compiled from Maps 1 and 2, but excluding droughts present in Map 1.

In view of the great variability and inconclusiveness of data on most aspects of disaster impact, the present report is confined solely to the presentation of data on disaster numbers, distribution, type of natural agency and mortality. A series of tables are added to indicate distributions by nations, by continents, and by types of natural agent.

The problem with data on droughts appears to be due to their long duration relative to the "memory" of most reporting media. Not only is it often difficult to discover when a drought began and/or ended (even within matters of weeks, months, or years), how long it has lasted, and whether two separate reports for a given area represent the same drought, but also estimates of the human impact of the drought are poor or non-existent in the sources we have used. Personal communication with various national and international agencies has also failed to help.

Comments

At this stage, there are not many things we can say that add significantly to what is seen in the tables and maps. The total number of major disasters (excluding droughts) was 661, giving an average of 31.4 per year. The number of those due to floods represents by far the greatest due to a single natural agent. The distribution by rank of natural agent was:

	Agent*	No. of Disasters
1)	Floods	209
2)	Typhoons, Hurricanes, Cyclones	148
3)	Earthquakes	86
4)	Tornadoes (incl. suites of contemporaneous ones)	66
5)	Gales and Thunderstorms	32
6)	Snowstorms	27
7)	Heat Waves	16
8a)	Cold Waves	13
8b)	Volcanic Eruptions	13
8c)	Landslides	13
9)	Rainstorms	10
10)	Avalanches	9
11)	Tidal Waves (alone)	5
12)	Fogs	3
13a)	Frost	2
13b)	Sand and Dust Storms	2

It should be noted that most typhoons, etc., rainstorms and tidal waves also incorporate flooding damage above our threshold, so that the total of flood events could also be put at about 350.

The number of disasters in any given year seems to be fairly consistent:

1947 (30), 1948 (45), 1949 (31), 1950 (35), 1951 (33), 1952 (28), 1953 (45), 1954 (35), 1955 (33), 1956 (28), 1957 (34), 1958 (25), 1959 (31), 1960 (34), 1961 (25), 1962 (24), 1963 (32), 1964 (28), 1965 (26), 1966 (29), 1967 (30).

The total loss of life from major disasters over the period was 441,855, giving an average of 22,093 persons a year. The breakdown according to type

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* After some initial exploration it seemed inevitable that we accept the typology of the reports, hence the rather unsatisfactory groupings of some agents.

of hazard and political units appears in the tables.

For reference we may note the numbers of unit disasters according to number of 10^o squares involved:

1 square	563
2 squares	80
3 squares	9
4 squares	7
5 squares	1
6 squares	1

Since there are components of the spatial probability which involve medium and small-area disasters overlapping two squares we cannot use this data as it stands for analysis in terms of some direct, geometric magnitude and frequency relation between areal extent and numbers of events. Nevertheless, the data are encouraging with respect to this kind of analytical approach.

The expected large difference in loss of life between the industrialised western nations and others is fairly clear. However, it seems that the very low figures for North America do represent the higher probability of reportage there of disasters whose primary impact is economic. The very high figures in some areas such as Peru are almost certainly a function of poor reportage of all but the most spectacular events, and in every case there is probably something like a communications "threshold" which is influencing the number of disasters reported, particularly where only the two criteria of dollar loss and injury apply. These are matters we hope to investigate further before we attempt to calculate some statistics of the space and time distributions of the phenomena. Suggestions for alternative data sources, and means of assembling the information would be welcomed.

Postscript

"It used to be the custom to commemorate moments of national humiliation or disaster by applying the adjective 'black' to the day of the week concerned....It may be that, in this Twentieth Century, almost daily acquaintance with large-scale catastrophe has deprived the custom of its point."

