Integrated Research on Disaster Risk (IRDR)

# Peril Classification and Hazard Glossary

DATA Project Report No. 1


IRDR
Integrated Research on Disaster Risk

**IRDR**

IRDR was established by the International Council for Science (ICSU) in 2010 in cooperation with the International Social Science Council (ISSC) and the United Nations International Strategy for Disaster Reduction (UNISDR). IRDR's main legacy will be an enhanced capacity around the world to address hazards and make informed decisions on actions to reduce their impacts. This will include a shift in focus from response–recovery towards prevention–mitigation strategies, and the building of resilience and reduction of risk through learning from experience and the avoidance of past mistakes.

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# Peril Classification and Hazard Glossary

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# Contents

# 1. Introduction

Understanding and documenting impacts from natural hazards is the foundation for decision-making and policy-setting in disaster risk reduction. The impacts range from human effects such as displacement, homelessness and fatalities, to environmental (wetland loss, desertification) and economic losses (damage to property and crops). Documenting impacts in a standardised and comprehensive way is challenging largely due to the lack of common terminologies for perils, measurement methodologies, and human loss indicators. The inability to compare losses across hazards, space, and time hampers the assessment of the burden of disasters at global to local levels.

To overcome these challenges, the Integrated Research on Disaster Risk (IRDR) programme established a project on disaster loss data (DATA) to "study issues related to the collection, storage, and dissemination of disaster loss data" (IRDR 2013, 10). A recent product of the DATA Project Working Group is a standard hazard terminology as well as peril classification for operational use in loss databases, which was agreed upon by all members of the Working Group. The peril glossary offered in this document provides guidelines on event classification and a unified terminology for operating loss databases only. It is not intended as a comprehensive list of perils or as a conclusive definitional standard of hazards. This technical paper details the classification scheme and hazard definitions used in loss databases, which will be implemented over time in global databases such EM-DAT, NatCatService and Sigma, as well as in national databases such as DesInventar and SHELDUS (see Annex).

# 2. Background

## 2.1 The Integrated Research on Disaster Risk Research Programme

The IRDR initiative is a decade-long research programme to better understand the challenges associated with environmental hazards originating from both natural and human-induced processes and actions. IRDR was established in 2008, and is jointly sponsored by the International Council for Science (ICSU), the International Social Science Council (ISSC) and the United Nations International Strategy for Disaster Reduction (UNISDR). The overarching objective of IRDR is to work across disciplinary boundaries and to integrate "research expertise from the natural, socio-economic, health and engineering sciences, as well as policy-making, coupled with an understanding of the role of communications, and public and political responses to reduce the risk" from disasters (IRDR 2013, 3; ICSU 2008, 18).

The goals of IRDR are to (IRDR 2013:6ff):

- Promote integrated research, advocacy and awareness-raising by developing and promoting integration and collaboration within the disaster risk reduction community to avoid unnecessary duplication and to maximise research outcomes.

- Characterise hazards, vulnerability, and risk by identifying hazards and vulnerability leading to risks, and forecasting, assessing, and dynamic modeling of risk.

- Understand decision-making in complex and changing risk contexts by identifying decision-making systems, their contexts, and their interactions, and improving the quality of decision-making practices.

- Reduce risk and curb losses through knowledge-based actions such as vulnerability assessments, and the analysis of effective approaches to risk reduction.

## 2.2 Why Loss Database Standards Are Important

In recent years the international community has made significant advances in improving the documentation of losses from natural hazards. These advancements are first and foremost visible in the significantly increased number of countries that now operate disaster loss databases, either through governmental, non-governmental, academic and/or private organisations. At present there are three global loss databases (CRED's EM-DAT, MunichRe's NatCatSERVICE, and SwissRe's Sigma) of which the latter two have limited public accessibility (see Annex). At the national level there are currently more than 55 loss databases although they vary in data quality, temporal coverage, loss indicators, and update frequency (see Annex). About 35 national databases that offer loss data through 2010 could only do so through financial and/or technical support provided by UNISDR for GAR 2011 and GAR 2013 (UNDP/BCPR 2013). Thus, database sustainability and long-term maintenance are critical needs for many database operators (Wirtz et al. 2014).

For many databases data gaps are common. There are gaps regarding: a) temporal coverage with missing years and/or months; b) spatial coverage with missing reports from some regions, communities, etc.; c) loss estimation with no losses reported for some events, particularly low impact/high frequency events; and d) loss indicators with inconsistent completeness across events.

Most databases record some form of human and economic losses (e.g., property damage, number of people killed) but there is neither a common set of loss indicators across all databases nor are these indicators defined based on a common understanding or standard. Agreement on common definitions and measures of human and economic loss is therefore a key objective of the IRDR DATA Project, and will be addressed in the future.

