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Recommendations on the Role of Official Statistics in Measuring Hazardous Events and Disasters

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Recommendations on the Role of Official Statistics in Measuring Hazardous Events and Disasters

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Preface

Many countries and regions are facing two increasingly stark trends: rapid urbanization and a growing number of natural disasters caused by climate change-related hazards. Combined, they substantially increase the risk to which many people are exposed.

The increasing number and magnitude of disasters and their impacts on people, the economy and the environment have led to the adoption of global policy frameworks to reduce disaster risk and ensure sustainable development, most importantly the *United Nations 2030 Agenda for Sustainable Development*, the *Paris Agreement on climate change* and the *Sendai Framework for Disaster Risk Reduction 2015-2030*.

National efforts to manage and reduce disaster risk are high on the policy agenda in many countries.

Disaster-risk management on the national level is usually a task of specialised agencies or line ministries, with only limited or no involvement of national statistical offices (NSOs) or other members of the national statistical system (NSS). However, the work of Disaster Risk Management Agencies (DRMAs) is largely dependent on data produced by NSS, such as statistics on population, economy, agriculture, etc. Due to lack of collaboration between DRMAs and NSOs official statistics are often not used as much as they could be, or they are not fit for purpose, e.g. due to time lags or confidentiality issues that need to be considered for small scale analysis.

This publication clarifies the role of NSOs and other members of NSS in providing information related to hazardous events and disasters, and identifies practical steps that these organisations can take, in coordination with national agencies responsible for disaster risk management, to better support disaster risk management efforts.

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This publication reflects the contributions of many individuals and organisations, both those participating in the UNECE Task Force that prepared it, and those who played advisory roles. The publication also benefited from complementary work by other partners in improving disaster-related statistics, including the United Nations Economic and Social Committee for Asia and the Pacific (ESCAP), the United Nations Office for Disaster Reduction (UNDRR) and the United Nations Statistics Division (UNSD).

The Task Force was chaired by Angela Ferruzza (Italian National Institute of Statistics).

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Midsummer Analytics (Canada) provided editorial services.

Michael Nagy (UNECE) served as secretary of the Task Force.

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Executive summary

1. This publication presents recommendations for national statistical offices (NSOs) and other organisations within national statistical systems (NSS), who would like to engage more in the measurement of hazardous events and disasters, on their roles in supporting work on this emerging topic. NSS in every country holds a wealth of information that may be applied in all phases of disaster risk management. In addition, national statistical systems have other competencies that are useful in the work in this area; notably, experience in coordinating different data producers; use of common standards and classifications; and adherence to strict professional principles and quality criteria. However, national statistical systems are often not involved in supporting disaster risk management to the extent they could be.

2. The main aims of the publication are (i) to clarify the role of national statistical offices and other members of national statistical systems in providing information related to hazardous events and disasters, and (ii) to identify practical steps needed for these organisations, in coordination with national agencies responsible for disaster risk management, to better support disaster risk management efforts.

3. The Recommendations were developed by a Task Force[1] set up by the Bureau of the Conference of European Statisticians in 2015. The work has been done in close cooperation with other international organisations active in this area, including the United Nations Economic and Social Committee for Asia and the Pacific, the United Nations Office for Disaster Risk Reduction and the United Nations Statistics Division.

4. The contributions of NSS work on hazardous events and disasters can benefit both national disaster risk management and official statistics. The basic data on population, the economy, the environment, and other topics needed in different phases of disaster risk management are already collected by national statistical systems. Their greater involvement in measuring hazardous events and disasters ensures the better use of existing information and increases the relevance of official statistics. It also ensures consistency with "traditional" statistics in the economic, social, and environmental domains, where the impacts of hazardous events and disasters are directly and indirectly measured. Policy attention in this area has shifted from disaster response to risk management and preparedness, where official statistics are well placed to meet the demand for high-quality, comparable information with long time series.

5. In many countries, the role of the national statistical system in disaster risk management and monitoring of hazardous events and disasters is not clear. The information needs for dealing with hazardous events and disasters are complex and involve many different agencies. Some needs can be met by official statistics, but others require different types of information that cannot be provided by the national statistical system. Therefore, clarifying its roles in providing information related to hazardous events and disasters regarding institutional cooperation,

[1] The Task Force comprised experts from the statistical offices of Armenia, Italy (Chair), New Zealand, Republic of Moldova, Mexico, South Africa and Turkey, and the following international organisations: Economic Commission for Latin America and the Caribbean (ECLAC); European Space Agency (ESA), Eurostat, Food and Agriculture Organization of the United Nations (FAO), United Nations Office for Disaster Risk Reduction (UNDRR), Joint Research Centre of the European Commission, United Nations Economic Commission for Europe (UNECE), United Nations Economic and Social Commission for Asia and the Pacific (ESCAP), World Health Organization (WHO) and the World Meteorological Organization (WMO). Furthermore, the Group on Earth Observations (GEO) participated in the work of the Task Force.

integration of statistical and geographical information, and statistical confidentiality, among other issues, is important.

6. Without a clear mandate, the tasks of NSS in measuring hazardous events and disasters are difficult to coordinate. Setting of work programmes, especially concerning information timeliness and spatial disaggregation of data, cannot be well specified, funded, or evaluated. Official statistics need to be made better fit for purpose; for example, by reducing time lags or increasing spatial detail. Special approaches may be needed to provide more timely data in case of emergencies and to deal with confidentiality issues.

7. Clarifying the role of NSS in general and NSOs in particular in disaster risk management is also necessary to respond to global data needs. Recent international agreements require the production of information on hazardous events and disasters. The monitoring and reporting requirements of the Sendai Framework for Disaster Risk Reduction, the United Nations 2030 Agenda on Sustainable Development, and the Paris Agreement on climate change call for countries to produce official statistics that will measure progress towards the achievement of the related goals.

Acronyms / Abbreviations

CBD	Convention on Biological Diversity
CES	Conference of European Statisticians
COP	Conference of Parties
DRM	Disaster risk management
DRMA	Disaster risk management agency
DRSF	Disaster-related Statistics Framework
ECA	United Nations Economic Commission for Africa
ECLAC	Economic Commission for Latin America and the Caribbean
ESA	European Space Agency
ESCAP	United Nations Economic and Social Commission for Asia and the Pacific
ESCWA	United Nations Economic and Social Commission for Western Asia
FAO	Food and Agriculture Organization of the United Nations
FDES	Framework for the Development of Environment Statistics
GEO	Group on Earth Observations
HED	Hazardous Events and Disasters
IRDR	Integrated Research on Disaster Risk
IUCN	International Union for Conservation of Nature
NGSO	National Geospatial and Statistical Office
NSO	National Statistical Office
NSS	National Statistical System
OECD	Organisation for Economic Co-operation and Development
OIEWG	Open-ended Intergovernmental Expert Working Group on Indicators and Terminology relating to disaster risk reduction
SEEA-CF	System of Environmental-Economic Accounting Central Framework
SNA	System of National Accounts
UNDRR	United Nations Office for Disaster Risk Reduction (new acronym, changed from UNISDR in April 2019)
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UNESCO-UIS	United Nations Educational, Scientific and Cultural Organization Institute for Statistics
UNFCCC	United Nations Framework Convention on Climate Change
UN-GGIM	United Nations Global Geospatial Information Management
UNICEF	United Nations International Children's Emergency Fund
UNISDR	United Nations Office for Disaster Risk Reduction (old acronym, changed to UNDRR in April 2019)
UNSD	United Nations Statistics Division
WHO	World Health Organization
WMO	World Meteorological Organization

1 Introduction

1.1 Objective

8. This publication presents recommendations for national statistical offices (NSOs) and other organisations within national statistical systems (NSS) on their roles in supporting the measurement of hazardous events and disasters (HED). In any given country, organisations within NSS have a wealth of information at their disposal that can be useful in all phases of disaster risk management (DRM). In addition, they have other competencies relevant to the work on DRM, including experience in coordinating different data producers; use of common standards and classifications; and adherence to strict professional principles and quality criteria. Despite these resources, however, NSOs and their NSS partners are often not involved in supporting DRM to the extent that they could be.

9. The main aims of this publication are (i) to clarify the role of NSOs (and their NSS partners) in providing data and statistics related to HED, and (ii) to identify practical steps needed for them, in coordination with national agencies responsible for DRM, to better support DRM efforts.

10. This publication contributes to current understanding of a newly developing and complex field involving several disciplines. Therefore, the work has been done in close cooperation with other international organisations active in this area, including United Nations Economic and Social Committee for Asia and the Pacific (ESCAP), the United Nations Office for Disaster Risk Reduction (UNDRR), and the United Nations Statistics Division (UNSD).

11. This document provides some general recommendations concerning this emerging topic. Countries are free to decide to which extent to implement the recommendations, depending on their priorities and needs. This document does not create any obligation for NSOs who do not see a need to engage in work on this topic. The decision about the national data collection and monitoring on hazardous events and disasters remains up to each individual country.

1.2 Policy interest in measuring hazardous events and disasters

12. The increased policy interest in measuring hazardous events and disasters is addressed in three high-level policy frameworks: the *Sendai Framework for Disaster Risk Reduction 2015-2030* (United Nations, 2015b), the *2030 Agenda on Sustainable Development* (United Nations, 2015c), and the *Paris Agreement* (United Nations, 2015a). All three frameworks require statistics and indicators to measure progress towards the achievement of their goals and targets. The international reporting for these policy frameworks is often carried out or coordinated by NSOs.

13. The *Sendai Framework for Disaster Risk Reduction 2015-2030* (Sendai Framework) adopted in 2015 aims to achieve substantial reduction of disaster risk and losses in lives, livelihoods and health, and in the economic, physical, social, cultural, and environmental assets of persons, businesses, communities and countries over the next 15 years. It aims to drive better governance and understanding of risk, greater investment in resilience, and enhanced preparedness for effective response, recovery, rehabilitation and reconstruction. The Sendai Framework has seven global targets, including substantial reductions in disaster mortality, numbers of people affected, economic losses, and damage to critical infrastructure.

14. The overarching goal of the *2030 Agenda on Sustainable Development* (2030 Agenda) is one of eradicating poverty. Disasters often disproportionally affect poor people, therefore the 2030 Agenda is also linked with disaster risk management. It includes issues of disaster

preparedness and risk in its 17 Sustainable Development Goals (SDGs). Several of these goals are relevant for DRM, in particular Goal 1 on ending poverty, Goal 11 on cities and human settlements, and Goal 13 on climate change. The global SDG indicator framework includes a number of indicators in common with those found in the Sendai Framework.

15. The *Paris Agreement* on climate change (Paris Agreement) will also include HED-related information reporting requirements because many hazardous events and disasters are closely linked with this subject. These requirements are currently being discussed and have not yet been identified in detail. For more information, see Chapter 3.

1.3 Why the national statistical system should be involved in the work related to hazardous events and disasters

16. NSS of a given country can contribute to HED-related work to the benefit of both national disaster risk management efforts and NSS itself. There are a number of reasons why it is important for NSS to be involved:

a) **Improving the use and relevance of existing official statistics**

NSS already provides much of the basic statistics on population, businesses, environment and other topics that are needed in different phases of disaster risk management. The relevance of official statistics[2] is at risk if the agencies dealing with hazardous events and disasters are looking for alternative information sources, possibly of lower quality, rather than using these statistics.

The increased use of existing official statistics for managing disaster risk and climate change also creates an opportunity to make these statistics more visible and accessible to other networks, and to establish partnerships. This additional incentive to improve accessibility of information (for example, by establishing multi-purpose databases, geo-coding, integrating information from different sources and subject matter areas, and improving timeliness) will benefit the whole statistical system.

b) **Reflecting impacts of hazardous events and disasters in official statistics**

The impacts of disasters on people, economy, and environment are expected to be visible in traditional economic, social, and environmental statistics. The involvement of NSS in measuring the impact of HED will help to ensure that statistics on losses related to these events are consistent with other official statistics. It will also improve the quality of official statistics.

The 2030 Agenda notes the linkages between disasters, poverty and economic and environmental sustainability. NSS should be involved to ensure complete understanding of these linkages which could have major impacts on society.

[2] Official statistics are statistics produced by the national statistical system in compliance with the *United Nations Fundamental Principles of Official Statistics* (United Nations, 2014), as well as internationally agreed statistical standards and recommendations. See 5.1 and the Glossary for more details.

c) **Meeting information needs related to hazardous events and disasters on a systematic basis**

Historically, information needs related to disasters were often addressed on an ad hoc basis due to the requirement for immediate response. However, policy action is shifting from immediate disaster response to risk management, preparedness and avoidance. Information for this kind of analysis will be needed on a continuous and systematic basis. NSS is well placed to meet such demands because of its involvement in producing high-quality, comparable data, statistics and indicators over long periods.

d) **Strengthening the role of NSOs**

NSOs are often seen solely as providers of statistics. However, they also have other unique strengths and competencies that would be useful in measuring hazardous events and disasters and their impacts. As coordinators of NSS, NSOs have a strong network and experience in coordinating multiple information producers, including ensuring the use of common standards, classifications, and terminology. They have a mandate to provide information based on professional independence, strict quality criteria, use of sound, transparent, and commonly agreed methodologies, and a commitment to accessibility. NSOs also have established procedures for communicating and disseminating information and are well suited to providing a platform for regular dissemination of HED-related information.

e) **Hazardous events happen in all countries and are not rare**

Various types of hazardous events and disasters happen regularly in all countries. The aim is to prevent small-scale instances of extreme temperatures, drought, floods, storms and forest fires, from escalating into disasters. Globally, the cumulative impact of such small-scale disasters is nearly as high as that of larger and rarer disasters that are mostly concentrated in certain geographic regions (see UNISDR, 2013). Therefore, hazardous events and disasters should be seen as a regular part of life, economy and environment where NSS should be involved, rather than as rarely occurring phenomena with minimal relevance to NSS because of their irregular nature.

1.4 Main challenges for the national statistical system in measuring hazardous events and disasters

17. The following main challenges for the NSS in measuring hazardous events and disasters, applicable for most countries of the region, were identified by the Task Force:

a) **Information available at NSS is not sufficiently used**

Although NSS has information at its disposal that can be used in disaster risk management, this information is often not sufficiently used. NSOs are often not aware of the related requirements, and disaster risk management agencies (DRMAs) are frequently not aware that this information is available.

b) **NSS is often not involved in producing HED-related statistics**

NSS is involved in producing HED-related statistics in a number of countries, but not in many. In a survey carried out by the Task Force in 2016[3], NSOs and other NSS organisations were responsible for producing HED-related statistics in one third of the responding countries. NSOs had a non-production role in about two thirds of the responding countries; sometimes this was merely publishing statistics produced by others. Three quarters of respondents considered that the role of NSOs in this area should be enhanced.

c) **Roles of NSOs and other organisations within NSS related to HED are not clear**

HED-related information needs are complex. Addressing these needs typically involves many different agencies. While some of the needs can be met by NSS, others require very different types of information which cannot be provided by official statistics. Therefore, it is important to clarify the roles of NSOs and the other organisations within NSS in providing HED-related information. Issues such as institutional cooperation, integration of statistical and geographical information, and statistical confidentiality should be addressed to meet these information needs. Very important is the establishment of mechanisms for linking of statistical information with geographical information.

Use and improvement of official statistics for disaster risk management purposes is often not clear due to lack of a clear mandate, legislation, specific protocols or funding. Internal responsibility within NSS for this type of information is often not clearly established.

d) **Official statistics are not fit for purpose**

Official statistics are often not fit for measuring HED-related issues. For example, the time lag may be too long, or the required spatial disaggregation may not be available. Special approaches are needed to provide more timely statistics and to deal with confidentiality issues in cases of emergency. As production of these types of statistics often is of low priority, there is lack of funding to make existing official statistics more suitable for disaster risk management, and to develop new statistics in this area.

1.5 How the Recommendations were developed

18. The *UNECE Task Force on Measuring Extreme Events and Disasters* developed these recommendations. The Bureau of the Conference of European Statisticians (CES) set up the Task Force in February 2015 as a follow-up to an in-depth review of this topic carried out in October 2014 based on a paper prepared by the National Institute of Statistics and Geography of Mexico (2015). The main objective of the Task Force was to clarify the role of official statistics in providing data related to extreme (a term later replaced by 'hazardous') events and disasters, and to identify practical steps for NSOs, in coordination with DRMAs, to support disaster risk reduction. The Task Force's terms of reference are found in Annex I. Terms of Reference for Task Force on Measuring Extreme Events and Disasters.