(Eric Ambler)

WORLD, HOMOLOSINE

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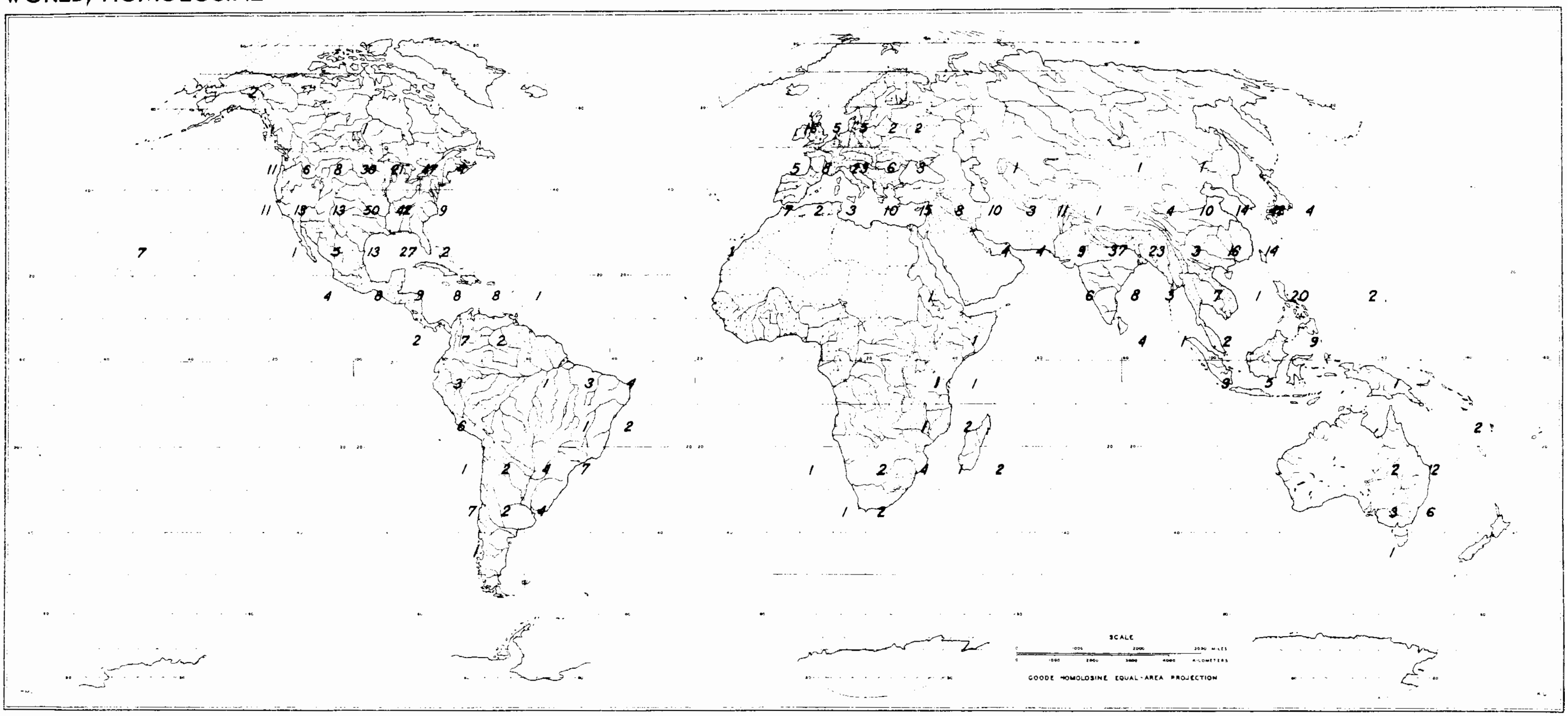