To improve the comparability of existing loss databases, event classifications must be standardised. If event and peril categories diverge from each other any subsequent efforts to standardise human loss indicators will be futile. A consistent peril classification will allow data users to compare losses from, for example, landslides in database A with losses from landslides in database B, thereby illustrating that differences are due to estimations of loss, not different definitions of landslides or how they were categorised.

Some members of the IRDR DATA Project Working Group have promoted the idea and concept of peril classifications for operational use in loss databases for many years. A preliminary classification scheme proposed by CRED and Munich Re (Below et al. 2009; Wirtz et al. 2014) was implemented in select databases to test its operational feasibility. The Working Group concluded that the preliminary framework was difficult to implement, particularly for national databases (e.g., DesInventar, SHELDUS) that operate specifically at the peril level. As a result, further revisions of the framework were necessary to reduce inconsistencies and better adhere to scientific hazard classifications and terminologies.

This report summarises the agreement on peril classifications and hazard definitions by the IRDR DATA Project Working Group. This new and revised framework is implementable by loss databases with either a high level of hazard aggregation (only includes categories such as meteorological or geophysical) that do not distinguish specific perils, as well as databases that use perils (hurricane, tsunami, earthquake) rather than the more general categories. In this way, the classification serves the needs of multiple types of loss databases often managed for very different purposes.

# 3. PERIL Classification

The classification schema is designed to serve multiple types of databases—global, national and sub-national—in order to make loss information more comparable. The list of perils is not comprehensive and includes only the most common events. For perils not included in this list, loss database operators will decide on peril naming and classification on a case-by-case basis. Furthermore, only perils that cause measurable damage (e.g., fatalities, crop loss, etc.) are considered here.

It is important to note that the association between perils and main events is not a one-to-one relationship. A peril can be linked to one or more main event categories. It is highly recommended that decisions about classification and aggregations from perils to main events be made on a case-by-case basis. For instance, a snow avalanche may be triggered by an earthquake, which would be considered a mass movement/geophysical event, or a snow avalanche may be caused by the weight and/or instability of the snow pack, which would define it as a landslide/hydrological event.

The revised classification distinguishes three classification levels moving from the most generalised (family) to the most specific (peril), or from the most specific (peril) to the most generalised (family). Although an attempt was made to follow scientific classifications and terminology as much as possible, in some cases a more pragmatic approach was chosen to align with the needs of the loss database operators. For example, mass movements are frequently subsumed under geophysical/geological hazards. The peril classification proposed here distinguishes between geophysical and hydrological mass movements. Landslides following earthquakes or volcanic eruptions fall into the geophysical main events category, whereas perils such as debris or mud flows fall under hydrological hazards.

The peril classification system is not intended as a hierarchical top-down approach. Many databases, especially at the national and subnational levels, only document perils. For analytical purposes these perils are often aggregated into broader categories, a feature captured in our classification system. On the other hand, some databases operate with a top-down approach, starting with the most general category and then becoming more specific. The approach taken by loss databases varies depending on the original purpose or mission, user audience, and structure of the database. The peril classification system proposed here attempts to accommodate both approaches.

## 3.1 Classification Structure

This revised classification system distinguishes three levels: family, main events and perils. There are six broad hazard categories within the family group (Figure 1), the most generalised level:

- **Geophysical:** a hazard originating from solid earth. This term is used interchangeably with the term geological hazard.

- **Hydrological:** a hazard caused by the occurrence, movement, and distribution of surface and subsurface freshwater and saltwater.

- **Meteorological:** a hazard caused by short-lived, micro- to meso-scale extreme weather and atmospheric conditions that last from minutes to days.

- **Climatological:** a hazard caused by long-lived, meso- to macro-scale atmospheric processes ranging from intra-seasonal to multi-decadal climate variability.

- **Biological:** a hazard caused by the exposure to living organisms and/or their toxic substances (e.g. venom, mold) or vector-borne diseases that they may carry. Examples are venomous wildlife and insects, poisonous plants, algae blooms, and mosquitoes carrying disease-causing agents such as parasites, bacteria, or viruses (e.g., malaria).

- **Extraterrestrial:** a hazard caused by asteroids, meteoroids, and comets as they pass near-earth, enter the Earth's atmosphere, and/or strike the Earth, or changes in inter planetary conditions that effect the Earth's magnetosphere, ionosphere, and thermosphere.