19. The Task Force comprised experts from the statistical offices of Armenia, Italy (Chair), New Zealand, Republic of Moldova, Mexico, South Africa and Turkey, and the following international

[3] Forty countries from the UNECE region and beyond responded to the survey. For summary results, see: https://www.unece.org/fileadmin/DAM/stats/documents/ece/ces/2016/mtg/Sess5_extreme_events_UNECE_TF.pdf.

organisations: ECLAC; European Space Agency, Eurostat, FAO, UNDRR, Joint Research Centre of the European Commission, UNECE, ESCAP, WHO and WMO. Furthermore, the Group on Earth Observations (GEO) participated in the work of the Task Force.

20. The Task Force worked in close cooperation with international initiatives active in this area, such as those led by ESCAP, UNDRR and the UN Statistics Division.

21. This publication complements the *Disaster-related Statistics Framework* (DRSF) prepared under the auspices of ESCAP (2018). DRSF provides a statistical framework for developing disaster-related statistics, including a basic set of disaster-related statistical indicators to monitor progress toward international targets, particularly the Sendai Framework. ESCAP adopted DRSF in May 2018.[4]

22. This publication also benefited from two reports prepared by UNDRR[5]:

- *Report of the Open-ended Intergovernmental Expert Working Group on Indicators and Terminology (OIEWG) Relating to Disaster Risk Reduction* (UNISDR, 2017): Adopted by the United Nations General Assembly in February 2017, this report describes indicators for the seven targets of the Sendai Framework. These same indicators were also adopted for the related goals and targets of the 2030 Agenda.
- *Technical Guidance for Monitoring and Reporting on Progress in Achieving the Targets of the Sendai* Framework *for Disaster Risk Reduction* (UNISDR, 2018): This document refined technical guidance for countries reporting on the indicators to monitor the achievement of the Sendai Framework targets and the 2030 Agenda.

1.6 Contents of the publication

23. Following this introductory chapter, key terms and concepts are defined in chapter 2.

24. Chapter 3 outlines the policy background and explains in more detail the national and international reporting needs on statistics and indicators related to hazardous events and disasters.

25. Chapter 4 defines the scope of statistics on hazardous events and disasters based on information requirements and the *Disaster-related Statistics Framework* developed by ESCAP and adopted in 2018.

26. Chapter 5 discusses the role of NSOs in measuring HED, noting how their particular strengths, such as professional independence, use of internationally agreed methodologies, and application of quality criteria, can contribute to the availability of information needed throughout the disaster risk management cycle. Core functions and additional functions of NSOs in disaster statistics are described noting that particular assignments of functions will vary based on national needs and institutional context.

27. Chapter 6 explains the legal, technical, and staffing infrastructure that enables a strong contribution of NSOs to disaster risk management statistics.

28. Chapter 7 provides seven recommendations for NSOs to consider when examining their current functions and potential contributions to disaster risk statistics. This chapter also outlines

[4] See https://www.unescap.org/commission/74/document/E74_RES6E.pdf.
[5] Note that the acronym was changed in April 2019 from UNISDR to UNDRR.

the possible roles of international organisations in supporting the development of NSO capacity to produce statistics on hazardous events and disasters.

29. Chapter 8 describes practical, incremental approaches that NSOs can take. The specific steps outlined in this chapter are intended to assist all NSOs, whether just beginning or already well engaged in the production of HED-related statistics.

30. Chapter 9 lists a set of unresolved issues and recommendations for follow-up work that should be considered for developing official statistics related to hazardous events and disasters further. These include activities to establish and maintain a community of practice, preparing practical guidelines, and clarification of specific technical questions for the development of statistical classifications for hazards and disasters.

31. Case studies of Armenia, Belarus, Brazil, France, Ireland, Italy, Mexico, Norway, the Philippines, Turkey and the United States can be found at the end of the document to provide details on practical work in this area. Paragraphs with references to these case studies are highlighted (similar to this paragraph).

32. For better identification the recommendations to NSS and NSOs are highlighted ***in bold italics*** throughout the text.


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2 Key terms and concepts

33. Key terms and concepts associated with hazardous events and disasters have been developed by other expert communities because statistics related to this subject are not within the traditional portfolio of NSOs. 2.1 discusses key terms and their links. 2.2 presents the phases of disaster risk management that are relevant for understanding the roles, responsibilities and functions of governmental institutions, including NSOs. A glossary of important terms and definitions is provided in Annex II. Glossary of main terms.

34. Disaster risk management incorporates expertise from diverse fields. As a result, the terminology used for DRM statistics was not standardised internationally or across disciplines until recently. There was no common agreement on classifications or on how hazardous events should be delimited in terms of space and time. This made the analysis of trends difficult, if not impossible, even within the same country.

35. The Sendai Framework was adopted in 2015. The framework called for national reporting to measure progress and, therefore, required agreement on key terms and definitions. The resulting global consultation provided the basis for internationally agreed terms, definitions and use of classifications related to disaster risk management. These have been incorporated in the metadata associated with the Sendai Framework and SDGs.

36. The *Framework for Development of Environment Statistics* (FDES; UNSD, 2017) recommends the implementation of statistics on "natural extreme events and disasters" (sub-component 4.1) and "technological disasters" (sub-component 4.2) in its *Basic Set of Environment Statistics*. However, the methodological guidelines, terms, definitions and classifications referred to in FDES have been partly superseded by recent developments in international guidelines related to both the Sendai Framework and the 2030 Agenda. The *Manual on the Basic Set of Environment Statistics*[6], which complements FDES, will present the more recent methodological terms, definitions and classifications in its forthcoming chapter on disaster statistics.

2.1 Key terms and their semantic relationships

37. Most of the disaster-related definitions used in this publication refer to the Report of the *Open-ended Intergovernmental Expert Working Group on Indicators and Terminology relating to Disaster Risk Reduction* (UNISDR, 2017), adopted by the United Nations General Assembly in February 2017. The definitions of key terms are given below and in Annex II. Glossary of main terms.

38. A **hazard** is the process, phenomenon, or human activity that may potentially cause loss of life, injury or other health impacts, property damage, social and economic disruption or environmental degradation. Hazards may be natural, anthropogenic or socio-natural[7] in origin. They include processes and phenomena that are biological, environmental, geological, hydrometeorological (or, climate related), and technological. This term does not include the occurrence or risk of armed conflicts and other situations of social instability or tension, which are subject to international humanitarian law and national legislation.

[6] See https://unstats.un.org/unsd/envstats/fdes/manual_bses.cshtml.

[7] Associated with a combination of natural and anthropogenic factors, including environmental degradation and climate change.

39. A **hazardous event** is the manifestation of a hazard in a particular place during a particular period of time. Severe hazardous events can lead to a disaster as a result of the combination of hazard occurrence and other risk factors (such as exposure).

40. A special case are **multi-hazard events** where hazardous events occur simultaneously, cascadingly or cumulatively over time. One example for that is the Fukushima Daiichi nuclear disaster of 2011, which was triggered by a tsunami which was the result of an undersea earthquake in the Pacific Ocean. In this case three hazardous events occurred cascadingly, an earthquake, a tsunami and a technological hazard.

41. A **disaster** is a serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability and capacity, leading to one or more of the following: human, material, economic and environmental losses and impacts. The effect of the disaster can be immediate and localized, but it is often widespread and could last for a long period of time. The effect may test or exceed the capacity of a community or society to cope using its own resources, and therefore may require assistance from external sources, which could include neighbouring jurisdictions, or those at the national or international levels.

42. **Disaster impact** is the total effect, including negative effects (e.g., economic losses) and positive effects (e.g., economic gains), of a hazardous event or a disaster. The term includes economic, human and environmental impacts, and may include death, injuries, disease and other negative effects on human physical, mental and social wellbeing.

43. **Disaster damage** is the total or partial destruction of physical assets and infrastructure in disaster-affected areas.

44. **Economic loss** is the total economic impact that consists of direct economic loss and indirect economic loss. Direct economic loss is the monetary value of total or partial destruction of physical assets existing in the affected area. Direct economic loss is nearly equivalent to physical damage. Indirect economic loss is a decline in economic value added as a consequence of direct economic loss and/or human and environmental impacts.

45. The distinction of disaster impact in terms of damage and loss stems from traditional assessment techniques applied by UN agencies, more specifically, the method for impact and needs assessment developed by ECLAC. For example, it has been incorporated into FAO's methodology to assess the impact of disasters on agriculture.

46. **Disaster risk** is the potential loss of life, injury, or destroyed or damaged assets, which could occur to a system, society, or a community in a specific time period, determined probabilistically as a function of hazard, exposure, vulnerability and capacity.

47. In other words, a disaster risk results from a combination of:

- Vulnerability (or resilience, included here as opposite of vulnerability);
- Capacity;
- Exposure; and
- The existence of a hazard.

48. **Vulnerability** is the condition determined by physical, social, economic, and environmental factors or processes which increase the susceptibility of an individual, a community, assets or systems to the impacts of hazards.

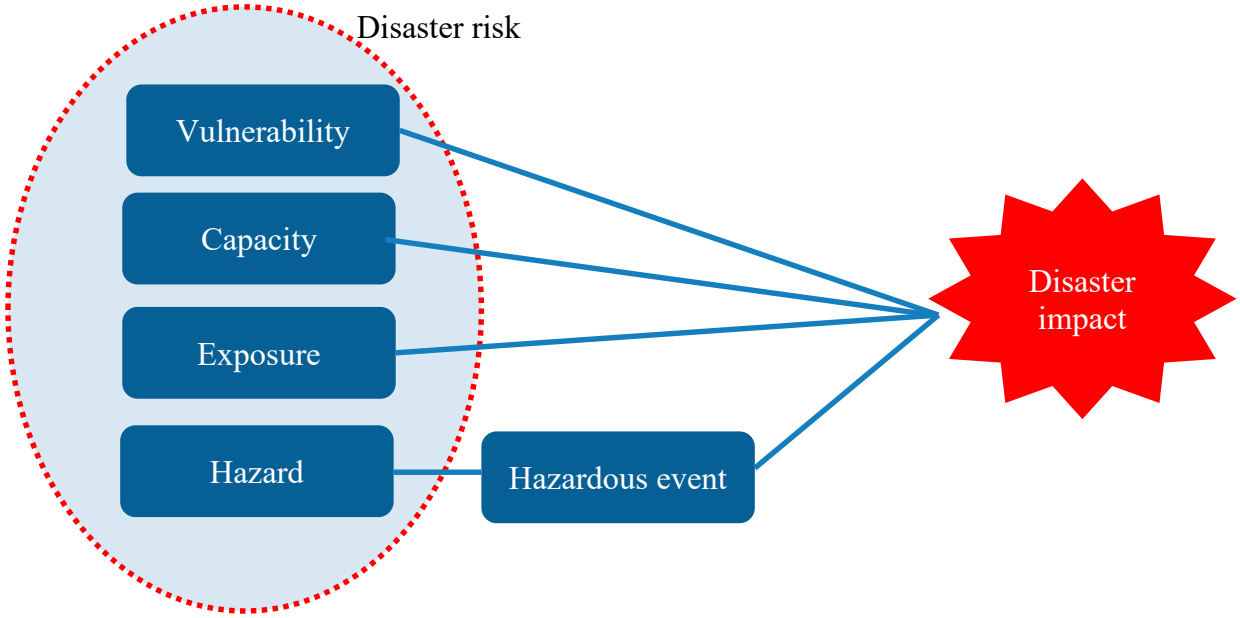
49. **Resilience,** included here as the opposite of vulnerability, is the ability of a system, community, or society exposed to hazards to resist, absorb, accommodate, adapt to, transform, and recover from its effects in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions through risk management.

50. **Capacity** is the combination of all the strengths, attributes and resources available within an organization, community or society to manage and reduce disaster risks and strengthen resilience. Capacity may include infrastructure, institutions, human knowledge and skills, and collective attributes such as social relationships, leadership and management.

51. **Exposure** is the situation of people, infrastructure, housing, production capacities and other tangible human assets located in hazard-prone areas.

52. Figure 1: shows the basic model of disaster risk and disaster impact as described above.

Figure 1: Simplified hazardous event-disaster impact model



Source: UNECE Task Force, 2018.

53. It is also important to distinguish between large-scale disasters and small-scale disasters for management and statistical purposes. Small-scale disasters and their impacts are often not recorded in official statistics, but according to the *Global Assessment Report on Disaster Risk Reduction 2013* (UNISDR, 2013), small-scale disasters account for nearly as much accumulated loss as major disasters.

54. Many NSOs also use the category of medium-scale disasters. DRSF recommends the use of a simple three-category system (small, medium, and large disasters) that is already commonly used by national agencies for indicating and grouping the scale of impacts from disasters. The geographic scale of the administration required for an emergency response and recovery effort (local, regional or national scale) is recommended as a proxy measure for categorizing the scale of disasters.

55. **Large-scale disasters** are emergencies at a national scale or higher that have special characteristics of interest because they are relatively rare yet have extensive and long-term effects on sustainable development. Examples are disasters caused by hurricanes, earthquakes,

or droughts. Large disasters tend to generate more data than small disasters and are often covered by post-disaster assessment studies. The impacts of large disasters often cross administrative boundaries, including international borders, and their statistics usually need to be recorded for multiple regions.

56. **Small- and medium-scale disasters** are emergencies that are smaller than national in geographic scale. On aggregate, small- and medium-scale disasters tend to cause greater impacts to a country or region because they are more frequent than large disasters. This distinction is related to the concept of extensive and intensive risk from disasters developed by UNISDR (2015). "Extensive risk is used to describe the risk associated with low-severity, high-frequency events, mainly associated with highly localised hazards. Intensive risk is used to describe the risk associated with high-severity, mid- to low-frequency events, mainly associated with major hazards." Small-scale disasters (for example, concentrated severe storms) have impacts limited to relatively small, localised areas. Medium-scale disasters are defined by a threshold of impacts causing emergency reaction from multiple regional administrative authorities, such as multiple villages, districts, or provinces (ESCAP Expert Group, 2018).

57. The categorisation into small- medium and large-scale disasters is useful for national purposes. However, this categorisation is not internationally comparable as it is relative to the size of any given country.

58. Some countries are using classifications that are relative to the size of the impact of any given hazardous event. For example, France uses the "French Gravity Scale of damaging natural events" which categorises disasters by the resulting impacts on humans and the material damages (see Case Study 8). Belarus distinguishes between "Emergencies" and "Major Emergencies" based on criteria such as persons injured, sick, dead and resettled. Other criteria include the declaration of a disaster and whether international assistance is needed (see Case Study 9).

59. Disaster risk reduction can also be considered from a **sectoral perspective**. For example, for agriculture – a sector highly dependent on weather and climate for its production – disaster risk management should incorporate regular monitoring and data collection on damage and loss from disasters of not only large- and medium-scale, but also on small-scale or "silent" disasters, which tend to be localised and have an isolated effect on agriculture and rural livelihoods. This has direct implications on how NSOs should approach data collection on disaster impact in agriculture.

60. Even if guidelines (such as DRSF) and national experience exist in the scaling of disasters, more work is needed to harmonise this scaling for statistical purposes and international comparability (see chapter 9).

61. A clarification is required for the term "extreme weather event" as used in the context of monitoring main phenomena of climate change; for example, in the assessment reports of the Intergovernmental Panel on Climate Change (IPCC). The term "extreme event" is usually only used to categorise climate, weather, or hydrological events which are outliers in a series of events. For example, IPCC (2015) defines an "extreme weather event" as follows:

> *An extreme weather event is an event that is rare at a particular place and time of year. Definitions of rare vary, but an extreme weather event would normally be as rare as or rarer than the 10th or 90th percentile of a probability density function estimated from*

> *observations. By definition, the characteristics of what is called extreme weather may vary from place to place in an absolute sense. When a pattern of extreme weather persists for some time, such as a season, it may be classed as an extreme climate event, especially if it yields an average or total that is itself extreme (e.g., drought or heavy rainfall over a season).*

62. The IPCC definition applies to weather events only. There is no analogous use of the term "extreme events" for other events, such as earthquakes, volcano eruptions, disease outbreaks, or accidents.

63. The term "extreme weather event" is not used in the terminology of the Sendai Framework, but can instead be seen as sub-category of "hazardous events". As "extreme" is a function of the probability of a hazardous event, it includes small-scale, medium scale, and large-scale events. For example, an extreme weather/climatological/hydrological event could be a local unusually heavy rainfall (small-scale), a flood affecting several municipalities (medium-scale), or a several-month drought affecting large areas of the country and neighbouring countries (large-scale).