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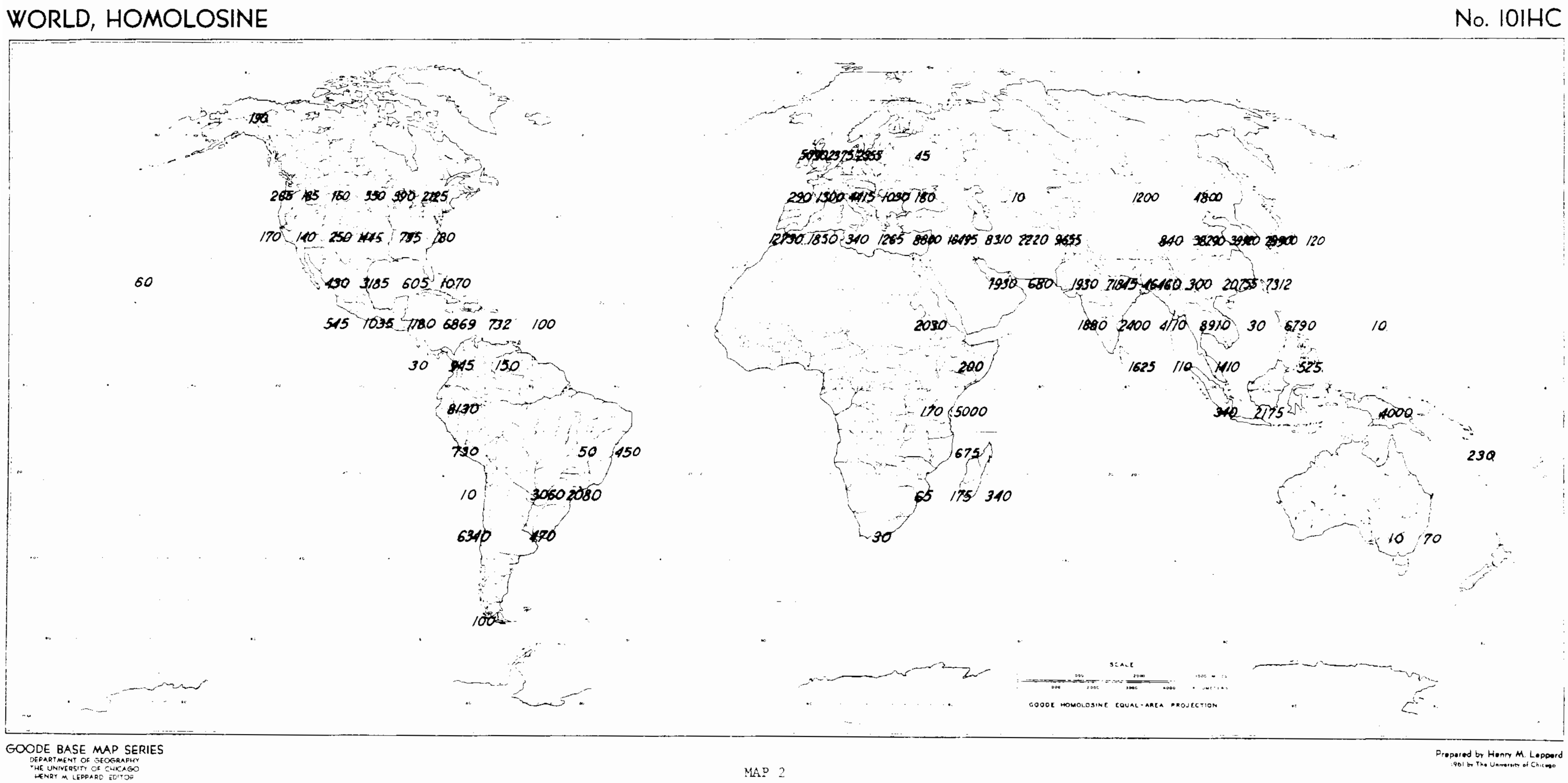
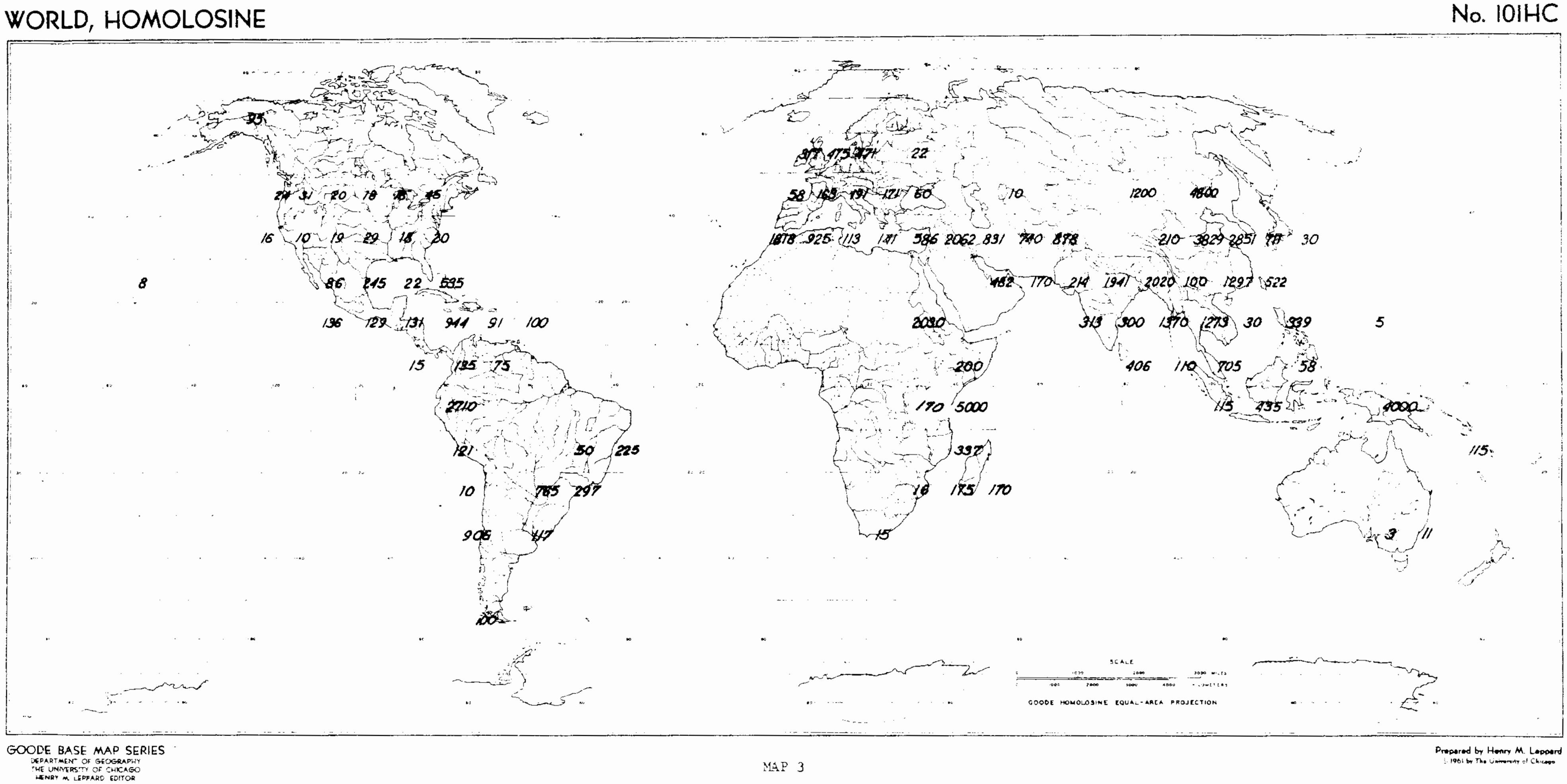
MAP 1