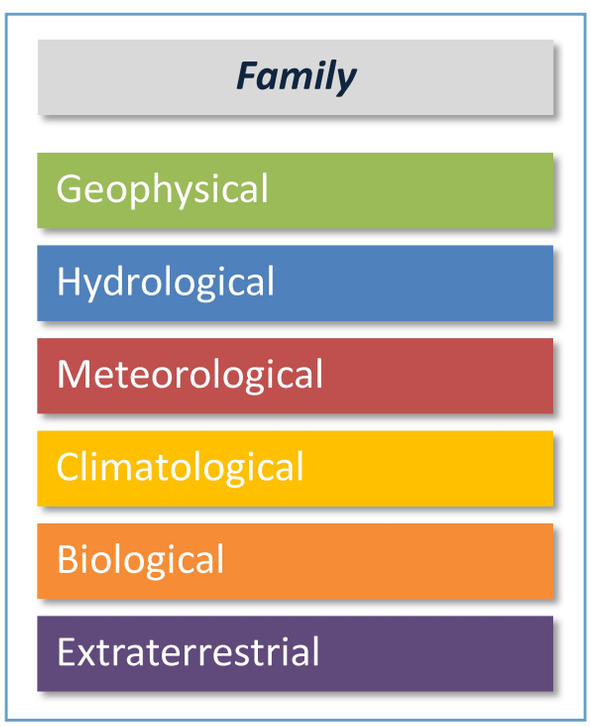


*Figure 1: Peril classification at the Family level.*

Each hazard family can be further classified by a set of generic hazards – or what we term, main events (Figure 2). For example, the geophysical hazard category can be further subdivided into earthquake, mass movement and volcanic activity. The hydrological hazard category is further differentiated into flood, landslide, and wave action. The meteorological hazard category includes convective storms, extratropical storms, tropical storms, extreme temperature, and fog. The climatological main event is further refined to include drought, glacial lake outburst and wildfire. The biological hazard family details animal incidents, diseases, and insect infestation. And lastly the extraterrestrial hazard family encompasses impacts, airburst and space weather.