64. The correlation of terminology used for climate change-related policies with that in the Sendai Framework is important to avoid confusion and to ensure coherence of information used for policies on climate change, disaster risk management, and sustainable development.

65. The term "natural disaster" also requires clarification and, in the opinion of the Task Force, should not be used. Most hazards, like earthquakes or cyclones, are the result of natural processes, occurring more or less frequently, and of greater or lesser magnitude. Whether a hazard becomes a disaster depends primarily on how the society is able to cope with the hazardous event. Vulnerable people are at risk not simply because they are exposed to hazards, but also because they have been made marginal in some way by a combination of variables such as poverty, education, class, gender, age, ethnicity, or disability, or because they have inherited those vulnerabilities and have not been able to resolve them.

66. The term "natural disaster" can also suggest that nothing can be done about these disasters. Therefore, ***the Task Force recommends using the term "disasters associated to natural hazards" instead, and to refrain from using the term "natural disasters".***

67. The case example of Ireland also shows the problem of classifying a disaster as natural, for example when a flooding was likely due to the collapse of a structurally unsound bridge, leading to a local river bursting its banks (see Case Study 7).

2.2 Phases of disaster risk management

68. It is important to define disaster risk management, and its different phases and requirements, in order to outline different functions and roles of NSOs (Section 5.3.1).

69. Disaster risk management is a continuous process and occurs before, during and after a disaster impact. It is a task typically assigned to a DRMA or a line ministry (the Ministry of Interior, for example).

70. DRM includes the following phases: assessment, prevention and mitigation, preparedness, response and recovery. These phases occur in parallel before, during and after a disaster (see Figure 2).

71. **Disaster response** is the provision of emergency services and public assistance during or immediately after a disaster to save lives, reduce health impacts, ensure public safety, and meet basic subsistence needs of those affected (UNISDR and OCHA, 2008). This can include rescue of affected people, specific care for vulnerable groups, distribution of basic supplies such as food, water, clothing and medical care, firefighting, monitoring of secondary disaster, construction of temporary housing, and establishment of tent villages, among other interventions.

72. **Disaster recovery** is the restoring or improving of livelihoods and health, as well as economic, physical, social, cultural and environmental assets, systems and activities, of a disaster-affected community or society, in accordance with the principles of sustainable development and "build back better," to avoid or reduce future disaster risk.

Figure 2: Phases of disaster risk management

Source: ESCAP Expert Group, 2018

73. **Risk assessment** is a qualitative or quantitative approach to determine the nature and extent of disaster risk by analysing potential hazards and evaluating existing conditions of exposure and vulnerability that together could harm people, property, services, livelihoods and the environment on which they depend. Disaster risk assessments include identification of hazards; review of the technical characteristics of hazards such as their location, intensity, frequency and probability; analysis of exposure and vulnerability, including the physical, social, health, environmental and economic dimensions; and evaluation of the effectiveness of prevailing and alternative coping capacities with respect to likely risk scenarios.

74. **Prevention** is activities and measures to avoid existing and new disaster risks. Examples include dams or embankments that eliminate flood risks, land-use regulations that do not permit any settlement in high risk zones, and seismic engineering designs that ensure the survival and function of any type of critical structure in a possible earthquake.

75. **Preparedness** is the knowledge and capacities developed by governments, response and recovery organisations, communities and individuals to effectively anticipate, respond to and recover from the impacts of likely, imminent or current disasters. It comprises activities undertaken prior to a disaster to prevent or mitigate the impact of the disaster. Preparedness

comprises an overall preparedness strategy, policy, institutional structure, warning and forecasting capabilities, and plans that define measures geared to helping at-risk communities safeguard their lives and assets by being alert to hazards and taking appropriate action in the face of an imminent threat or actual disaster (UNISDR and OCHA, 2008).

3 Policy background

3.1 National information needs

76. The main driver for information needs on hazardous events and disasters is national disaster risk management (Section 2.2). Each phase of DRM includes typical issues and requires plans and decisions. Each of these needs a different set of information. In several of these instances, official statistics are an important component. The ESCAP Expert Group on Disaster Related Statistics identified the demand for disaster-related information for each of the phases of disaster risk management as presented in Table 1.

Table 1: Phases of national disaster risk management and related information requirements

Phase	Typical issues	Typical decisions and plans required	**Information requirements** (Information traditionally managed by NSOs appears in **bold***)
Risk Assessment	• Disaster risks can be estimated but are not known • Development investments should be informed by risk profiles • Risks that development investments may exacerbate existing (and/or create new) disaster risks	• Prioritise investments in risk reduction • Invest in development while avoiding new risks • If particularly vulnerable groups are identified, guide policies favoring their relocation	• Dynamic hazard profiles (magnitude, temporal and spatial distribution) • **Baseline of exposure in geographic areas prone to natural hazards; identifying particularly vulnerable groups** • Utilizing available data to calculate risk profiles • Historical disaster data • Forecasted losses
Risk Preparedness, Prevention and Mitigation	• Risk profiles change as new information becomes available, such as when development occurs in potentially vulnerable areas • Early warning systems and other monitoring systems deliver continuous information on risks and possibilities for mitigating impacts	• Introduction of new measures to reduce disaster risk • Introduction of mechanisms to improve sufficient early warning and preparedness • Investment in development that addresses disaster risks and minimises new exposures • Whether and how to discourage development in	• Scale and type of investment in disaster risk reduction • Signals of hazards transforming into increased risk of disaster • Level of awareness, preparedness, and investment against disasters • Factors that cause and or exacerbate disaster risks • **Baseline information on vulnerable groups**

Phase	Typical issues	Typical decisions and plans required	**Information requirements** (Information traditionally managed by NSOs appears in **bold***)
Response	• Act quickly and efficiently to save lives and mitigate unnecessary suffering • Sufficient resources to control crisis • Urgent demand to meet overwhelming needs where vital systems and delivery of basic resources is affected	• Determine the magnitude of the disaster and prioritise the need for emergency relief • Maximise efficiency of response • Manage needs given impacts to local supplies of goods and services • Mount emergency response while also establishing requirements for medium- and long-term recovery	• Disaster occurrence and type, including temporal, and spatial spread of the event • **Immediate indication of impacts on population, losses, damage, and disruption of services.** • Recovery needs which may increase • Coordination of response team
Recovery	• Unaddressed humanitarian needs • Risk of new crisis within fragile communities if recovery needs are not met • Reduced spotlight on initial response may reduce resources for recovery • Development policy-planning cycle resumes with many requirements but, due to disaster, with less available resources	• Determine appropriate level of investment required for complete recovery from impacts for disasters • Prioritise recovery of economic sectors and determination of appropriate scale of re-building effort in affected location • Return to consideration of future risk identification and mitigation (see above)	• **Comprehensive and credible post-disaster accounting for damage, losses, and disruption of services** • Magnitude of requirements to address recovery needs • Coping mechanisms of communities, localities and sectors • **New post-disaster calculation of vulnerability to future incidents**

* The tasks and coordination competencies of NSOs are different in countries, therefore the identified information managed by NSOs does not always fully apply.

Source: Adapted from ESCAP Expert Group (2015) using terms to conform with the definitions used in this publication.

3.2 Global reporting mandates

77. In addition to its role in responding to national DRM information needs, NSS also provides the means to monitor and report on progress in achieving international policy goals related to disaster risk reduction.

78. The international policy demand to measure HED-related impacts has recently increased. The three most central policies in this area are the Sendai Framework, the 2030 Agenda, and the Paris Agreement. Key measurement aspects of each of these frameworks for Disaster Risk Reduction and areas of overlap are noted below.

3.2.1 Sendai Framework for Disaster Risk Reduction 2015-2030

79. The *Sendai Framework for Disaster Risk Reduction 2015-2030* was adopted at the Third UN World Conference in Sendai, Japan, in March 2015 and supported by the United Nations Office for Disaster Risk Reduction at the request of the UN General Assembly. It is an outcome of stakeholder consultations initiated in March 2012 and inter-governmental negotiations from July 2014 to March 2015.

80. The Sendai Framework includes seven targets:

1) Substantially reduce global disaster mortality by 2030, aiming to lower the average per 100,000 global mortality rate in the decade 2020–2030 compared to the period 2005–2015;
2) Substantially reduce the number of affected people globally by 2030, aiming to lower the average global figure per 100,000 in the decade 2020–2030 compared to the period 2005–2015;
3) Reduce direct disaster economic loss in relation to global gross domestic product (GDP) by 2030;
4) Substantially reduce disaster damage to critical infrastructure and disruption of basic services, among them health and educational facilities, including through developing their resilience by 2030;
5) Substantially increase the number of countries with national and local disaster risk reduction strategies by 2020;
6) Substantially enhance international cooperation to developing countries through adequate and sustainable support to complement their national actions for implementation of the present Framework by 2030; and
7) Substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to people by 2030.

81. To measure the global progress against these targets, United Nations General Assembly resolution 69/284 established the *Open-ended Intergovernmental Expert Working Group on Indicators and Terminology relating to disaster risk reduction* (OIEWG). The OIEWG report to the General Assembly (UNISDR, 2017) recommended definitions for key terms and suggested the classification of hazards that is used in this publication. OIEWG also agreed on a set of 38 global indicators corresponding to the seven targets (see Annex III. Sendai Framework indicators).

82. At the request of OIEWG, UNISDR prepared the *Technical Guidance for Monitoring and Reporting on Progress in Achieving the Global Targets of the Sendai Framework for Disaster-Risk Reduction 2015-2030* (UNISDR, 2018). This Technical Guidance provides standard methodologies for the calculation of Sendai Framework indicators and discusses critical technical issues.

83. Progress in implementing the Sendai Framework will be assessed annually by UNISDR. Analysis and trends will be presented in the Sendai Framework Progress Report based on information provided by countries. UNISDR countries use the online Sendai Framework Monitor to report against indicators for measuring the targets of the Sendai Framework and disaster risk reduction-related indicators of SDGs. The first Sendai Framework Progress Report is expected in 2019 and will, on an exceptional basis, cover trends related to its implementation since the adoption of the Sendai Framework in 2015.

3.2.2 2030 Agenda for Sustainable Development

84. In 2015, the United Nations approved the *2030 Agenda for Sustainable Development* (United Nations, 2015c) to eradicate extreme poverty and achieve sustainable development by 2030. The 2030 Agenda builds upon and exceeds the ambitions of the Millennium Development Goals in its number and scope of goals and targets, as well as in calling for all UN member countries, developing and developed alike, to participate.

85. The 2030 Agenda includes 17 Sustainable Development Goals. Several goals are directly or indirectly related to mitigation and adaptation of hazardous events and disasters. The goals most important to this publication are:

- SDG 1 - End poverty in all its forms everywhere;
- SDG 11 - Make cities and human settlements inclusive, safe, resilient and sustainable; and
- SDG 13 - Take urgent action to combat climate change and its impacts.

86. Some of the Sendai Framework's global indicators for measuring progress are identical with the indicators used for measuring SDGs 1, 11 and 13.

87. In 2016, the United Nations Statistical Commission agreed on a Global Indicator Framework that specified 232 indicators to monitor global progress against these 17 goals and 169 targets. Indicators related to disaster risk were carefully coordinated between OIEWG and IAEG-SDGs to leverage expertise and reduce redundancy. In all, more than 30 indicators are related to disaster risk reduction in the SDG Global Indicator Framework, 5 of which are also Sendai Framework indicators (see Annex IV).

88. It is important to note that most of the disaster risk related indicators are not routinely measured across all regions according to internationally agreed upon standards. In fact, at the time of issuing this publication, further conceptual work is required before routine measurement by countries can be expected.

89. It is also important to note that custodian agencies were assigned for each SDG indicator. These agencies are charged with providing metadata, developing methodologies, and testing the indicators. The custodian agencies were also requested to collect, harmonise and aggregate national statistics to produce global aggregates for monitoring and reporting purposes. Unlike the organisational structure in the Sendai Framework, several UN and other agencies are charged with custodianship of the set of disaster risk related indicators, usually in partnership with two or more other custodian agencies. This work structure underscores the unique coordination and collaboration needs associated with SDG indicator production.

3.2.3 Paris Agreement

90. The *Paris Agreement* (United Nations, 2015a) adopted at the *21st Conference of Parties to the United Nations Framework Convention on Climate Change* in 2015 (UNFCCC), aims to strengthen the global response to the threat of climate change in the context of sustainable development and poverty eradication.

91. Article 2 describes the overall purpose of the Paris Agreement. Two aspects particularly relevant to HED are highlighted here. First, Parties committed to holding the global average temperature increase to well below 2°C above pre-industrial levels and to pursuing efforts to limit the increase to 1.5°C, with the aim to "significantly reduce the risks and impacts of climate change". Second, Parties committed to "increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production".

92. Accordingly, the Paris Agreement and the outcomes of the UN climate conference (COP21) lay down requirements covering domains including:

- Greenhouse gas emission reductions and absorptions;
- Cooperative approaches;
- Adaptation;
- Loss and damage;
- Financial resources;
- Technology development and transfer;
- Capacity building;
- Climate change education, training, public awareness, public participation and public access to information;
- Transparency;
- Global stock-take; and
- Facilitation of implementation and promotion of compliance.

93. Countries have the obligations to communicate or update *Nationally Determined Contributions* every 5 years. Furthermore, every five years, starting in 2023, a global stocktake to assess collective progress will take place.

94. The technical details necessary to ensure the implementation of the Paris Agreement were agreed at COP24 in Katowice, Poland in December 2018. In particular, the transparency requirements of Parties to the Paris Agreement related to HED include elements such as:

- Resilience and vulnerability of persons and ecological systems;
- Early warning systems;
- Climate change impacts over time;
- Loss and damage;
- Emergency preparedness;
- Slow-onset events and extreme climate events;
- Risk assessment and management;
- Capacity development progress;
- Climate change education; and
- Global progress of mitigation and adaption objectives.

95. These requirements build on existing reporting and review processes under UNFCCC and have been updated in Katowice. UNFCCC has prepared a report describing how the information production and reporting requirements of the Sendai Framework, the 2030 Agenda, and the Paris Agreement could be aligned. Given the overlap in the ambition and focus of these frameworks, it is likely that alignment at the indicator and metadata level will be a priority, wherever possible.

96. Related to the Paris Agreement is the *Warsaw International Mechanism for Loss and Damage* which was established already in November 2013 at the COP19 in Warsaw. This mechanism is designed to address loss and damage associated with impacts of climate change, including extreme events and slow onset events, in developing countries that are particularly vulnerable to the adverse effects of climate change.

97. The Loss and Damage Mechanism fulfills the role under the Convention of promoting implementation of approaches to address loss and damage associated with the adverse effects

of climate change, pursuant to decision 3/CP.18[8] (see UNFCCC, 2013), in a comprehensive, integrated and coherent manner by undertaking, inter alia, the following functions:

1) Enhancing knowledge and understanding of comprehensive risk management approaches to address loss and damage associated with the adverse effects of climate change, including slow onset impacts;
2) Strengthening dialogue, coordination, coherence and synergies among relevant stakeholders; and
3) Enhancing action and support, including finance, technology and capacity-building, to address loss and damage associated with the adverse effects of climate change.

[8] Decision 3/CP.18: Approaches to address loss and damage associated with climate change impacts in developing countries that are particularly vulnerable to the adverse effects of climate change to enhance adaptive capacity.


a
b
c

4 Scope and measurement framework for statistics on hazardous events and disasters

98. The scope of statistics on hazardous events and disasters is defined by user needs, which can be summarised as:

- Operational needs; for example, baseline population data for disaster risk management and emergency response;
- Summary and time-series statistics needs; for example, for post-disaster assessment, monitoring of climate change impacts, or international reporting; and
- Integrated sustainable development policy needs; for example, land use planning and infrastructure development.

99. The purpose of the information drives the form of measurement, and often the source and provider. Accordingly, the information needs for national DRM differ from those necessary for global reporting. At the national level, the establishment of policies and definition of the needs for HED-related information is often triggered by disasters. For example NSOs of Brazil and Italy became engaged in supporting national DRM after devastating events (see Case Study 1 and Case Study 6).

100. Relating these different needs and measures to a common conceptual framework can help NSOs in developing national strategies for disaster risk management statistics.

101. The *Disaster-Related Statistics Framework* (DRSF; ESCAP Expert Group, 2018) provides a measurement framework for disaster-related statistics. It can also be applied to hazardous events which, although not creating a risk of disasters, are needed to monitor climate change. Examples of hazardous events that do not always result in disasters include extreme storms on the open seas or in other unpopulated areas without direct socio-economic impacts, and landslides or flooding outside of settled areas.