WORLD MAP OF THE NUMBER OF "DISASTROUS IMPACTS" (INCLUDING DROUGHTS) BY 10° SQUARES, 1947-1967



MAP 2

WORLD MAP OF TOTAL LOSS OF LIFE RESULTING FROM DISASTERS EXCLUDING DROUGHT, 1947-1967



MAP 3

WORLD MAP OF THE AVERAGE NUMBER OF DEATHS PER " DISASTROUS IMPACT " BY 10° SQUARES, 1947-1967

TABLE 1

LIST OF UNIT DISASTERS COVERING MORE THAN ONE 10^{o} SQUARE
(excluding droughts)

Year	Month	Natural Agent	Location	Number of 10^{o} Squares
1947	Apr-May	Flood	USA	2
1947	Jne-Jly	Flood	USA	2
1947	Aug	Heatwave	USA	2
1948		Flood	East Pakistan	2
1948	Jan-Feb	Cold Wave	S. USA	4
1948	May-Jne	Flood	N.W. USA	2
1949	Jan-Feb	Blizzards	N.W. USA	6
1949	Jne-Jly	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-Jly	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	Jne	Flood	Australia	2
1952	Jne	Flood	S.W. USA	2
1952	Jly	Earthquake	W. USA	2
1952	Sept	Flood	Mexico	2
1952	Sept	Hurricane	Mexico	2
1952	Oct	Typhoon	Phil. & Indochina	2
1953	May	Tornado	S. USA	2
1953	Feb	Flood	North Sea area	2
1953	Jne	Flood	N.W. USA	2
1953	Aug	Flood	Chile	2
1953	Sept	Blizzards	Mexico	2
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, East Pak., Assam	2
1955	Sept	Heatwave	W. USA	2
1955	Sept	Hurricane	Mexico, Caribbean	3