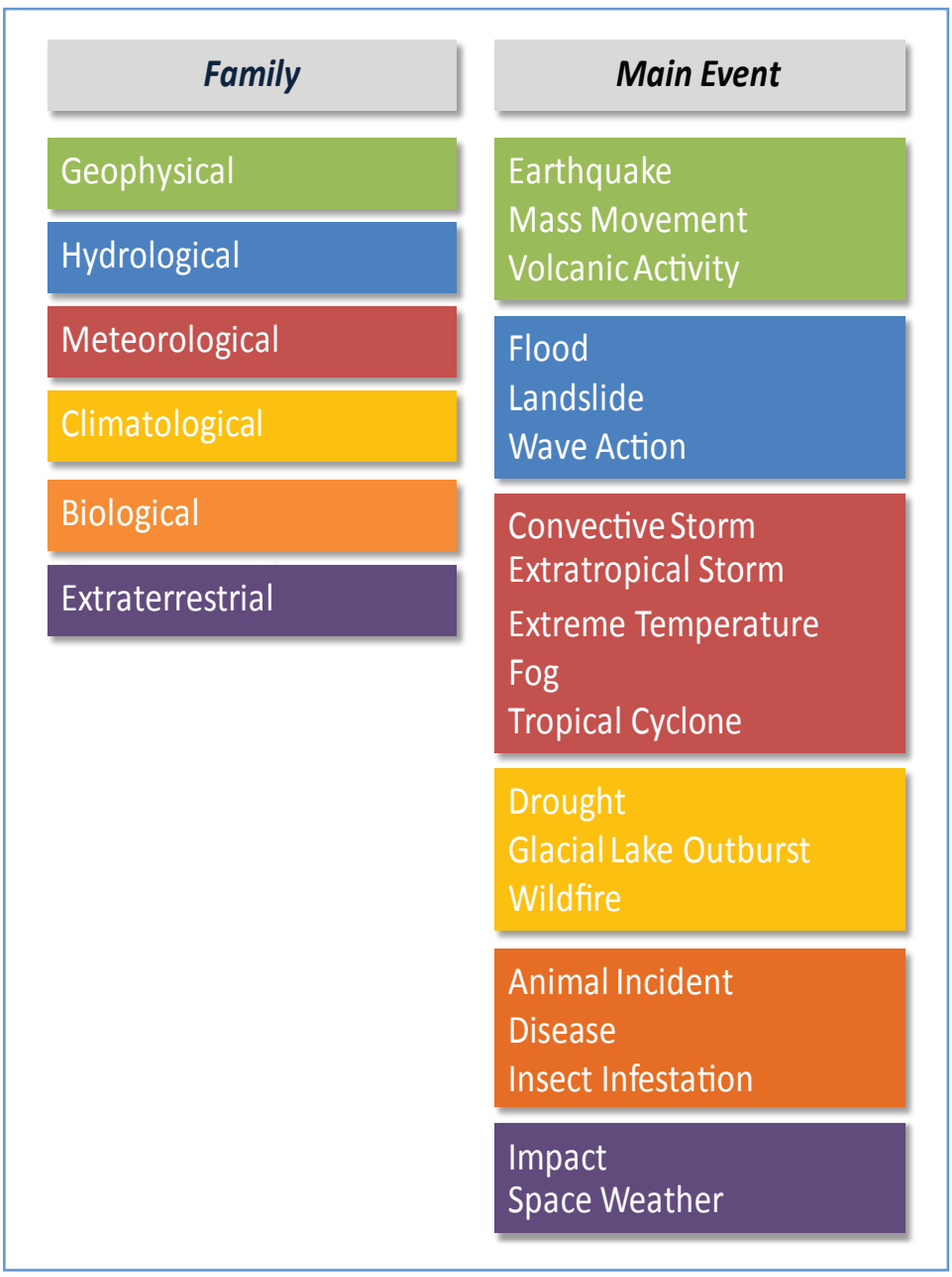


*Figure 2: Peril classification at the Family and Main Events levels.*

Whenever more detailed or specific hazard information is available, loss data can also be reported at the peril level (Figures 3 and 4). A peril is the specific cause of the loss, such as lightning or a tornado. It is important to note that perils are associated with one or more hazards in the main event category. For example, lightning could be associated with convective storms in the main event but could also be associated with tropical cyclones. In other words, there is not an exclusive one-to-one relationship between perils and main events (a departure from the preliminary peril classification proposed by CRED and Munich Re). Finally, some peril terms are artificial (e.g., fire following earthquake (EQ), landslide following earthquake (EQ) but were included in this system due to the operational needs of database operators.


*Figure 3: Peril classification at the Family, Main Event and Peril levels without a pre-determined association of perils with a main event.*


*Figure 4: Peril classification at the Family, Main Event and Peril levels. The association of perils with main events is solely a suggestion. Some perils may change their main event association based on the actual event and loss trigger.*

## 3.2 Glossary

To facilitate the adoption and implementation of the peril classification scheme, a standardised set of definitions was developed. These definitions (Table 1) are based on descriptions developed by the World Meteorological Organization (WMO)[1]; the U.S. Centers for Disease Control and Prevention (CDC)[2]; the U.S. National Weather Service[3]; the U.S. Geological Survey (USGS)[4]; the National Aeronautics and Space Administration (NASA)[5]; Keller and DeVecchio (2012); as well as definitions published by Below et al. (2009) in their preliminary peril classification document.

*Table 1: Definitions of perils, main events, and families.*

| *Term* | *Definition* |
|---|---|
| **Airburst** | An explosion of a comet or meteoroid within the Earth's atmosphere without striking the ground. |
| **Animal Incident** | Human encounters with dangerous or exotic animals in both urban and rural environments. |
| **Ash Fall** | Fine (less than 4 mm in diameter) unconsolidated volcanic debris blown into the atmosphere during an eruption; can remain airborne for long periods of time and travel considerable distance from the source. |
| **Avalanche** | A large mass of loosened earth material, snow, or ice that slides, flows or falls rapidly down a mountainside under the force of gravity.<br>• Snow Avalanche: Rapid downslope movement of a mix of snow and ice.<br>• Debris Avalanche: The sudden and very rapid downslope movement of unsorted mass of rock and soil. There are two general types of debris avalanches - a cold debris avalanche usually results from an unstable slope suddenly collapsing whereas a hot debris avalanche results from volcanic activity leading to slope instability and collapse. |
| **Bacterial Disease** | An unusual increase in the number of incidents caused by the exposure to bacteria either through skin contact, ingestion or inhalation. Examples include salmonella, MSRA, and cholera, among others. |
| **Biological Hazard** | A hazard caused by the exposure to living organisms and their toxic substances (e.g. venom, mold) or vector-borne diseases that they may carry. Examples are venomous wildlife and insects, poisonous plants, and mosquitoes carrying disease-causing agents such as parasites, bacteria, or viruses (e.g. malaria). |