102. DRSF defines a scope of demands for a basic range of disaster-related statistics and indicators for a) operational purposes; b) summary and time-series statistics, and c) integrated sustainable development policy. The scope of data collection covers hazards, exposure, vulnerability, coping capacity[9], disaster impact, and disaster-risk-related activities (Figure 3).The statistics recommended in DRSF include statistics on hazards, exposure, vulnerability, coping capacity, disaster impact, and disaster risk related activities. These statistics have to be fit for operational uses in all phases of disaster risk management, as well as for risk and post-disaster assessment. Furthermore, these statistics are needed for international reporting, climate change policies, and integrated sustainable development policies such as infrastructure development or land use planning.

103. DRSF also documents the recommended statistics frameworks for recording the damage and loss from disasters in agriculture and its sub-sectors, including the methodology developed by FAO and UNDRR to assess disaster impact on crop, livestock, fisheries, aquaculture and forestry.

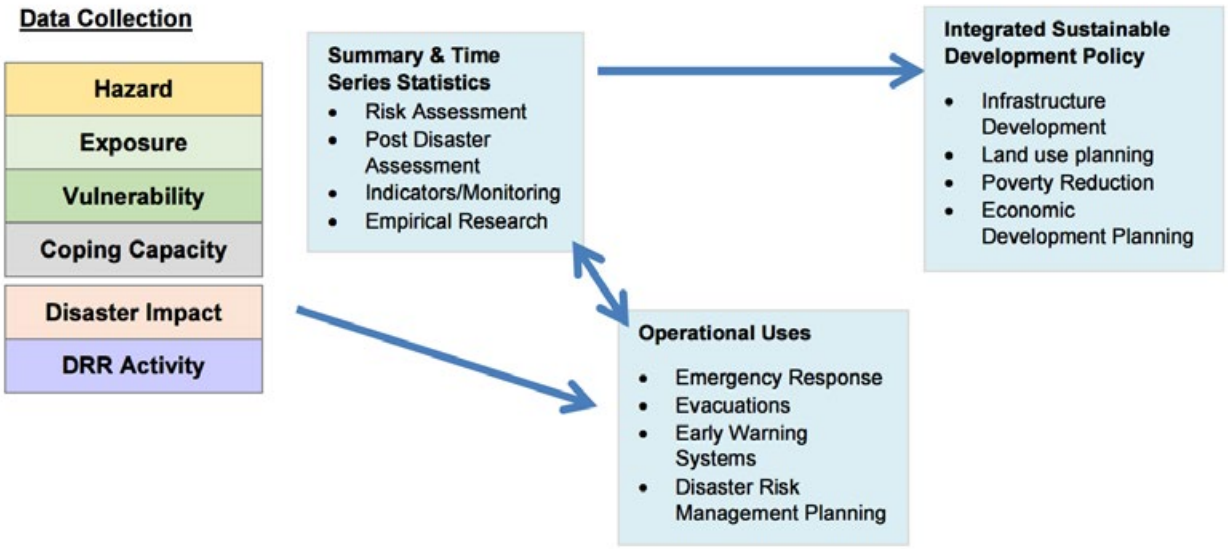
[9] Referred to as “resilience” in this publication.

104. The Task Force concluded that the scope of DRSF defined needs to be slightly broadened to fully integrate the information required for climate change policies and sustainable development. Hazardous events not resulting in disasters must also be recorded, as these are important for risk assessment and climate change monitoring.

105. The scope of statistics on hazardous events and disasters is to be defined from a user perspective along the lines of the Sendai Framework for Disaster Risk Management, SDGs, and the Paris Agreement. The scope includes all hazards as defined in the Sendai Framework, namely geophysical hazards, hydrological hazards, meteorological hazards, climatological hazards, extra-terrestrial hazards, environment degradation, biological hazards, and technological hazards. For a detailed list of hazards see Annex V. Proposed hazard classification.

106. ***Countries may decide to broaden the scope according to their own national needs*** and, for example, to include a wider range of hazards.

Figure 3: Scope of demands for disaster-related statistics



Source: ESCAP Expert Group, 2018.

107. Considering the above, the scope of HED-related statistics includes:

> *Statistics on the occurrence and magnitude of hazardous events and disasters, exposure to hazards, vulnerability, coping capacity, impact of hazardous events and disasters on human and natural systems, and the efforts to reduce disaster risk.*

108. DRSF provides a measurement framework and the basic range of disaster-risk related statistics, which may be useful to NSOs when determining the scope of disaster statistics suitable for their national context and reporting needs. The basic range consists of 8 tables with statistics on:

A. Disaster occurrences
B. Exposure to hazards
C. Human impacts

D. Direct material impacts in physical terms
E. Direct material impacts in monetary terms
F. Agriculture
G. Direct environmental impacts
H. Disaster risk reduction expenditure.

109. ***An expansion of the scope of Table A on disaster occurrences is recommended to also include other hazardous events of national or international relevance such as extreme weather events not causing direct impacts.*** This will fully align with the wider scope of "hazardous events and disasters" above. More information about these tables can be found in Annex VI Structure of the basic range of disaster-related statistics (DRSF) of this report and in DRSF.

110. The selection of statistics and indicators on hazardous events and disasters may differ in countries, depending on national priorities and information needs. However, these national statistics should allow aggregation of national information for global reporting and comparison. The case studies from Armenia (Case Study 3) and Turkey (Case Study 2) demonstrate how national disaster-related statistics may differ in terms of coverage and level of detail.


Televisions
Audio and Video
Financial Services

5 Role of the national statistical system

111. Official statistics can be used to measure hazardous events and disasters in many ways. NSS provides important socio-demographic, economic, and environmental statistics needed in each phase of disaster risk management. Currently, the involvement of NSS in this area varies across countries due to differences in national priorities and institutional settings.

112. Many different agencies are typically involved: DRMAs; line ministries; mapping agencies; hydrometeorological institutes; environment protection agencies and sub-national administrative bodies. Research institutions and NGOs (such as the Red Cross/Red Crescent) also play important roles in producing disaster risk information; for example, post-disaster assessments and disaster databases.

113. A survey carried out by the Task Force in 2016 showed that NSS was involved in HED-related work in about two thirds of responding countries. Most often, the involvement concerned publishing some HED-related statistics, and NSOs were not the main responsible institution. About three quarters of responding countries considered that the role of NSOs should be bigger.

114. ***When identifying the potential contributions of official statistics in this area, the information requirements for DRM, the existing NSS, and the current institutional role of NSOs should all be taken into account.*** Therefore, a ***close collaboration of NSO with the national DRMA*** (which is often not part of the NSS) ***is crucial*** for defining the roles of the NSO and the NSS in measuring HED.

115. This chapter explores ways in which NSOs can contribute to disaster risk statistics. Section 5.1 begins by defining and describing the traditional roles and responsibilities of NSO and NSS, noting how these responsibilities can affect national statistical policy decisions relevant to HED-related statistics. Section 5.2 describes the competencies and strengths of NSS and how these can be helpful in HED-related work. Section 5.3 outlines the potential contributions of NSS at each phase of disaster risk management. Section 5.4 identifies the core roles and possible additional tasks for NSOs.

5.1 Traditional roles and responsibilities of national statistical offices

116. Formally, official statistics comprise statistics produced by government agencies or other public bodies within NSS following the *United Nations Fundamental Principles of Official Statistics* (United Nations, 2014).

117. Although the exact structure and governance of NSS differ in each country, the *Fundamental Principles of Official Statistics* provide a common guide for NSS mission and core responsibilities. Understanding these responsibilities helps to identify unique opportunities and challenges for NSS in contributing to HED-related statistics. This also helps to increase awareness among other DRM agencies of NSS disaster management risk capabilities, assisting them in deciding where their contributions would be most effective.

118. The definitions below are taken from the CES publication *Guidance on Modernizing Statistical Legislation* (UNECE, 2018a) approved in June 2018 by the statistical offices of over 60 countries from UNECE region and beyond. The publication provides definitions of official

statistics, NSO and NSS. It also identifies common elements of effective legal frameworks to guide countries in reviewing their statistical legislation.

119. A national statistical office is the main producer and disseminator of official statistics in a country. It is responsible for coordinating all activities for the development, production, and dissemination of official statistics within NSS. An NSO is led by a chief statistician who coordinates statistical activities in NSS, including the sharing of official statistics. The chief statistician also represents the nation's statistics at the international level and coordinates its international collaboration efforts. This person may issue national statistical standards and guidelines to implement national statistical law and the *UN Fundamental Principles of Official Statistics*.

120. NSOs in most countries are part of a broader national statistical system comprising all the organisations and units within the country that jointly collect, process, and disseminate official statistics on behalf of the government. These other producers are professional, independent organisational entities that develop, produce, and disseminate official statistics as their main task. Producers of official statistics are recognised by the chief statistician. NSS also includes the mechanisms of interaction among suppliers, producers, users, and other stakeholders.

121. NSS produces official statistics, as defined in national statistical programmes, based on transparent and documented processes. It adheres to the following criteria:

- Producers of official statistics affirm their capability and willingness to comply with the provisions of the national statistical law and of the *UN Fundamental Principles of Official Statistics* (described further below); and
- The deliveries and activities shall not duplicate those conducted by other producers nor result in an excessive burden on respondents.

122. Adherence to the *UN Fundamental Principles of Official Statistics* (*Fundamental Principles*) is important as a guarantee of good quality, including impartiality and professionalism (UNECE, 2018b). Official statistics are free from political or commercial influence. The members of NSS who compile the statistics have no vested interests and are bound by a strict professional duty of impartiality. Official statistics, to ensure their international comparability, interoperability, and exchange, must be generated based on open methodologies and produced following internationally recognised standards. They are produced transparently so that users can assess their accuracy and reliability. Official statistics are firmly based on evidence: they are generally based on survey and/or administrative data sources which are larger in scale than most non-official statistics and are provided according to national need rather than commercial expediency. A global network of experts develops official statistics sharing methods and practices internationally.

123. The first of the *Fundamental Principles* states: "Official statistics provide an indispensable element in the information system of a democratic society, serving the government, the economy and the public with data about the economic, demographic, social and environmental situation. To this end, official statistics that meet the test of practical utility are to be compiled and made available on an impartial basis by official statistical agencies to honour citizens' entitlement to public information."

124. The responsibilities engaged in this first principle are broad and complex. Each NSO must ensure the high quality of official statistics and demonstrate its relevance, accuracy, objectivity

and accessibility [10] across economic, social, and environmental domains. As discussed in subsequent sections, achievement of one or more of the above-mentioned quality dimensions can mean a trade off in the achievement of one or more of the others (for example, relevance, timeliness, and accuracy) or even among aspects of these dimensions (for example, transparency and data confidentiality). Furthermore, producers of these statistics often rely upon data from a number of government ministries subject to various national laws with differing requirements. At times, statistical production can require considerable coordination across ministries and governmental agencies.

125. Decisions regarding how best to balance these requirements across the needs of multiple users vary by national context and the nature and intended use of the information. The particular information needs in measuring hazardous events and disasters (such as suitability for small-scale analysis and short time lags) should therefore be taken into account when selecting suitable information sources.

126. One Fundamental Principle that has a specific influence on HED-related work is related to confidentiality (Principle 5): "Individual data collected by statistical agencies for statistical compilation, whether they refer to natural or legal persons, are to be strictly confidential and used exclusively for statistical purposes." This means that statistical system cannot release any information that would allow identification of an individual (either a physical or legal person). This principle can present a challenge when providing statistics on specific small areas or groups of population (for example, in the context of emergency response). This issue should be explored further to best maintain confidentiality while allowing use of available information for saving lives and reducing damage.

127. Ultimately, ***the potential contributions of NSOs to HED-related work should be reflected in national statistical law, national statistical policy, and annual statistical work programmes.*** This would secure a mandate for NSS to contribute to disaster risk statistics in coordination with other government agencies and international partners. It would thereby facilitate access to resources necessary to build and sustain statistical capacity in this area, and to initiate agreements and protocols among the different partners.

128. At the global level, the importance of linking statistical and geographical information to respond to policy-driven information demands has been well demonstrated by the work of *United Nations Initiative on Global Geospatial Information Management* (UN-GGIM, 2017) and others. The extent to which geospatial data providers have been integrated within NSS as producers of official statistics varies across countries, and this affects access to information for the production of HED risk statistics as discussed further below.

5.2 Competencies of the national statistical system that can be helpful in the work on hazardous events and disasters

129. The strict adherence of NSS to the *Fundamental Principles* provides important characteristics to official statistics that can be useful in the work on hazardous events and

[10] These are dimensions of statistical quality. Different statistical quality frameworks exist; for example, those of Eurostat, IMF, OECD, UNECE, and UNSD. Though these frameworks may group quality dimensions in different ways, they usually include relevance, accuracy, reliability, timeliness, punctuality, accessibility, clarity, coherence and comparability.

disasters. As coordinator of the statistical systems, the country's NSO has a particular responsibility to uphold and promote the *Fundamental Principles* across the statistical system.

130. The *Fundamental Principles* include professional independence, strict conditions and quality criteria, use of sound, transparent and commonly agreed methodologies and a commitment to data accessibility.

131. NSOs are continuously reviewing and improving the availability and quality of statistics as new methods and data sources emerge in order to maintain the relevance of official statistics. This responsibility applies not only to current statistics, but also to the development of new statistics. Existing work streams can be tapped to ensure that disaster risk management related statistics are optimised for a defined purpose.

132. Perhaps the most essential characteristic of NSOs is their commitment to objectivity in the production and dissemination of official statistics. Professional independence is a strength that benefits all aspects of the production and dissemination of statistics on hazardous events and disasters.

133. Official statistics often also include a link to the geographic region and, in some countries, exact co-ordinates are already attributed to statistics through geo-referencing. The demand for geo-referenced information is increasing, and this is an essential feature for HED-related statistics. In addition to having geo-referenced statistics, the use of standard geographies (often based on administrative boundaries or grid systems) allow for the integration of statistical with other sources of data such data from earth observations. Registers such as businesses, addresses, dwellings and buildings are a rich source of information.

134. ***The United Nations Global Statistical Geospatial Framework (UN-GGIM, 2018)***, which is being implemented in more and more countries, ***is a fundamental reference for NSOs*** to be able to respond to the increased demand on better integration of statistics with geospatial information.

135. Development of long, consistent time series is a core competency of the statistical system. Official statistics include well developed methods to adjust data, so changes are made comparable over time; for example, changes in prices or temperature are made comparable by accounting for seasonal variation. When such adjustments are made, the effect of a known source of influence on the variation in the data is eliminated so that only the changes caused by unknown sources of influence and natural variation are left. The availability of coherent time series and clear, well-structured statistical compilations is very important for disaster related statistics to identify authentic trends rather than random fluctuations of extreme values.

136. The statistical system also has routines for developing statistics that are internationally comparable. This is done through a global institutional infrastructure to ensure that the definitions, classifications, and data collection are harmonised across countries.

137. Furthermore, a core goal of the statistical system is the production of timely statistics. NSSs have developed methods and data collection processes to improve timeliness.

138. Recently, the focus of official statistics on environmental and climate issues has broadened, with many NSOs compiling environmental accounts to measure natural resource assets, energy,

waste, water and air emissions, as well as environmental protection expenditures. The *System of Environmental-Economic Accounting Central Framework* (SEEA-CF; United Nations et al., 2014a) is a statistical standard valid at the global level. SEEA-CF contains internationally agreed concepts, definitions, classifications, accounting rules, and tables for producing comparable statistics on the environment and its relationship with the economy.

139. At the same time, some long-standing challenges may limit the role of NSOs in measuring hazardous events and disasters. The strong emphasis on quality can reduce timeliness. There is a preference for well-established time series rather than production of specialised data files in a variety of formats fit for different uses; inclusion of administrative borders and geo-referencing, for example. Highly detailed information collection poses risks to confidentiality that are traditionally addressed either by limiting access or systematically reducing precision or accuracy in publicly released information.

140. Most of these weaknesses can be overcome. ***National statistical laws, programmes, and emergency protocols can be updated to reflect data sharing arrangements that maintain confidentiality protection. Data collection and processing can incorporate new sampling techniques and geo-references to improve timeliness and utility.***

5.3 Potential contributions of the national statistical system at each phase of disaster risk management

141. The potential role of NSS varies at each phase of disaster risk management. This is outlined in more detail in the following sections.

142. While NSS has a lot to offer, not all DRM information requirements could or should be met by official statistics. The role of each institution involved in this process should be clearly identified, including their individual responsibilities regarding information provision. This is especially critical in emergency response to save lives and reduce damage.