Table 1 (Cont'd)

Year	Month	Natural Agent	Location	Number of 10^{o} Squares
1956	Feb	Cold Wave	Europe	5
1956	Feb	Tornado	N.C. USA	2
1956	Apr	Cyclone	Mozambique	2
1956	Jne-Jly	Flood	Iran	2
1956		Flood	East Pakistan	2
1956	Sept	Hurricane	S. USA	2
1957	Apr-May	Flood	S.W. USA	2
1957	Jly	Earthquake	Mexico	2
1958	Jan-Mar	Storms	W. USA	2
1958	Jne	Storms	Mexico	2
1958		Rains	W. USA	2
1958	Sept	Typhoon	Japan	2
1958	Oct	Typhoon	Philippines	2
1958	Nov	Storms	East Pakistan	2
1959	Jan	Flood	N.E. USA	3
1959	Jan	Tornado	S.W. USA	2
1959	Mar-Apr	Flood	Madagascar	2
1959	Apr	Flood	Brazil, Uruguay, Argentina	2
1959	May	Flood	South Africa	2
1959	Aug	Typhoon	Taiwan, China	2
1959	Sept	Typhoon	South Korea and Japan	2
1959	Sept-Oct	Hurricane	E. USA	2
1959	Oct-Nov	Storms	East Pakistan	2
1959	Dec	Typhoon	Philippines	2
1960	Jan	Heatwave	S.E. Australia	2
1960	Jan	Cold Wave	Europe	4
1960	Mar-Apr	Flood	Mid-west USA	3
1960	May	Typhoon	Philippines, China	2
1960	Jne	Heatwave	N.W. India	2
1960	Aug	Tidal Wave	East Pakistan	2
1960	Sept	Hurricane	Caribbean, S. USA	3
1960	Oct	Typhoon	Philippines	2
1960	Oct	Cyclone	East Pakistan	2
1961	Mar	Typhoon	East Pakistan	2
1961	May	Typhoon	East Pakistan	2
1961	Sept	Hurricane	E. & S. USA	4
1961	Dec	Cold Wave	India	3
1962	Dec	Typhoon	Philippines	2

Table 1 (Cont'd)

Year	Month	Natural Agent	Location	Number of 10^o Squares
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	Jly	Typhoon	Philippines	2
1964	Jne	Flood	East 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	Apr	Tornadoes	Mid-west USA	2
1965	May	Tornadoes	Mid-west USA	2
1965	May	Cyclone	East Pakistan	2
1965	Jne	Heatwave	India	2
1965	Aug	Hail	Mid-west USA	2
1965	Sept	Hurricane	S. USA	2
1965	Dec	Cyclone	East Pakistan	2
1966	Feb	Blizzards	S. & E. USA	2
1966	Jly	Heatwave	Mid-west USA	2
1966	Oct	Hurricane	Caribbean, Mexico, S. USA	4
1967	Sept	Hurricane	S. USA	2
1967		Typhoon	Philippines	2

TABLE 2

LOSS OF LIFE AND NUMBER OF DISASTER IMPACTS BY NATION STATE

1947-1967

(not including droughts)

Nation	Number of Lives Lost	No. of Disaster Impacts
Afghanistan	2,210	3
Albania	15	1
Algeria	1,865	2
Argentina	450	5
Assam	690	2
Australia	70	10
Austria	320	8
Belgium	20	2
Brazil	5,650	12
Burma	4,400	7
Canada	290	9
Canary Islands	-	1
Caribbean Islands (Leeward & Windward)	240	3
Ceylon	1,625	4
Chile	6,445	8
China	129,520	28
Columbia	900	7
Cuba	1,370	7
Costa Rica	34	3
Cyprus	40	1
Czechoslovakia	10	3
Denmark	25	1
Ecuador	8,050	2
El Salvador	430	3
Eire	-	1
France	1,020	8
Germany, East	2,160	5
Germany, West	590	11
Great Britain	4,930	17
Greece	140	8
Guatemala	800	2
Haiti	6,870	7
Honduras, British	280	2
Hong Kong	3,320	5
Hungary	15	2
India	70,350	44
Indonesia	2,720	10
Iran	21,320	18
Iraq	225	1
Israel	10	2
Italy	3,840	21