[1] http://www.wmo.int/pages/themes/hazards/index_en.html
[2] http://www.cdc.gov/
[3] http://w1.weather.gov/glossary/
[4] http://vulcan.wr.usgs.gov/Glossary/volcano_terminology.html
[5] http://www.nasa.gov/mission_pages/sunearth/news/storms-on-sun.html#.UpYJ5OKQMrg

| Climatological Hazard | **A hazard caused by long-lived, meso- to macro-scale atmospheric processes ranging from intra-seasonal to multi-decadal climate variability.** |
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| **Coastal Erosion** | The temporary or permanent loss of sediments or landmass in coastal margins due to the action of waves, winds, tides, or anthropogenic activities. |
| **Coastal Flood** | Higher-than-normal water levels along the coast caused by tidal changes or thunderstorms that result in flooding, which can last from days to weeks. |
| **Cold Wave** | A period of abnormally cold weather. Typically a cold wave lasts two or more days and may be aggravated by high winds. The exact temperature criteria for what constitutes a cold wave vary by location. |
| **Convective Storm** | A type of meteorological hazard generated by the heating of air and the availability of moist and unstable air masses. Convective storms range from localised thunderstorms (with heavy rain and/or hail, lightning, high winds, tornadoes) to meso-scale, multi-day events. |
| **Debris Flow, Mud Flow, Rock Fall** | Types of landslides that occur when heavy rain or rapid snow/ice melt send large amounts of vegetation, mud, or rock downslope by gravitational forces. |
| **Derecho** | Widespread and usually fast-moving windstorms associated with convection/convective storm. Derechos include downburst and straight-line winds. The damage from derechos is often confused with the damage from tornadoes. |
| **Disease** | Either an unusual, often sudden, increase in the number of incidents of an infectious disease that already existed in the region (e.g., flu, E. coli) or the appearance of an infectious disease previously absent from the region (e.g., plague, polio). |
| **Drought** | An extended period of unusually low precipitation that produces a shortage of water for people, animals and plants. Drought is different from most other hazards in that it develops slowly, sometimes even over years, and its onset is generally difficult to detect. Drought is not solely a physical phenomenon because its impacts can be exacerbated by human activities and water supply demands. Drought is therefore often defined both conceptually and operationally. Operational definitions of drought, meaning the degree of precipitation reduction that constitutes a drought, vary by locality, climate and environmental sector. |
| **Earthquake** | Sudden movement of a block of the Earth's crust along a geological fault and associated ground shaking. |

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| **Energetic Particles** | **Emissions from solar radiation storms consisting of pieces of matter (e.g., protons and other charged particles) moving at very high speed. The magnetosphere and atmosphere block (solar) energetic particles (SEP) from reaching humans on Earth but they are damaging to the electronics of space-borne technology (such as satellites) and pose a radiation hazard to life in space and aircrafts travelling at high altitudes.** |
| **Expansive Soil** | Earthen material, particularly clays that, upon wetting, freezing, or drying will alternately expand or contract causing damage to foundations of buildings and other structures. Shrinkage is generally referred to as desiccation. |
| **Extraterrestrial Hazard** | A hazard caused by asteroids, meteoroids, and comets as they pass near-earth, enter the Earth's atmosphere, and/or strike the Earth, and by changes in interplanetary conditions that effect the Earth's magnetosphere, ionosphere, and thermosphere. |
| **Extratropical Storm** | A type of low-pressure cyclonic system in the middle and high latitudes (also called mid-latitude cyclone) that primarily gets its energy from the horizontal temperature contrasts (fronts) in the atmosphere. When associated with cold fronts, extratropical cyclones may be particularly damaging (e.g., European winter/windstorm, Nor'easter). |
| **Extreme Temperature** | A general term for temperature variations above (extreme heat) or below (extreme cold) normal conditions. |
| **Fire following Earthquake** | Urban fires triggered by earthquakes. Particularly susceptible areas include densely spaced, wooden buildings that dominate local architecture, and where the earthquake has damaged or ruptured water and gas pipelines. Small local fires have the potential to merge into conflagrations destroying many city blocks. |
| **Flash Flood** | Heavy or excessive rainfall in a short period of time that produce immediate runoff, creating flooding conditions within minutes or a few hours during or after the rainfall. |
| **Flood** | A general term for the overflow of water from a stream channel onto normally dry land in the floodplain (riverine flooding), higher-than-normal levels along the coast and in lakes or reservoirs (coastal flooding) as well as ponding of water at or near the point where the rain fell (flash floods). |
| **Fog** | Water droplets that are suspended in the air near the Earth's surface. Fog is simply a cloud that is in contact with the ground. |
| **Forest Fire** | A type of wildfire in a wooded area. |