5.3.1 Risk assessment

143. The Sendai Framework[11] emphasises that policies and practices for disaster risk management should be based on an understanding of disaster risk in all its dimensions: vulnerability, capacity, exposure of persons and assets, hazard characteristics, and the environment. For this purpose, countries should promote the collection, analysis, management, dissemination, and use of relevant information; encourage the use and strengthening of baseline data; periodically assess disaster risks, vulnerability, capacity, exposure, hazard characteristics and their possible sequential effects; and systematically evaluate disaster losses to understand their economic, social, health, education, environmental and cultural heritage impacts.

144. NSSs regularly produce information that can contribute to such risk assessment, including baseline data describing the exposed population, its resiliencies, vulnerabilities and coping capacity.

145. Exposure to hazards is defined as the set and situation of people, infrastructure, housing, production capacities, and other tangible human assets. These can be combined with the specific vulnerability and capacity of the exposed elements to any particular event to estimate the

[11] Paragraph 23 of Sendai Framework (United Nations, 2015b).

quantitative risks associated in the area of interest. For this purpose, NSS can provide statistics on:

- Population;
- Housing and dwellings;
- Infrastructure;
- Businesses; and
- Other assets (for example, cultural and natural heritage).

146. These statistics are also needed as a baseline for evaluating the impact of hazardous events and disasters after the event. It is important to be able to ***provide the statistics with detailed spatial breakdown***, preferably in a geocoded format, for areas that can be prone to natural disasters (for example, river basins, coastal areas and areas near volcanoes) as well as those susceptible to industrial disasters (for example, areas near factories handling hazardous substances).

147. Vulnerability is the condition determined by physical, social, economic, and environmental factors or processes which increase the susceptibility of an individual, a community, asset or system to the impacts of hazards. There are two main components of vulnerability: geographical and socio-economic.

148. Geographical vulnerabilities are, for example, settlements in unsafe areas like flood plains or steep slopes and urban slums. Coastal zone settlements are also an example of geographic vulnerability, given their potential exposure to floods and sea level rise. Small island developing states (SIDS) face unique geographic vulnerabilities.

149. Access to essential resources, such as freshwater, sanitation and communication systems is also a factor of geographic vulnerability to hazardous events. Such events can put potable water and sanitation systems at risk of rapid salinization and contamination. Natural or historical monuments, museums and archaeological sites could also present unique economic and cultural vulnerabilities. Hazardous events could destroy or damage these sites and decrease tourism income.

150. Socio-economic vulnerability comes in many forms. Age distribution of a community can be significant in situations where physical fitness is necessary for survival of an individual, family, and the larger community. Sex distribution can also be significant if violence and sexual abuse against women emerges after disasters, or in the case where men are more likely to get injured or killed when working in disaster response. Poverty, which is associated with unequal opportunity for healthy and safe environments, poor education and risk awareness and limited coping capacity, is also an important factor (de Ville de Goyet et al., 2006).

151. Examples of statistics related to vulnerabilities include:

- Median household disposable income;
- Education enrolment, by age group and level of achievement;
- Information on assets of households, such as type of dwelling;
- Other human development statistics, such as nutrition and childhood health;
- Type of employment, such as engagement in agriculture or fishing; and
- Urbanisation of affected or exposed areas.

152. NSOs can also provide or facilitate access to information describing resources available to exposed populations. This includes information regarding the population's access to critical infrastructure such as education and health facilities; transportation systems; electricity generation and transmission facilities; information, computer and telecommunications equipment; and dams, water supply and sewage treatment infrastructure. Geocoding the related data can assist with description of hazard risks.

153. This kind of information is also relevant to measuring resilience, the opposite of vulnerability.

154. ***In addition to providing information on exposed populations and their vulnerability, NSOs may be able to provide information on hazards*** in some cases; for example:

- Location and extent of hazards for geographical analysis; and
- Frequency and duration of hazards for temporal analysis.

155. In cooperation with other agencies and research, NSOs may also be able to provide information on:

- Scale and intensity of hazards; and
- Probability of occurrence of hazards.

5.3.2 Prevention and mitigation

156. The prevention and mitigation activities focus on raising and strengthening the protective infrastructure during the prevention and mitigation phase of disaster risk management. Some examples include conducting a hazard risk assessment; establishing and testing local disaster prevention plans and early forecast and warning systems; training first responders; establishing legal and policy frameworks for disaster risk management, including construction regulations; and developing risk reducing technologies. These activities are conducted at the community, province/district, national and international level (Baas et al., 2008).

157. ***Important statistics to be made available by NSOs could include those relating to:***

- Scale, location, and other characteristics of ***investments*** in disaster risk reduction (technical infrastructure investments, for example);
- ***Signals of slowly developing risks*** that are approaching thresholds to a potential disaster (land-use changes in disaster-prone areas, for example); and
- ***Factors that cause or exacerbate disaster risks*** (environmental degradation, highly vulnerable infrastructure, or extreme poverty, for example).

5.3.3 Preparedness

158. As stated in the *Framework for the Development of Environment Statistics* (Subcomponent 6.3: Extreme Event Preparedness and Disaster Management), measures of disaster preparedness vary according to community and location characteristics, and the historical profile of hazardous ***events*** and disasters. Relevant information may include:

- Existence and description of national disaster plans;
- Type and number of shelters in place;
- Type and number of internationally certified emergency and recovery management specialists;

- Number of volunteers; and
- Quantity of first aid, emergency supplies, and equipment stockpiles.

159. Other important requirements include information on the existence of early warning systems for all major hazards and the expenditure on disaster prevention, preparedness, clean-up and rehabilitation. Common providers of this information are DRMAs, other emergency management agencies and municipalities. ***NSOs may provide relevant population data*** (for identifying the population under risk of disasters) ***and some historic disaster data*** (to forecast disaster losses).

5.3.4 Disaster impact

160. Disaster impact is the total effect, which may be negative (such as economic losses) or positive (such as economic gains), of a disaster. The term includes economic, human, and environmental impacts. ***Involvement of NSOs in evaluating the impacts of hazardous events and disasters is important to ensure coherence with the official economic, social, and environmental statistics where the impacts will also be seen.***

161. The baseline data that NSS has on population, environment, housing and dwellings, infrastructure, businesses and other assets (such as cultural and natural heritage) are needed for evaluating the impact of hazardous events and disasters after the event. It is important to have these data with detailed spatial breakdown so that they can be provided for different geographic areas that may be affected. The immediate impacts of disasters are usually negative, but the long-term effects can include positive aspects; for example, boosting economic activity to rebuild damaged assets, “building back better”, and inflow of labour for reconstruction efforts.

162. Examples of statistics on ***disaster*** impacts (Below et al., 2009) include those covering:

- Magnitude of events;
- Human casualties and injuries;
- Number of permanently or temporarily displaced people;
- Number of directly and indirectly affected persons;
- Number of structures damaged or destroyed;
- Cultural heritage damaged or destroyed;
- Infrastructure and lifelines;
- Ecosystem services;
- Crops and agricultural systems;
- Disease vectors;
- Psychological wellbeing and sense of security;
- Financial or economic loss (including insurance loss); and
- Coping capacity and need for external assistance.

163. There are several challenges for producing these statistics. Identification of the end of a disaster is often difficult. For example, an earthquake may be followed with aftershocks and a heat wave. Some impacts occur after the initial event, such as buildings collapsing several weeks after an earthquake, or persons dying weeks or months after the event. This means that initial estimates will likely change over time. For example, in Puerto Rico the official national statistics after the hurricane Maria in 2018 accounted for 64 deaths. After an innovative analysis of mortality the official death toll was raised to 2975. This was mainly due to the cascading effects

of loss of electricity, clean water, etc. The hurricane ended about 24-48 hours after it first started to affect the island, but the impacts lasted until the cascading effects ended.

164. Perhaps the most important challenge is the fact that many disaster impacts are not observed directly. Establishing causality is difficult because other factors can affect outcomes besides the disaster. Some assumptions and very clear measurement rules are required to calculate figures for recovery. UNISDR has developed practical recommendations for these issues in the form of *Technical Guidance for Monitoring and Reporting on Progress in Achieving the Global Targets of the Sendai Framework for Disaster Risk Reduction 2015 – 2030* (UNISDR, 2018).

165. As far as crop production is concerned, the impact of disasters should be surveyed regularly at the end of the harvesting period, which is when most agricultural surveys are conducted. Furthermore, a variety of "baseline" information is necessary, which is normally part of agricultural production questionnaires, i.e. plot area, crops by plot, production by crop, etc. Alternatively, data can also be collected on a per-disaster basis, upon early warning indications or in the immediate aftermath of the event. In this case, separate data collection forms should be developed, and a parallel survey deployment mechanism should be established.

166. In the case where regular agricultural data collection activities are not conducted, FAO has developed a practical toolkit -- available from the Statistics Division of FAO upon request -- to assist country governments with the institutionalization of tailored *National-level Damage and Loss Information Systems for Agriculture*. The tool kit consists of sample survey forms, data collection tools and database templates and guidance documents, which can serve to augment capacity for damage and loss assessment in national governments and help lay down standard operating procedures for regular disaster damage and loss data collection in agriculture.

5.3.5 Response

167. Disaster response is the provision of emergency services and public assistance during or immediately after a disaster to save lives, reduce health impacts, ensure public safety and meet basic subsistence needs of those affected (UNISDR, 2009). This can include rescue of affected people, specific care for vulnerable groups, distribution of basic supplies such as food, water, clothing and medical care, firefighting, monitoring of secondary disasters, construction of temporary housing, and establishment of tent villages.

168. Clear identification of the roles of all institutions involved in HED related work is especially critical in emergency response to save lives and avoid and reduce loss and damage during a disaster. Emergency protocols are essential for an orderly and effective response. Several countries, such as Armenia, have emergency protocols which, once triggered, have an immediate impact on the concerned institutions and their roles in reducing the disaster impact.

169. The main task for NSOs during a disaster is to ***quickly provide the required statistics for the affected area***. These are the same statistics that were listed under exposure, vulnerabilities, and resilience focusing on the area affected by a specific hazardous event or disaster. It is essential that they are geo-coded or available as grid-data (high resolution) and easily accessible in order to be fit for use in disaster response.

170. ***Basic statistics for different types of hazardous events and disasters should be identified in advance and made available in an "emergency data-kit" when needed***. This data-kit could include the most recent information on:

- Population;
- Dwellings;
- Businesses;
- Buildings;
- Historical and natural heritage areas;
- Critical infrastructure; for example, health and education facilities, roads, highways, power grids, pipelines, water supply; and
- Potential hazards that could increase disaster impacts; for example, waste storage sites.

171. In addition, NSOs may be asked to provide information on disaster occurrence, including temporal and spatial spread of the event and the type and characteristics of impacts and recovery needs.

5.3.6 Recovery

172. Disaster recovery is the process of restoring, rebuilding, and reshaping the physical, social, economic, and natural environment through pre-event planning and post-event actions (Smith and Wenger, 2006). Disaster recovery for local and national recovery systems includes related damage and needs assessment, policy and strategy setting, institutional arrangements, and financing (Global Facility for Disaster Reduction and Recovery, 2015).

173. Disaster recovery requires the same kind of information as disaster response. Since recovery is also a long-term issue, NSOs may have a role in providing updated information to support recovery efforts by governments and other institutions. This information is also important for international reporting.

174. The UN Development Group, the World Bank, and the European Union developed the Post-Disaster Needs Assessment (PDNA) framework[12] to assess the full extent of a disaster's impact, define the needs for recovery, and serve as the basis for designing a recovery strategy and guiding funding. The framework quantifies physical damages and economic losses and identifies socio-economic recovery needs based on information obtained from the affected population.[13]

175. ***NSOs can provide information on the assessment of disaster impacts that can serve as an input to PDNAs. In addition, NSOs can provide information on demographic, social, cultural, economic, and environmental issues relevant to restoration and rehabilitation processes.*** This information will aid the post-disaster calculation of vulnerability to future incidents, in turn benefiting updated preparedness and mitigation strategies.

176. ***NSOs should have a strategy to collect data after a disaster.*** This data is important for PDNA and for the implementation of preventive programs facing future hazardous events.

[12] See https://www.undp.org/content/undp/en/home/librarypage/crisis-prevention-and-recovery/pdna.html.
[13] See http://www.worldbank.org/en/events/2017/06/12/post-disaster-needs-assessment-for-resilient-recovery.

5.3.7 International reporting

177. Countries have international reporting obligations under *SDGs*, the *Sendai Framework on Disaster Risk Reduction* and the *Paris Agreement*. In addition, there may be reporting obligations related to specific environmental conventions, such as the *Convention on Long-range Transboundary Air Pollution*, or the *Basel Convention on the Control of Transboundary Movements of Hazardous Wastes*. These obligations are independent from the above described phases of disaster risk management and related information needs.

178. Concerning the SDG indicators, CES recommends that the provision of indicators for the global SDG list in countries should be coordinated by NSO. Although the data and statistics required for these indicators are often provided by many different agencies in the country, ***NSO should coordinate, or at least be aware which agencies are providing the data and should be copied on correspondence in the process.***

179. Data and statistics for the Sendai Framework indicators (Annex III) should be provided at the national level by an appointed national Sendai Framework Focal Point through the Sendai Framework Monitoring System. A number of countries are maintaining or setting up disaster loss databases that would provide a basis for calculating the Sendai Framework indicators. The databases are often managed by national disaster management agencies, civil protection agencies, meteorological agencies, or line ministries collecting disaster data. It is expected that by 2020 most countries will have set up such a database, following the UNISDR guidance.

180. The Sendai Framework (Annex III) and the global SDG indicator list (Annex IV) have 5 indicators in common. The indicators related to disasters are under SDGs 1 (no poverty), 11 (sustainable cities and communities) and 13 (climate action). As explained below, three of these indicators are used to measure achievement of three SDG targets.

181. The disaster related indicators in the global SDG indicator list are:

- 1.5.1; 11.5.1; 13.1.1: Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population;
- 1.5.2: Direct economic loss attributed to disasters in relation to global gross domestic product (GDP); and
- 11.5.2: Direct economic loss in relation to global GDP, damage to critical infrastructure, and number of disruptions to basic services, attributed to disasters.

182. The list includes also two non-statistical indicators:

- 1.5.3; 11.b.1; 13.1.2: Number of countries that adopt and implement national disaster risk reduction strategies in line with the Sendai Framework; and
- 1.5.4; 11.b.2; 13.1.3: Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies.

183. The responsibility of providing the non-statistical indicators in a country often does not lie with NSS. These responsibilities should be clearly identified, however, and it is recommended that NSOs be informed what the other responsible agencies report on SDG indicators.

184. Reporting obligations concerning the Paris Agreement are not yet fully identified. As already noted in section 3.2.3 the information needs are broad.

5.4 Recommended roles and tasks for national statistical offices related to disaster risk management

185. The previous section listed information needs for each stage of DRM and for international reporting. This information can be provided by different governmental and non-governmental entities, using different sources and measurement tools, and produced at different geographic levels. The nature of information and the scale of measurement can vary substantially.

186. NSOs are well suited to provide some of the relevant data, statistics and indicators. Others are produced elsewhere within NSS, and by agencies outside it. NSOs must also cooperate with international organisations for regional and global reporting. Therefore, ***NSOs should coordinate their work with many institutions to ensure efficient and effective disaster risk management and reporting at national and international levels.***

187. The particular tasks of an NSO in this process depend upon the national institutional and policy context. Based on current NSO practices and their typical strengths, core tasks can be identified that each NSO could undertake. These are explained in Section 5.4.1. In many countries, NSOs are already implementing these tasks (see for example Philippines Case Study 4). In addition, in a number of countries NSOs are carrying out additional functions which may not be in the core mandate of NSS.

5.4.1 Core roles and tasks

188. According to the Task Force's 2016 survey, the most common contribution of NSS to DRM is the ***provision of the baseline data needed to produce statistics on exposure and impact***. NSS is uniquely positioned to provide these data, as they are regularly produced through traditional censuses, surveys, and administrative registers.

189. In addition, NSS can ***support DRM with its competence and expertise in producing and communicating information***. The disaster response emergency data-kit described above (section 5.3.5) is just one example. As lead agencies in NSS, NSOs have strong networks for coordinating the multiple information producers and flows needed for monitoring progress of the Sendai Framework, SDGs and the Paris Agreement.

190. NSOs are also responsible for ***setting and enforcing quality standards*** in official statistics, empowered by national law and international commitments. NSOs establish and enforce methodological standards for this purpose. This supports the development of transparent, long and consistent time series, which is a core competency of the statistical system.