Table 2 (Cont'd)

Nation	Number of Lives Lost	No. of Disaster Impacts
Jamaica	260	1
Japan	31,630	44
Jordan	220	1
Kenya	170	1
Lebanon	490	4
Libya	260	1
Madagascar	750	2
Mexico	3,740	16
Morocco	12,100	2
Mozambique	110	1
Mauritius	40	1
Netherlands	1,870	3
Nepal	1,600	4
Nicaragua	475	2
New Guinea (Territ. of)	4,000	1
New Hebrides	240	2
Pakistan	89,060	26
Peru	920	7
Philippines	7,240	23
Poland	45	4
Portugal	630	3
Puerto Rico	310	3
Réunion Islands	300	2
Ryukyus	490	4
Saudi Arabia	500	1
Somalia	200	1
South Africa, Union of	35	1
South Korea	6,400	11
South Vietnam	15,910	8
Spain	730	4
Sudan	2,030	1
Switzerland	55	2
Taiwan	3,020	9
Thailand	1,310	2
Tibet	1,190	3
Turkey	9,350	12
Uruguay	40	1
U.S.A.	7,620	201
Venezuela	430	3
Yugoslavia	1,030	2

TABLE 3

LOSS OF LIFE BY DISASTER TYPE AND BY CONTINENTS, 1947-1967
(not including droughts)

	Australasia	Asia (exc. USSR)	Europe (exc. USSR)	Africa	South America	Central America & Caribbean	North America
Floods	60	154,000	10,540	2,690	2,990	2,210	680
Rain	-	1,090	-	-	-	-	10
Gale and Thunderstorm	-	20,210	120	-	60	310	240
Tornado Groups	-	940	30	535	-	-	1,890
Hailstorm	-	-	-	-	-	-	-
Blizzard and Snowstorm	-	360	1,340	-	-	200	1,620
Sand, Dust Storm	-	-	-	-	-	-	10
Typhoon	-	52,360	-	40	-	-	-
Hurricane	240	300	165	500	-	10,290	1,730
Typhoon and Tidal Wave	-	88,840	40	110	-	450	-
Tidal Wave	-	3,120	-	-	-	-	60
Heatwave	10	3,400	340	-	-	-	925
Cold Wave	-	1,330	1,440	-	-	-	600
Fog	-	-	3,550	-	-	-	-
Frost	-	-	-	-	-	-	-
Earthquake	-	31,310	1,370	14,230	8,040	950	200
Volcano	4,000	2,630	-	-	440	150	-
Avalanche	-	-	340	-	3,340	-	-
Landslide	-	1,520	300	-	800	260	-
Totals	4,310	361,410	19,575	18,105	15,670	14,820	7,965

TABLE 4

AVERAGE LOSS OF LIFE PER DISASTER IMPACT BY CONTINENTS

Continents	No. of Lives Lost	No. of Disaster Impacts	Average Loss of Life per Disaster Impact
North America	7,965	210	37
Central America and Caribbean	14,820	49	302
South America	15,670	45	348
Africa	18,105	17	1,065
Europe (excl. USSR)	19,575	85	230
Asia (excl. USSR)	361,410	297	1,216
Australasia	4,310	13	332
Totals	441,855	716	618

TABLE 5

PERCENTAGE OF TOTAL LOSS OF LIFE FOR EACH DISASTER TYPE

Disaster Types	Number of Lives Lost	% of Total Loss of Life
Floods	173,170	39.2
Rain	1,100	0.2
Gale and Thunderstorms	20,940	4.7
Blizzards and Snowstorms	3,520	0.8
Sand, Dust Storms	10	-
Cyclone and Tidal Waves	89,440	20.2
Tidal Waves	3,180	0.7
Hurricanes	13,225	3.0
Tornado Groups	3,395	0.8
Typhoons	52,400	11.9
Hailstorms	-	-
Heatwaves	4,675	1.1
Cold Waves	3,370	0.8
Fog	3,550	0.8
Earthquakes	56,100	12.7
Volcanoes	7,220	0.6
Avalanches	3,680	0.8
Landslides	2,880	0.7
Total	441,855	100.0

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