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| **Frost, Freeze** | **Frost is the consequence of radiative cooling resulting in the formation of thin ice crystals on the ground or other surfaces in the form of needles, feathers, scales, or fans. Frost occurs when the temperature of surfaces is below freezing and water vapor from humid air forms solid deposits on the cold surface.**<br><br>**Freeze occurs when the air temperature is at (32˚F/0˚C) or below over a widespread area for a climatologically significant period of time. Use of the term is usually restricted to advective situations or to occasions when wind or other conditions prevent frost. Frost and freeze are particularly damaging during the crop growing season.** |
| **Fungal Disease** | Exposure to fungi either through skin contact, ingestion or inhalation of spores resulting in an unusual increase in the number of incidents. Examples are fungal pneumonia, fungal meningitis, etc. |
| **Geomagnetic Storm** | A type of extraterrestrial hazard caused by solar wind shockwaves that temporarily disturb the Earth's magnetosphere. Geomagnetic storms can disrupt power grids, spacecraft operations, and satellite communications. |
| **Geophysical Hazard** | A hazard originating from solid earth. This term is used interchangeably with the term geological hazard. |
| **Glacial Lake Outburst** | A flood that occurs when water dammed by a glacier or moraine is suddenly released. Glacial lakes can be at the front of the glacier (marginal lake) or below the ice sheet (sub-glacial lake). |
| **Ground Movement** | Surface displacement of earthen materials due to ground shaking triggered by earthquakes or volcanic eruptions. |
| **Hail** | Solid precipitation in the form of irregular pellets or balls of ice more than 5 mm in diameter. |
| **Heat Wave** | A period of abnormally hot and/or unusually humid weather. Typically a heat wave lasts two or more days. The exact temperature criteria for what constitutes a heat wave vary by location. |
| **Hydrological Hazard** | A hazard caused by the occurrence, movement, and distribution of surface and subsurface freshwater and saltwater. |
| **Ice Jam Flood** | The accumulation of floating ice restricting or blocking a river's flow and drainage. Ice jams tend to develop near river bends and obstructions (e.g., bridges). |
| **Impact** | A type of extraterrestrial hazard caused by the collision of the Earth with a meteoroid, asteroid or comet. |
| **Insect Infestation** | The pervasive influx, swarming and/or hatching of insects affecting humans, animals, crops, and perishable goods. Examples are locusts and African Bees. |
| **Lahar** | Hot or cold mixture of earthen material flowing on the slope of a volcano either during or between volcanic eruptions. |

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| **Landslide following Earthquake** | **Independent of the presence of water, mass movement may also be triggered by earthquakes.** |
| **Lava Flow** | The ejected magma that moves as a liquid mass downslope from a volcano during an eruption. |
| **Lightning** | A high-voltage, visible electrical discharge produced by a thunderstorm and followed by the sound of thunder. |
| **Liquefaction** | The transformation of (partially) water-saturated soil from a solid state to a liquid state caused by an earthquake. Liquefaction reduces the strength and stiffness of soil causing buildings to topple over. |
| **Mass Movement** | Any type of downslope movement of earth materials. |
| **Meteorological Hazard** | A hazard caused by short-lived, micro- to meso-scale extreme weather and atmospheric conditions that last from minutes to days. |
| **Parasitic Disease** | Exposure to a parasite–an organism living on or in a host–causes an unusual increase in the number of incidents. Exposure to parasites occurs mostly through contaminated water, food or contact with insects, animals (zoonotic), pets, etc. Examples are malaria, chagas disease, giardiasis and trichinellosis. |
| **Prion Disease** | A type of biological hazard caused by prion proteins. Prion diseases or transmissible spongiform encephalopathies (TSEs) are a family of rare progressive neurodegenerative disorders that affect both humans and animals characterised by long incubation periods and neural loss. Examples are Bovine Spongiform Encephalophathy (BSE), Creutzfeldt-Jakob-Disease (CJD), Kuru, etc. |
| **Pyroclastic Flow** | Extremely hot gases, ash, and other materials of more than 1,000 degrees Celsius that rapidly flow down the flank of a volcano (more than 700 km/h) during an eruption. |
| **Radio Disturbance** | Triggered by x-ray emissions from the Sun hitting the Earth's atmosphere and causing disturbances in the ionosphere such as jamming of high and/or low frequency radio signals. This affects satellite radio communication and Global Positioning Systems (GPS). |
| **Rain** | Water vapour condenses in the atmosphere to form water droplets that fall to the Earth. |
| **Riverine Flood** | A type of flooding resulting from the overflow of water from a stream or river channel onto normally dry land in the floodplain adjacent to the channel. |
| **Rogue Wave** | An unusual single crest of an ocean wave far out at sea that is much higher and/or steeper than other waves in the prevailing swell system. |