191. NSOs have procedures in place for ***developing statistics that are internationally comparable***. This is done through a global institutional infrastructure to ensure that the definitions, classifications, and data collection are harmonised across countries using transparent and internationally agreed upon methods. This is very important for international reporting of statistics and indicators.

192. NSOs also have well established ***procedures for communicating and disseminating statistics to decision makers***. NSOs set policy for sharing official statistics among components of NSS. Coupled with the implementation of statistical production standards to promote interoperability and transparency, this allows the collected information to meet multiple policy and research needs while minimizing cost and burden. NSOs are well situated to determine,

through their interaction with policy makers, what information should be produced. Accordingly, NSOs are well suited to provide a platform for regular dissemination of information on hazardous events and disasters.

5.4.2 Additional roles and tasks

193. The Task Force's 2016 survey showed that in most countries where NSOs are involved in the HED-related work, their role is limited to disseminating existing official statistics as baseline data for DRM. Only about one third of NSOs are involved in producing statistics specifically related to HED.

194. NSO role in DRM could expand beyond the core functions currently carried out. NSOs could ***assist with the assessment of direct and indirect social, environmental and economic impacts of hazardous events and disasters***. This could include leading work on assessing disaster risk impacts, supporting preventative risk assessments, maintaining the national disaster database, and managing collective information sharing tools. NSOs could also lead coordination of data flows with geographical information services and international databases.

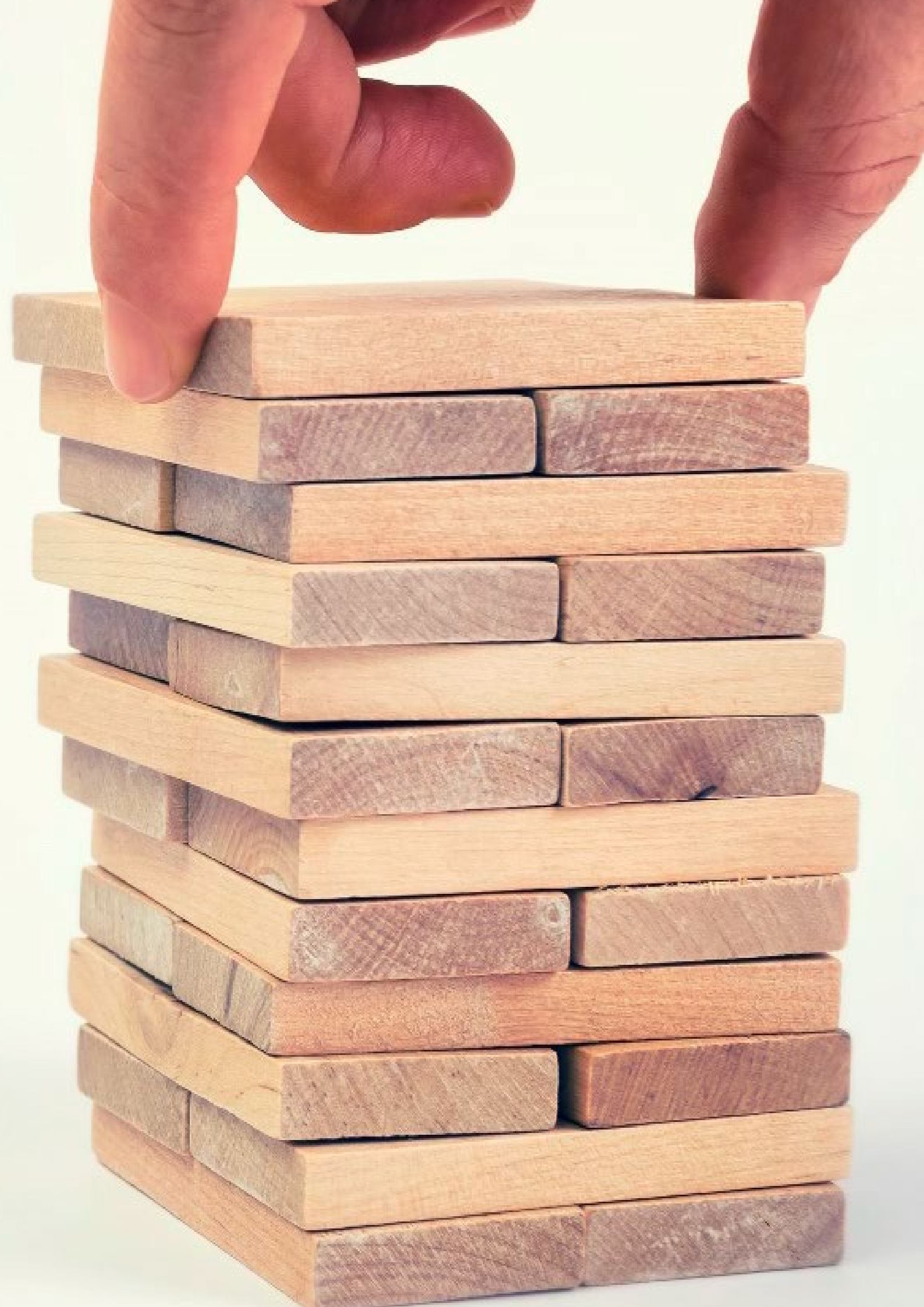
195. The ability of an NSO to take on additional HED-related tasks depends on national institutional arrangements and the roles of different agencies in disaster risk management. In a few countries NSOs are already carrying out additional tasks in the production of disaster risk statistics.

196. For example, INEGI in Mexico manages a Collaborative Site for Disaster Attention (see Case Study 5). This site allows different government agencies involved in disaster management to provide statistical and geographic information through the full cycle of emergency response to ensure informed decision making in each phase.

197. In Brazil, the Institute of Geography and Statistics (IBGE) has developed a methodology to integrate population census information and maps of disaster risk areas (see Case Study 1). These are the areas susceptible to adverse weather and hydrometeorological conditions that can trigger hazardous events such as floods and landslides. These hazards, in turn, generate risk of disasters with significant impacts on society and the environment. IBGE and the National Center for Natural Disaster Monitoring and Alerts have constructed a tool for identifying and characterizing population in risk areas.

198. In Italy, NSO is contributing to the initiative *Casa Italia* for maintaining a national risk map of Italian municipalities (see Case Study 6).

199. The U.S. Census Bureau provides two tools that are used in DRM, that is the *OnTheMap for Emergency Management* and the *Census Business Builder: Regional Analyst*. These tools provide quick access to hundreds of demographic and economic data variables (see Case Study 10)



6 Key infrastructure

200. The statistical infrastructure covers the tools that support the operation of a statistical system. According to the survey carried out by the Task Force, current challenges include dissemination of small-scale statistics while ensuring confidentiality, lack of geocoded data, and cooperation between involved agencies. A ***review of the existing key infrastructure*** may be necessary to address the requirements for better HED-related information, new collections, and additional user needs. Changes would allow existing official statistics to take up its role as focal point for reporting on Sendai Framework indicators, the Paris Agreement, and SDG indicators and better serve the needs of disaster risk management, climate change and sustainable development.

201. This chapter discusses the statistical infrastructure required when producing statistics on hazardous events and disasters, and considers legislation, frameworks and integration, standards and classifications, statistical methods, organisational structures and production resources, quality assurance and guidelines, and knowledge and capacity.

6.1 Legislation

202. Legislation has a crucial role in supporting the production of statistics on hazardous events and disasters. Without unambiguous legislation and clear division of work between organisations, information production, management, analysis and reporting could suffer from undue complications and inefficiencies. The existence of a national legal basis regulating the cooperation among all players is key for inter-agency collaboration and data sharing.

203. The model provided by the *Guidance on Modernizing Statistical Legislation* (UNECE, 2018a) defines the rights and obligations of the bodies that compose NSS. It also prescribes the scope of that system and the principles and procedures to be applied in developing, producing, and disseminating official statistics. The *Guidance on Modernizing Statistical Legislation* defines NSO as the leading authority of NSS and as a professionally independent body. It furthermore lays down the obligations of respondents who provide data for statistical purposes and ensures their rights and the protection of confidential data. It also regulates the access of NSOs to administrative data sources and their use for statistical purposes.

204. Following the model of the *Guidance on Modernizing Statistical Legislation,* the ***production of statistics on hazardous events and disasters should become part of the multi-year and annual statistical programmes*** of NSS. A review of the existing programmes may be necessary to obtain the mandate for the production of these kinds of statistics and to clarify roles and responsibilities within NSS.

205. ***Statistical legislation should be reviewed*** from the viewpoint of mandating NSS work on measuring hazardous events and disasters. Statistical legislation should facilitate effective cooperation among agencies and permit access to the information required for DRMAs in both peace time (before and after disasters) as well as in the case of emergency. For emergency situations, an emergency protocol, which is already used by some countries (Armenia, for example), would clarify which information must be provided by NSO, and how a potential conflict with statistical confidentiality can be avoided. The emergency protocol will support the fast dissemination of important information that contribute to disaster emergency response, save lives, and minimise damage.

206. Likewise, legislation related to disaster risk agencies should be aligned where possible with national statistical laws, with the *Fundamental Principles* and with the *European Statistics Code of Practice* (Eurostat and European Statistical System, 2017).

207. As a means of dealing with the limitations on access imposed by statistical laws, some countries assign responsibility for parts of disaster risk management (such as economic impact assessment) directly to NSO. Another option is to treat DRMAs as part of the official statistical system. This facilitates their access to official statistics but also requires their adherence to the requirements of national statistical laws and international guidelines.

208. Ideally, national legislation should provide agencies responsible for disaster risk management with the right to access information needed for risk assessment, disaster emergency relief, and post-disaster assessments. Such legislation would have to be aligned with the national statistical laws and principles and, most importantly, respect the rules of statistical confidentiality.

6.2 Public and private sector data partnerships

209. There is high value in public and private sector data partnerships to achieve the highest level of data quality - particularly with respect to privately insured loss data. However, such partnerships often require non-disclosure agreements, which limits the level of data granularity that can be publicly reported or disclosed.

6.3 Statistical confidentiality

210. Protection of confidential data is regulated by statistical laws in almost all countries. It is an important prerequisite to the production of reliable official statistics. Confidentiality rules prevent agencies outside the statistical system, including those usually responsible for disaster risk management, from having full access to this sensitive detailed data.

211. Disaster risk management typically requires DRMAs to access small-scale statistics, particularly population and economic data. There are several methods to make the necessary data available for public and other uses outside NSS without compromising confidentiality:

- **Statistical grids**: Statistical grids are a system of statistical output areas composed of equal sized, normally squared grid cells with varying grid cell sizes. In a cross-border context 1 km² grid cells have become a quasi-standard and represent a good compromise between the demand for detailed and flexible statistics and data protection concerns. Most commonly statistical grids are used to report population counts or population densities but in principle are suitable for the dissemination of any type of spatially referenced statistics. Statistical grids can be viewed as a spatial reference system that can serve as the smallest statistical area unit for which - respecting statistical confidentiality - data may be provided to the user. Individual point-based data within an individual grid cell are aggregated, in the same manner as individual statistical data are aggregated for dissemination purposes. Grids data are thus grid-based statistical data. These data could be made available either as open data or accessed through web map services. For example, the Population and Housing Census 2020 already includes a release of important indicators within the 1km grid (grid data) across Europe. This data will be compiled annually (post Census).

- **Public-use microdata files** (for example provided by Statistics Canada): These files contain microdata that have been modified to ensure that no individual can be identified in them. Statistics Canada also offers real-time remote access, where users do not view the data but get access to a full range of descriptive statistics, and the operation of research data centres (Dosman and Stobert, no date).
- **Aggregates prepared by NSO upon request**: In absence of existing mechanisms to give users direct access to anonymised microdata, the analytical departments of NSOs could prepare the required aggregates upon request or following a protocol or agreement with DRMAs that respects rules of confidentiality.

212. Even if statistical confidentiality is a challenge in using current statistics for DRM, it is not a problem in all cases. For example, in the case of the emergency data-kit (see paragraph 170) produced for national use, access rights can be limited, therefore confidential data can be included. For international reporting aggregated data is usually adequate.

213. Regulations should guarantee the institutional framework and clarify the role of NSOs in the case of emergencies, also considering legal, technical and other barriers for information exchange. For example, the role of NSO of Armenia is clearly defined in the case of an emergency (see Case Study 3).

6.4 Frameworks, standards, and classifications

214. Statistics on hazardous events and disasters are considered in different existing statistical frameworks, including the *System of National Accounts* (SNA), the *Framework for the Development of Environment Statistics* (FDES), and the *Disaster-related Statistics Framework* (DRSF) of UNESCAP.

215. The *System of Environmental-Economic Accounting Central Framework* (SEEA-CF; United Nations et al., 2014a) is a statistical standard valid at the global level. SEEA-CF contains internationally agreed concepts, definitions, classifications, accounting rules, and tables for producing comparable statistics on the environment and its relationship with the economy. The SEEA-CF does not include statistics or accounts on hazardous events and disasters. However, SEEA-CF and *SEEA Experimental Ecosystem Accounts* (SEEA-EEA, United Nations et al., 2014b) can provide the basis for statistics on losses of environmental assets, degradation of ecosystems and related ecosystem services.

216. In SNA, the effects of non-economic phenomena such as natural disasters and political events (for example, wars) are recorded as catastrophic losses in the “other changes in the volume of assets account”.

217. “Hazardous events and disasters” are one of the 6 components of FDES. This component divides further to cover the subcomponents “natural hazardous events and disasters” (subcomponent 4.1) and “technological disasters” (subcomponent 4.2). Statistics on the occurrence and impacts of these disasters are included in both components.

218. Current statistical standards and classifications do not always fully support the production of HED-related information. For example, no statistical classification of hazards is available, and sometimes users require aggregation of data in very specific ways (for “critical infrastructure” as one example).

219. However, the adoption of the Sendai Framework in 2015 initiated several international activities which contributed to a further clarification of key terms. It also recommends classifications to be used for national disaster databases and for the reporting of Sendai Framework and SDG indicators. Key reference documents to be mentioned in that regard are described below.

6.4.1 Framework for the Development of Environment Statistics

220. The Statistical Commission, at its 44th session, endorsed the *Framework for the Development of Environmental Statistics 2013* as the framework for strengthening environment statistics programmes in countries. The Committee recognised it as a useful tool in the context of sustainable development goals and the post-2015 development agenda.

221. FDES provides an organising structure to guide the collection and compilation of environment statistics at the national level. It is broad and holistic in nature and covers the various issues and aspects of the environment (including cross-cutting issues such as climate change) relevant for policy analysis and decision making.

222. FDES organises environment statistics in a simple and flexible manner into components, sub-components, statistical topics, and individual statistics, using a multilevel approach. The six components are 1) Environmental conditions and quality; 2) Environmental resources and their use; 3) Residuals; 4) Extreme events and disasters; 5) Human settlements and environmental health; and 6) Environment protection, management and engagement.

223. Component 4, “extreme events and disasters”, organises statistics on the occurrence of hazardous (extreme) events and disasters and their impacts on human well-being and the infrastructure of the human subsystem. It distinguishes between *natural extreme events and disasters* (subcomponent 4.1) and *technological disasters* (subcomponent 4.2). Statistics and related information include, for example, the type of extreme event and disaster, location, magnitude, number of people affected, and economic and physical losses.

224. Captured under component 6, “environment protection, management and engagement”, sub-component 6.3 on “extreme event preparedness and disaster management” organises statistics on the preparedness and disaster management of a country. These will differ based on the type of extreme event and disaster that usually occurs or may occur. Disaster management expenditure should also be captured under this sub-component.

6.4.2 The Disaster-related Statistics Framework (DRSF)

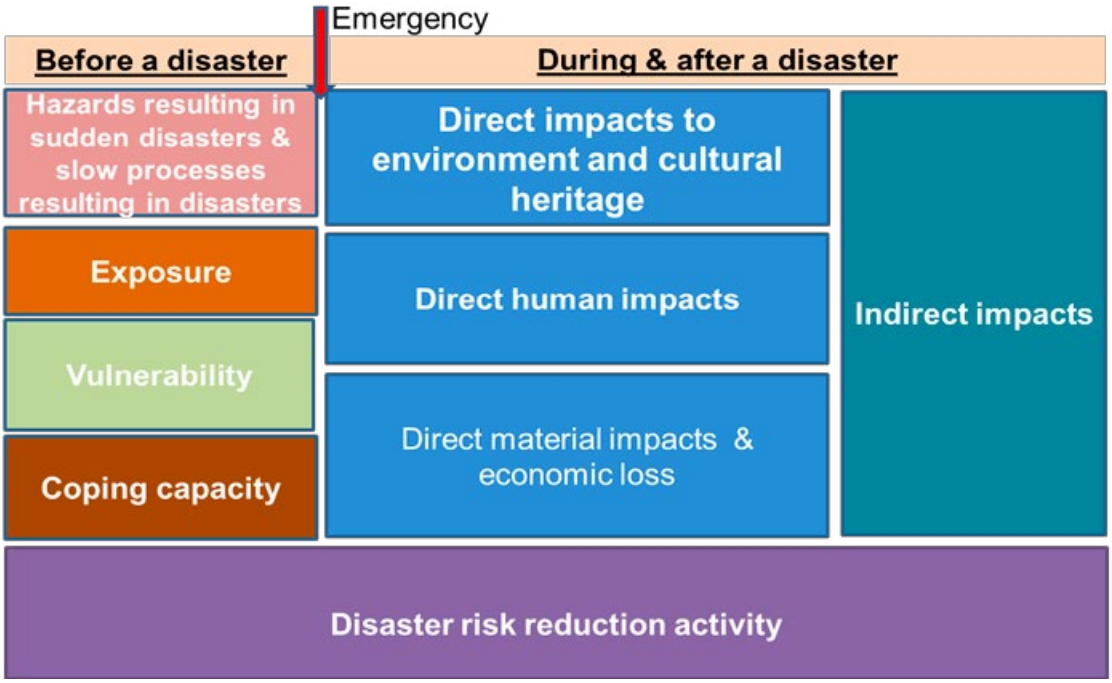
225. DRSF is a guideline for statistics which includes descriptions for a basic range of disaster-related statistics and methodological guidance and tools for their implementation. It was developed by an ESCAP Expert Group and adopted by ESCAP in May 2018 (ESCAP Expert Group, 2018).

226. DRSF is designed for use by national agencies to improve quality and harmonization of statistics in support of monitoring the Sendai Framework and SDGs. Even though the document was developed from a regional point of view, it provides a statistical framework that can be useful for all countries.

227. DRSF tools include a collection of tables (templates) that provides a visualization of how the current collections of basic data could be compiled into structured tables for presentation of statistics in response to the specific needs of analysis.

228. The main components and templates of DRSF are arranged according to the main phases of disaster risk management ("before a disaster" and "during and after a disaster") and are illustrated in the following Figure 4.

Figure 4: Components of the Disaster-related Statistics Framework



Source: ESCAP Expert Group, 2018.

6.4.3 Report of the open-ended intergovernmental expert working group (OIEWG) on indicators and terminology relating to disaster risk reduction

229. The report of OIEWG (UNISDR, 2017) outlines the indicators for the 7 targets of the Sendai Framework and terminology relating to disaster risk reduction. Furthermore, this report defines important key terms used in disaster risk management and recommends classifications such as ISIC (International Standard Industrial Classification of All Economic Activities) or the Integrated Research on Disaster Risk (IRDR) peril classification of hazards for the compilation of Sendai Framework indicators.

6.4.4 Technical guidance for monitoring and reporting on progress in achieving the global targets of the Sendai Framework for Disaster Risk Reduction

230. This document (UNISDR, 2018) supports the refinement and finalization of technical guidance for countries reporting on the indicators to monitor achievement of the 7 targets of the Sendai Framework.

6.4.5 United Nations Global Statistical Geospatial Framework (GSGF)

231. The *United Nations Committee of Experts on Global Geospatial Information Management* (UN-GGIM) provides a body for the institutionalisation of the integration of geospatial

information with statistics. UN-GGIM (2017) developed the *Strategic Framework on Geospatial Information and Services for Disasters* to serve as a guide for member states in their respective national activities to ensure the availability and accessibility of quality geospatial information and services across all phases of the emergency cycle, and to reach out and engage with decision makers. The framework was adopted by UN-GGIM in 2017 and subsequently endorsed by ECOSOC in July 2018. It recommends that geospatial databases and information products are developed, maintained, and updated based on common standards, protocols and processes, and used as important tools in every decision-making process across all phases of DRM. It stipulates, among others, that each member state shall be in the position to generate, maintain and provide quality geospatial information and services across all phases of disaster risk management, that geospatial data and information shall be openly accessible to the disaster risk management community, as appropriate, and that the implementation of the Framework shall encourage data sharing, interoperability and harmonization among neighbour countries to respond efficiently to cross-border disasters.

232. ***GSGF***, which is being implemented in more and more countries, ***is a fundamental reference for NSOs*** to be able to respond to the increased demand on better integration of statistics with geospatial information.

6.4.6 Classifications

233. As statistics on hazardous events and disasters are a cross-cutting issue over several statistical domains (such as demography, economy, agriculture, and environment) the statistical classifications used in these domains apply.

234. The most important statistical classifications mentioned in this context are the following:

- International Standard Industrial Classification of All Economic Activities (ISIC rev. 4);
- International Classification of Diseases (ICD-10);
- Geographic classifications used in NSS, including standard geographic classifications based on road or administrative boundaries, health regions or physical geographic boundaries such as drainage basins or ecozones; and
- Other statistical classifications as needed for the assessment of impacts on agriculture, or environmental assets, which can all be found in the International Family of Classifications.[14]

235. No statistical classification exists for categorizing hazards. ***It is recommended to use the list of hazards in Annex I of the Technical Guidance for Monitoring and Reporting on Progress in Achieving the Global Targets of the Sendai Framework for Disaster Risk Reduction*** (UNISDR, 2018). This classification has been derived from the *Integrated Research on Disaster Risk (IRDR) Peril Classification* and expanded by technological disasters.

6.5 Organisational structures

236. ***The increased role for NSS and NSO in work related to hazardous events and disasters may call for organisational changes within NSOs***. Most statistical offices are organised along either "subject matter" lines (for example, economic statistics) or "functional" lines (for example, data collection) or, often, a mix of the two. Working in cross-cutting areas, such as hazardous

[14] See https://unstats.un.org/unsd/classifications/Family.

events and disasters and climate change, requires an organisation that supports collaboration across different structural units and subject areas.

237. The relatively few NSOs that are directly involved in the compilation of HED-related statistics do not have a specific organisational unit that has been assigned the related tasks. Instead, the work is spread over different units and coordinated by a focal point within NSO.

238. For example, in Brazil the IBGE's (Brazilian Institute of Geography and Statistics) *Department of Geography* is involved in the work on identifying and characterizing population at risk in Brazil. The *Department of Population and Social Indicators* also included questions about disaster risk management in the *Municipal Basic Information Survey* (MUNIC) in 2013 and 2017 (see Case Study 1).

6.6 Data sources and statistical methods

239. A ***review of metadata*** is required so that it can be used to address DRM information needs. This will require the formulation and testing of new methodologies for statistical indicators of disaster risk. An accompanying set of statistical standards will also be required to promote interoperability and transparency of DRM information.

240. A notable strength of NSOs is their knowledge and application of statistical methodology to a wide range of phenomena. NSOs are key producers and curators of comprehensive datasets on demographic, environmental, social, and economic issues. Much of the subject matter that is relevant for disaster risk reduction is traditionally within NSO competencies. For example, population, housing, economic, environmental and agriculture statistics are used by other agencies for activities related to hazardous events and disasters. Beyond these traditional competencies, many NSOs also include environment statistics and geospatial information.

241. NSOs also contribute to advancements in compilation methodology, helping assure the quality and coherence of information. Nonetheless, improving HED-related statistics will require development of new methods not currently used in the statistical system. Application of existing methods to new data will also be necessary, particularly in the compilation and linkage of data.

242. Geo-referencing is essential for HED-related statistics, particularly at significant disaggregation levels. Although NSOs are already experienced in preparing maps and datasets for various information needs on sub-national phenomena, the lack of spatial disaggregation for areas which are not part of the standard data collection and dissemination products is a current limitation to further contribution to disaster risk statistics. As mentioned earlier, the *United Nations Global Statistical Geospatial Framework* (UN-GGIM, 2019) is a fundamental reference for NSOs to be able to respond to the increased demand on better integration of statistics with geospatial information.

243. ***Improving existing data is essential for HED-related statistics***, and in particular with regard to the following points:

- Disaggregation should be increased. Details such as location, gender, age, disability, hazard type, and event, are necessary to monitor the Sendai Framework targets.
- Data standardization and data quality should be improved. Standardised and comparable methodology has to be implemented to produce DRM statistics.

- Existing data collection systems should be reviewed and improved. Simple adjustments to data collections, such as increasing survey coverage to compile small-area statistics, could yield significant benefits.
- Linkages between socio-economic and environmental data should be improved, as should the availability of geo-coded data.
- Financial resources, technology transfer, and capacity building should be increased. These are crucial to filling identified gaps.

244. ***Expanding the scope of data and statistics has to be considered***; in particular, those on:

- Hazards and disasters (frequency, duration, intensity, impact and other dimensions);
- Exposure and vulnerability of critical infrastructure;
- Resilience, risks and vulnerability of population groups, and the population at risk from disasters;
- Social and economic impacts of HED; and
- Non-standard geographical areas (such as, coastal areas, flood- and drought-prone areas, slums, and settlements on steep slopes).

245. The following briefly discusses how different statistical tools can be combined and further developed to improve existing data and statistics to fill HED-related information gaps.

6.6.1 Census

246. A census is the complete enumeration of a population or groups at a point in time with respect to well defined characteristics; for example, population, production, or traffic on particular roads. Existing census data might provide an important source for small-scale statistics on HED if confidentiality rules can be respected.

247. A census also provides benchmark information to which statistics from other sources can be related. For example, population censuses provide the sample frames for most household-based surveys.

248. Limitation of census data use in HED-related statistics may be caused by the lack of geocoding, the time lag between data collection and availability, as well as long intervals between data collection periods (commonly 10 years in the case of population census).

249. It is essential that the ***geographic characteristics of the data are available*** to improve the suitability of census data for small-scale analysis. For example, the *CES Recommendations for the 2020 Censuses of Population and Housing* (UNECE, 2015) recommend to geo-reference the place of usual residence with a pair of precise geographical coordinates of the address point, or in the absence of such coordinates, to a precise and complete postal address.

6.6.2 Surveys

250. Usually, sample surveys are selected as a cost effective, low burden method to collect information. However, sample surveys do not typically provide enough local detail for analysis of, for example, the regional economic and social impacts of a previous disaster or for sub-national disaster risk assessment.

251. Historically, the primary use of these baseline data did often not require geocoding or disaggregation to a particular specificity. Data collection designs (and costs) are often not fit for

purpose of small-scale statistics needed for disaster risk management. ***Addition of coordinates or postal addresses to surveys would be a first important step*** to improve their suitability for small-scale statistics and various geographical disaggregation of the data. ***Adjustment of the survey sample design and the questions covered may be another way to improve the suitability of survey data*** for hazardous events and disasters measurement.

252. Very specific surveys are **post-disaster surveys** (or "first field surveys") which are carried out right after or shortly before the state of emergency has been finished. Post-disaster surveys help to assess disaster damage and loss in detail. They may also have a major influence on future response activities and on the timing and effectiveness of the early stages of recovery. Their success depends on adequate planning and preparation both before and after the disaster occurs.

253. Post-disaster surveys are usually carried out by DRMAs, often without involvement of NSOs. Although these reports provide very important information about disaster impacts on humans, economy, infrastructure and the environment, there are limitations concerning their integration with official statistics.

254. ***NSOs should review post-disaster surveys for alignment with statistical classifications and terminology.*** They should allow disaggregation as required for national and international reporting (by sex, age, occupation, for example). Population, land and businesses (including agriculture) should also be linked with corresponding statistical registers to allow later assessments of both direct and indirect impacts (such as loss of production and loss of work places). More guidance about post-disaster surveys can be found, for example, in the Australian Disaster Resilience Manual 14 on *Post Disaster Survey and Assessment*[15] (Australian Institute for Disaster Resilience, 2001).

6.6.3 Statistical registers

255. A statistical register typically plays the role of data coordination, integrating data from several sources, both statistical and administrative. This may be done by linking records using common identifiers or by using different matching techniques. Although statistical registers have been used as sampling frames for surveys, they are increasingly seen as sources of statistical data in their own right, particularly regarding data for small geographical areas or small sub-groups of the population. Geo-referencing of statistical registers is the most important prerequisite for small-scale analysis.

256. Therefore, ***statistical registers, and in particular, registers for land use, population, businesses, and agriculture, are important potential sources for HED-related statistics***. These registers are particularly important sources for baseline information for risk assessment and for emergency response.

6.6.4 Administrative data

257. Administrative data is the set of data derived from an administrative source. Data typically have to be processed to align with statistical classifications, terms and definitions, and to fulfil other quality requirements of official statistics.

[15] https://knowledge.aidr.org.au/media/1961/manual-14-post-disaster-survey-and-assessment.pdf.

258. In addition to traditional administrative sources for official statistics (ministries of finance, agriculture, energy and environment, among others) ***new administrative data sources need to be explored for producing HED-related statistics***. These include:

- **Disaster Risk Management Agencies**: DRMAs usually produce statistics and reports on, among others, disaster magnitudes, affected areas, direct disaster impacts, population and infrastructure at risk, investments in disaster risk management. They have their own sub-national network to collect data from that level. This network may reduce the data-collection burden of NSOs, provided that statistical classifications, terms, and definitions are used. Post-disaster surveys are one tool DRMAs often use to assess direct disaster impacts in the field.
- **National hydrometeorological institutes**: Their data include information on individual extreme meteorological events (type of hazard, magnitude, affected area and duration, for example)
- **National geological surveys**: These agencies may provide information about frequency and magnitude of geological hazardous events, such as earthquakes or landslides.
- **Insurance companies**: For example, big re-insurance companies provide long time series on disasters caused by natural hazards for single events. Data include descriptions of the event, the affected area, overall losses, insured losses, and fatalities.[16]

259. Alignment and integration of information from these additional administrative sources is particularly challenging. There is usually a lack of unique HED identifiers, so reporting thresholds, hazard classifications, and temporal and spatial delimitation of hazardous events are not aligned. Double counting may occur when a hazard affects more than one administrative area.

260. NSOs should ***identify particular data-related problems and guide administrative sources in the use of statistical classifications, terms, and definitions in their own surveys and reporting systems. Development of unique identifiers and national criteria for the delimitation of single events is also recommended***.

6.6.5 Big Data options

261. Big data is a term that describes large volumes of high velocity, complex, and variable data that require advanced techniques and technologies to enable capture, storage, distribution, management, and analysis. Many authors adhere to the "Four Vs definition" that points to the four characteristics of Big Data: Volume (the amount of data), Variety (different types of data and data sources), Velocity (data in motion) and Veracity (data uncertainty).

262. The *UNECE task team on Big Data* in 2013 proposed the following taxonomy to classify Big Data[17]:

- **Social networks (human-sourced information)**: This information is the record of human experiences, that were previously recorded in books and works of art, and later in photographs, audio and video.

[16] See, for example, Munich Re's NatCatService on natural catastrophes. https://natcatservice.munichre.com/.

[17] See https://statswiki.unece.org/download/attachments/77170975/Outcomes%20of%20the%20UNECE%20Project%20on%20Using%20Big%20Data%20for%20Official%20Statistics.docx?version=2&modificationDate=1456817253553&api=v2.

- **Traditional business systems (process-mediated data)**: These processes record and monitor business events of interest; for example, registering a customer, manufacturing a product or taking an order.
- **Internet of Things (machine-generated data)**: This information is derived from the sensors and machines used to measure and record the events and situations in the physical world.

263. Although these data sources may provide a large potential for improving the quality of official statistics, including HED-related statistics, the manner in which they can complement official statistics still needs to be further explored. The challenges, advantages, and disadvantages were discussed by the *UNECE High-Level Group for the Modernisation of Official Statistics*.[18]

264. A specific example of Big Data is geospatial data originating from Earth observations. Such information has been widely recognised as an important aspect of disaster risk management. There is growing experience with the integration of geospatial information with traditional statistics. This requires close cooperation between NSOs and national mapping, environment, cadastral, territorial and urban planning authorities.

265. For example, in Brazil (see Case Study 1) and Mexico (see Case Study 5), geospatial and statistical activities are closely integrated and supervised by a single organisation, the National Geospatial and Statistics Office (NGSO). Likewise, NSOs of Canada, Colombia, Italy, Netherlands, New Zealand, Norway and Singapore have a range of internal geospatial capabilities and good collaboration with their national geospatial communities. In the European Union, NSOs provide geospatial data support for the INSPIRE programme (Infrastructure for Spatial Information in the European Community).