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| **Sandstorm, Dust Storm** | **Strong winds carry particles of sand aloft, but generally confined to less than 50 feet (15 m), especially common in arid and semi-arid environments. A dust storm is also characterised by strong winds but carries smaller particles of dust rather than sand over an extensive area.** |
| **Seiche** | A standing wave of water in a large semi- or fully-enclosed body of water (lakes or bays) created by strong winds and/or a large barometric pressure gradient, |
| **Shockwave** | A shockwave carries energy from a disturbance through a medium (solid, liquid, gas) similar to a wave though it travels at much higher speed. It can be a type of extraterrestrial hazard caused by the explosion (airburst) or impact of meteorites that generate energy shockwaves capable of shattering glass, collapsing walls, etc. |
| **Sinkhole** | Collapse of the land surface due to the dissolving of the subsurface rocks such as limestone or carbonate rock by water. |
| **Snow, Ice** | Precipitation in the form of ice crystals/snowflakes or ice pellets (sleet) formed directly from freezing water vapour in the air. Ice accumulates when rain hits the cold surface and freezes. |
| **Space Weather** | A general term for extraterrestrial weather conditions driven by solar eruptions such as geomagnetic storms, radio disturbances, and solar energetic particles. |
| **Storm Surge** | An abnormal rise in sea level generated by a tropical cyclone or other intense storms. |
| **Subsidence** | Subsidence refers to the sinking of the ground due to groundwater removal, mining, dissolution of limestone (e.g., karst, sinkholes), extraction of natural gas, and earthquakes. |
| **Tornado** | A violently rotating column of air that reaches the ground or open water (waterspout). |
| **Tropical Cyclone** | A tropical cyclone originates over tropical or subtropical waters. It is characterised by a warm-core, non-frontal synoptic-scale cyclone with a low pressure centre, spiral rain bands and strong winds. Depending on their location, tropical cyclones are referred to as hurricanes (Atlantic, Northeast Pacific), typhoons (Northwest Pacific), or cyclones (South Pacific and Indian Ocean). |
| **Tsunami** | A series of waves (with long wavelengths when traveling across the deep ocean) that are generated by a displacement of massive amounts of water through underwater earthquakes, volcanic eruptions or landslides. Tsunami waves travel at very high speed across the ocean but as they begin to reach shallow water they slow down and the wave grows steeper. |

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| **Volcanic Activity** | **A type of volcanic event near an opening/vent in the Earth's surface including volcanic eruptions of lava, ash, hot vapour, gas, and pyroclastic material.** |
| **Wave Action** | Wind-generated surface waves that can occur on the surface of any open body of water such as oceans, rivers and lakes, etc. The size of the wave depends on the strength of the wind and the traveled distance (fetch). |
| **Wildfire** | Any uncontrolled and non-prescribed combustion or burning of plants in a natural setting such as a forest, grassland, brush land or tundra, which consumes the natural fuels and spreads based on environmental conditions (e.g., wind, topography). Wildfires can be triggered by lightning or human actions. |
| **Wind** | Differences in air pressure resulting in the horizontal motion of air. The greater the difference in pressure, the stronger the wind. Wind moves from high pressure toward low pressure. |
| **Winter Storm, Blizzard** | A low pressure system in winter months with significant accumulations of snow, freezing rain, sleet or ice. A blizzard is a severe snow storm with winds exceeding 35 mph (56 km/h) for three or more hours, producing reduced visibility (less than .25 mile (400 m). |

# 4. Conclusion

Over the course of the next months and years, the peril classifications and definitions proposed by the IRDR DATA Project will be implemented in member databases (see Annex). This harmonised peril classification system and definitions serve the international disaster risk reduction community and contributes to the Hyogo Framework for Action in regard to improving information on key hazards and their impacts.

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# Appendices

**Databases at a Glance**

| | EM-DAT | NatCatSERVICE | Sigma | GLIDE | DesInventar | SHELDUS |
|---|---|---|---|---|---|---|
| **Spatial Coverage** | Global | Global | Global | Global | National | National |
| **Spatial Resolution** | Country | Country | Country | Country | County, municipality | U.S. county |
| **Temporal Coverage** | 1900 – present | 79 AD – present | | 1930 – present | Varies by country, more than 30 countries operate DesInventar databasess | 1960 – present |
| **Number of Records** | >20,000 | >33,000 | | >5,000 | Varies by country | >800,000 |
| **Recording Thresholds** | ≥10 fatalities, ≥100 affected, declaration of state of emergency, or call for international assistance | | | ≥10 fatalities, ≥100 affected, declaration of state of emergency, or call for international assistance | ≥1 human loss or ≥$1 in economic loss | ≥1 human loss or ≥$1 in economic loss |
| **Data Sources** | U.N agencies, IFRC, World Bank, reinsurers, press, news agencies, etc. | Property claims service, insurance clients, U.N agencies, World Bank, press, | | U.N agencies, IFRC, World Bank, reinsurers, press, news agencies, etc. | U.N agencies, weather services, geological services, press, etc. | U.S. National Climatic Data Center, National Geophysical Data Center, U.S. Geological Survey, etc. |

| Audience | Humanitarian community, academia | General public, insurance industry | General public, insurance industry | Loss database operators | Emergency management, hazard mitigation planning, academia | Emergency management, hazard mitigation planning, academia |
|---|---|---|---|---|---|---|
| **Download URL** | www.emdat.be | | | www.glidenumber.net | www.desinventar.org | www.sheldus.org |
| **Owner** | Centre for Research on the Epidemiology of Disasters (CRED), Université Catholique de Louvain, Belgium | Munich Re, Germany | Swiss Re, Switzerland | Asian Disaster Reduction Center (ADRC), Japan | Varies by country | Hazards and Vulnerability Research Institute (HVRI), University of South Carolina, USA |
| **Loss Indicators** | | | | | | |
| Killed | x | | x | | x | x |
| Injured | x | x | x | | x | x |
| Missing | | x | x | | x | |
| Homeless | x | | x | | x | |
| Affected | x | x | x | | | |
| Evacuated | | x | | | x | |
| Relocated | | | | | x | |
| Displaced | | x | | | | |
| Property Loss | x | | | | | x |
| Crop Loss | x | | | | | x |
| Environmental Loss | x | | | | | |
| Insured Loss | | x | x | | | |

| | EM-DAT | NatCatSERVICE | Sigma | GLIDE | DesInventar | SHELDUS |
|---|---|---|---|---|---|---|
| Relocated | | | | | x | |
| Displaced | | x | | | | |
| Property Loss | x | | | | | x |
| Crop Loss | x | | | | | x |
| Environmental Loss | x | | | | | |
| Insured Loss | | x | x | | | |
| Aggregate Economic Loss | x | x | x | | x | |
| Infrastructure Damage | x | x | | | x | |
| Economic Sector Damage | x | x | | | x | |
| **Peril Coverage** | | | | | | |
| Geophysical | x | x | x | x | x | x |
| Hydrological | x | x | x | x | x | x |
| Meteorological | x | x | x | x | x | x |
| Climatological | x | x | x | x | x | x |
| Biological | x | | | x | x | |
| Extraterrestrial | | | | | | |
| Technological | x | | x | x | x | |
| Terrorism | | | x | | | |

## About IRDR

The impacts of natural hazards continue to increase around the world; the frequency of recorded disasters affecting communities has risen significantly over the past century. Although earthquakes and tsunamis can have horrific impacts, most disaster losses stem from climate-related hazards such as hurricanes, cyclones, other major storms, floods, landslides, wildfires, heat waves, and droughts.

The Integrated Research on Disaster Risk (IRDR) programme is a decade-long integrated research initiative co-sponsored by the International Council for Science (ICSU), the International Social Science Council (ISSC), and the United Nations International Strategy for Disaster Reduction (UNISDR) – the Co-Sponsors. It is a global, trans-disciplinary research programme created to address the major challenges of natural and human-induced environmental hazards. The complexity of the task is such that it requires the full integration of research expertise from the natural, socio-economic, health and engineering sciences as well as policy-making, coupled with an understanding of the role of communications, and public and political responses to reduce the risk.

Unfortunately, there is a great shortfall in current research on how science is used to shape social and political decision-making in the context of hazards and disasters. Addressing this problem requires an approach that integrates research and policy-making across all hazards, disciplines, and geographic regions. The IRDR programme endeavours to bring together the natural, socio-economic, health, and engineering sciences in a coordinated effort to reduce the risks associated with natural hazards.

The programme is guided by three research objectives:

1. Characterisation of hazards, vulnerability and risk.
2. Understanding decision-making in complex and changing risk contexts.
3. Reducing risk and curbing losses through knowledge-based actions.

Three cross-cutting themes support these objectives:

- Capacity building, including mapping capacity for disaster reduction and building self-sustaining capacity at various levels for different hazards.
- Development and compilation of case studies and demonstration projects.
- Assessment, data management, and monitoring of hazards, risks, and disasters

Attainment of these objectives through successful projects will lead to a better understanding of hazards, vulnerability and risk; an enhanced capacity to model and project risk into the future; better understanding of decision-making choices that lead to risk plus how they may be influenced; and how this knowledge can better guide disaster risk reduction.

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