6.6.6 Other statistical methods and requirements

266. Collaborative sites (such as in Mexico, see Case Study 5) can also promote integration, interoperability, and accessibility of DRM-related statistics. This can include databases of registered disaster damages.

267. Development of HED-related statistics will ***require enhancements in the capacity and inter-functionality of the IT systems*** used by NSOs, for example, to allow the linking of different types of data from different sources.

268. ***Information dissemination via different means*** (for example, electronic dissemination in form of downloadable interactive tables, reports, maps and graphs, and more traditional printed yearbooks and compendia) will not only address different user needs but also provide information backup in case of emergency.

269. For data security, data backups at different locations are recommended in case NSO headquarters are also affected by the disaster. This happened, for example, during the floods in Prague on 13 August 2002, the earthquake on 14 February 2016 in Christchurch, New Zealand

[18] See https://www.unece.org/statistics/networks-of-experts/high-level-group-for-the-modernisation-of-statistical-production-and-services.html.

and in the earthquake on 19 September 1985 in Mexico City. In case of Mexico, the headquarters of NSO (INEGI) was moved to Aguascalientes, a less disaster-prone location.

270. NSOs are also recommended to ***keep a minimum set of information ready (emergency data-kit) for use in case of emergency, with clarified protocols*** regarding access and rules for analysis (considering the need for respondent confidentiality). The data-kit may include, for example, recent population, business and infrastructure statistics.

6.7 Quality assurance and guidelines

271. Much work is required to integrate data originating from different sources and to transform them into official statistics. Good quality assurance is therefore very important.

272. For all types of statistics, the application of a quality assurance framework is recommended; for example, the *National Quality Assurance Framework* [19], the *European Statistical System Quality Assurance Framework*[20], and the *Eurostat Handbook on Data Quality Assessment Methods and Tools* [21] (Ehling and Körner, 2007).

273. No specific additional quality criteria are needed for HED-related statistics. However, as the statistics may have a direct impact on the quality of disaster risk assessment and, relatedly, the speed and efficiency of emergency response, ***monitoring of important quality features (accuracy, timeliness, and punctuality, for example) is recommended***.

6.8 Knowledge and capacity

274. HED-related knowledge and capacity is spread around numerous agencies, ministries, and research institutes, many of which produce and use statistics outside the statistical system (for example, through meteorological and atmospheric monitoring networks). It could be necessary for NSOs to work together with these institutions to ensure standardisation and good quality.

275. The statistical system often does not put much emphasis on cross-cutting data and measuring interactions between subject areas. ***New expertise will be required in several areas*** (for example, small-scale analysis, geospatial information integration, and disaster economic impact monitoring) to develop and incorporate new statistics to support disaster risk management.

276. Attracting, retaining, and training staff with the needed proficiency to implement and improve such methodologies is a challenge. There are not enough personnel with the required knowledge and skills since hazardous events and disasters is a new subject for NSOs and HED measurement is not the responsibility of many of them. It ***could be necessary to invest in human resources***.

277. Relatedly, the building of credibility in this field is a challenge for NSOs because they are relative newcomers without large teams of professionals possessing the required specific knowledge. These knowledge gaps should be taken into account in recruiting staff. As many

[19] https://unstats.un.org/unsd/dnss/qualityngaf/ngaf.aspx.
[20] https://ec.europa.eu/eurostat/documents/64157/4392716/ESS-QAF-V1-2final.pdf/bbf5970c-1adf-46c8-afc3-58ce177a0646 and https://ec.europa.eu/eurostat/web/quality/overview.
[21] https://ec.europa.eu/eurostat/documents/64157/4373903/05-Handbook-on-data-quality-assessment-methods-and-tools.pdf/c8bbb146-4d59-4a69-b7c4-218c43952214.

potential employees will not have the necessary combination of statistical and subject matter knowledge, the ***required expertise could instead be obtained through partnering and collaboration with relevant agencies and experts. On the job training for statisticians in the area of HED is also needed.***

278. NSOs could ***use their international network for statistical development to share experience across countries***. The mutual support among countries would be helpful for capacity development and could also save resources.

279. Given that NSS holds a lot of information relevant to disaster risk management, ***institutional knowledge of information needs should be improved***. This would enable a potential reorganisation of existing NSO information to better meet users' needs.


THE OTHER WAY
THIS WAY
THAT WAY

7 Recommendations

7.1 Introduction

280. There is a growing demand for hazardous events and disaster related statistics to respond to international policy frameworks and for all stages of disaster risk management (risk assessment, prevention and mitigation, preparedness, response and recovery). This chapter introduces the Task Force's recommendations to NSOs for measuring hazardous events and disasters. Though targeted primarily at NSOs their implementation will concern other users and producers of HED-related statistics, both inside and outside the statistical system. The recommendations also call for further work at international level to promote the involvement of official statistics in measuring hazardous events and disasters.

281. The recommendations are grouped as follows: 1) identifying overall information needs; 2) engaging with DRMAs; 3) identifying specific data and statistics needs; 4) improving existing statistics; 5) developing new statistics; 6) improving statistical infrastructure; and 7) the role of international statistical community.

282. The recommendations are based on the Task Force's own discussions and on the following:

- Task Force's survey of NSOs on their involvement in HED-related statistics in 2016;
- Feedback from three dedicated and well-attended sessions in the Expert Fora on Climate Change Related Statistics on 2-4 October 2018, 3-5 October 2017, and 5-7 October 2016;
- Feedback from two face-to-face meetings of the Task Force: on 6th October 2017 to discuss the findings of the Task Force and its recommendations, and on 5th October 2018 to review the draft recommendations;
- Discussion of the interim recommendations by the CES Bureau in October 2018 and the draft full text in February 2019; and
- Electronic consultation with all CES members in spring 2019.

283. The recommendations follow a structure similar to the *CES Recommendations on Climate Change-Related Statistics* (UNECE, 2014a), as the topics are closely related and both represent cross-cutting issues of growing importance.

284. The aim of the recommendations is to address the following issues:

a) **Roles of NSOs**: Even if global policy frameworks underscore the role of NSOs in producing HED-related information, their roles in DRM are often not clear and official statistics are not used to their full potential.

b) **Awareness**: Users of HED-related information are not fully aware of all the information available from NSOs that might meet their needs. Likewise, NSOs are not fully aware of the needs of these users.

c) **Gaps**: Many gaps exist in official statistics that hamper their use in DRM; for example, statistics on the population and businesses at risk from disasters are not always fit for purpose.

d) **Timeliness**: Timeliness can play an important role in DRM, in particular when information about affected population is needed in case of emergency.

e) **Accessibility**: Though official statistics are generally easily accessed in aggregate form, this is not the case for microdata. For reasons of respondent confidentiality, users outside of NSOs cannot access microdata that could improve the quality of analyses useful for HED.

f) **Interpretability**: To have a broad impact, HED-related information must be easily interpreted by a range of users, including the general public. "Plain language" descriptions of the data, statistics and indicators have to be provided.

g) **Statistical office operations:** NSS collects data across several operational domains. As a cross-cutting issue, HED-related information is found across all these domains. Coordination of this information within NSS is rarely undertaken, leaving users with the challenge of dealing with several different entry points.

h) **Methods and standards:** While NSOs have long understood the need for common methods and standards to ensure comparability across statistical domains and jurisdictions, some additional methods and standards are still needed for these kinds of statistics. There is, for example, a lack of a common terminology and statistical classification of hazards. More attention should be given to geo-referencing of data and small-scale aggregation of data.

7.2 Recommendation 1: Clarify the main purposes of engaging in the domain of measuring hazardous events and disasters

285. NSOs should ***clarify the main purposes of engaging in the domain of measuring hazardous events and disasters***. National disaster risk management, often also including climate change adaptation, is a responsibility of Disaster Risk Management Agencies, line ministries and other specialised agencies. For example, monitoring of extreme climate, weather, and hydrological events is performed by hydrometeorological services. NSOs have important contributions to make by providing consistent official statistics at different phases of DRM. National DRMAs, policy makers, researchers and civil society are the users of this information.

286. Collaboration of government agencies at all levels (national and sub-national) is important to clarify the main national purposes and to develop strong databases and geospatial information.

287. Official statistics are also needed for the reporting to international frameworks to allow comparison among countries and the monitoring of global policy goals.

288. Potential users are often not aware of the official statistics available to them. There is lack of statistical literacy on the use of official statistics for DRM and climate change policies.

289. Therefore, it is important for NSOs to identify the national HED-related statistical information needs by engaging with the user community. This will also help clarify the roles of NSOs in providing HED-related information and increase potential users' knowledge of the official statistics available for their purposes.

290. NSOs should then clarify the main objectives of their engagement in measuring hazardous events and disasters.

7.3 Recommendation 2: Reach out to national agencies responsible for national disaster risk management

291. NSOs should ***be proactive in reaching out to national agencies responsible for national disaster risk management***. This will:

- Help to identify initial information needs and gaps;
- Facilitate collaboration between NSS, DRMAs and other relevant agencies outside NSS;
- Identify training needs; and
- Help to clarify the role of NSOs in providing statistics and assisting, as needed, in DRM and climate change adaptation.

7.4 Recommendation 3: Review key hazardous event- and disaster-related needs for data and statistics

292. NSOs should ***first identify the HED-related needs for data and statistics before developing a strategy for improving the relevant information***. The current state of official statistics should be considered. Awareness of the information needed in the country, together with an evaluation of the current capacity of NSS to respond, are fundamental prerequisites to a plan to reduce the HED-related information gaps.

293. For the review it is important to recall the key competencies of NSOs. This will ensure that HED-related information is based on existing official statistics as much as possible, and existing data gaps and new information demands can be better met.

294. The key needs can concern data and statistics that are not available, as well as improving the existing statistics where better timeliness and quality, longer time-series or more spatial disaggregations would be required.

7.5 Recommendation 4: Improve hazardous event- and disaster-related data and statistics

295. NSOs should *consider improving HED-related data and statistics in collaboration with DRMAs*. It is recommended that they:

- ***Improve awareness within NSS of related information needs***. For a variety of reasons, official statistics are not always used to their full potential and often there is duplication of data collection between NSOs and other organisations. As the coordinator of NSS, NSOs should promote better awareness of existing information in NSS and how they can be used for measuring hazardous events and disasters.
- ***Ensure that DRMAs use official statistics as much as possible.*** This could include, for example, the use of geo-referenced population registers, as well as business and agriculture registers for disaster risk mapping (respecting respondent confidentiality). DRMAs should be encouraged to use standard statistical classifications (such as ISIC rev. 4) and/or map their own classifications to the statistical standards.
- ***Enrich the existing official statistics with more statistics at the local level.***

- ***Improve official statistics used for DRM with NSS partners.*** For example, existing statistics need to be made fit for small-scale analysis. Improved timeliness may be required, especially for specific population, social and agricultural statistics. Other domains, such as business registers and environment statistics, may also require improvements.
- ***Explore additional data sources to address gaps and improve quality.*** Additional data sources may include, for example, geospatial information together with Earth observation data or data from NGOs or research institutes. Data could be also available from local authorities that do not regularly transmit data to NSS. Not all such data may be useful for production of official statistics, but they may provide important contextual information.
- ***Keep a limited set of information ready for cases of emergency.*** Such an emergency data-kit should include most recent population data and statistics about businesses and key infrastructure. This will help to assess quickly the number of population and critical infrastructure potentially affected by a hazardous event. The existence of an emergency protocol which clarifies the role of NSO in case of emergency is of great importance to ensure the quick flow of required information, and clarity about the roles and responsibilities of DRMAs and NSOs.

296. ***NSOs should draft, together with DRMAs, a prioritised list of national information gaps and prepare a road map on HED-related data and statistics.***

7.6 Recommendation 5: Consider development of new hazardous event- and disaster-related data and statistics based on a review of the key needs

297. When considering the production of new data and statistics, it is important to ***recall the key competencies of NSOs and take into account the traditional boundaries of their work***. For example, NSOs do not usually compile forecasts or make judgements about cause-effect relationships.

298. Key HED-related information needs to consider include, among others:

- Data and statistics on the frequency, magnitude and impacts of hazardous events and disasters;
- Data and statistics to address climate change adaptation and adaptive capacity;
- Data and statistics on disaster risk and vulnerability;
- Linkages among existing economic, social and environmental information to improve DRM in all phases, including data and statistics on the impact (damage and loss) of disasters on agriculture (crops, livestock, fisheries, aquaculture and forestry); and
- Geo-referenced data to support spatial analysis of data linked to DRM and to produce statistics for new geographical areas.

7.7 Recommendation 6: Review statistical infrastructure from the viewpoint of meeting hazardous event- and disaster-related needs for data and statistics

299. NSOs are recommended to:

- ***Review existing statistical infrastructure to see how the needs of DRM and related international reporting are being met;***

- ***Identify*** **what** ***new capacity, knowledge, skills and partnerships are required;***
- ***Consider how current institutional structures support production of HED-related information and*** **develop** ***partnerships with all levels of government;***
- ***Review existing national classifications, definitions, statistical frameworks, products and services for their coherence with DRSF and the Sendai Framework;***
- ***Gradually develop*** **new** ***partnerships, expertise and capabilities; and***
- ***Identify a focal point*** **and** ***clarify responsibilities within NSO.***

7.8 Recommendation 7: The international statistical community should take an active role in contributing to the global system on measuring hazardous events and disasters

300. Beside the work on SDG indicators, there is demand for official statistics from the global expert community working on HED-related issues. This has been recently addressed by UNFCCC, UNISDR and WMO. Furthermore, these international organisations have agreed upon certain concepts (including classifications and terminology) in international processes that must be considered in developing the related information. ***The international statistical community and NSOs are*** recommended ***to:***

- ***Seek closer collaboration between the statistical community and international organisations working on these issues.*** Within the UNECE region, CES and its Secretariat would be well placed to collaborate with FAO, IPCC, UNFCCC, UNISDR, WMO and others. Better interaction between the different stakeholders could help ensure that the different expert communities consider information availability and avoid developing methods that require data that are not generally available in most countries. It could also help reduce the possibility of overlapping international demands for data collection and reporting.
- ***Actively engage or initiate work related to statistical operationalisation of terms, definitions, classifications, indicators etc. used in disaster risk management***. Furthermore, contribute to further alignment between DRSF and Sendai Framework indicator methodologies and the existing classifications and statistical frameworks, and engage in other follow-up activities as identified in this report.
- ***Actively engage, at the national level, with representatives delegated to report progress on the implementation of the Sendai Framework*** to assist in information-related issues, comment on methodologies and assist in review processes.
- ***Exchange experience on NSOs' contributions to improving HED-related information***, for example, at expert meetings and through other communication channels.

8 Implementation

301. This chapter describes practical, incremental approaches NSOs can take. The specific steps outlined are intended to assist NSOs in the production of HED-related information, whether just beginning or already well engaged in the work in this area.

302. Some of the steps described may be pursued concurrently rather than sequentially. The steps might also be taken up in a slightly different order depending on national context and opportunities. However, two key features should be reflected in any road map for implementing HED-related statistics. First, the process should be viewed as incremental, to be undertaken step-by-step, with short-, medium- and long-term objectives identified. Second, the process should be viewed as iterative, repeating similar steps with increasing detail as information is gathered and plans are formed.

303. The recommended implementation steps, discussed in detail in the following sections, are:

- Identify a focal point;
- Engage with stakeholders to clarify data needs;
- Define the scope of statistics relevant for national needs;
- Assess available information;
- Prioritise data gaps;
- Prepare a development plan;
- Assign tasks for NSO; and
- Manage and disseminate compiled data.

8.1 Identify a focal point

304. National needs on HED-related data and statistics are driven by national context, DRM-related information needs, and by international reporting requirements.

305. NSOs, in their standard setting and coordination role for NSS, can contribute to all phases of the DRM cycle and is essential to international monitoring and reporting. To do this work efficiently, NSOs and their partners in NSS must ensure that official statistics serve multiple information needs; and that they are fit for purpose, accessible, and comparable over time and across countries.

306. To strengthen the production of HED-related information, ***senior management should assign responsibility to a focal-point (unit) within NSO***. The first task for this focal point is to identify the main objectives for developing HED-related information given the particular national context and international reporting needs. This task involves improvement of knowledge and awareness of the scope of data and statistics needed for national DMR purposes and international monitoring by reviewing relevant frameworks.

307. For example, Statistics Norway has a long experience when it comes to coordinating different national agencies and their different contributions to this kind of deliveries. Statistics Norway considers the existence of a focal point the most important issue for this work to be done (see Case Study 11).

8.2 Engage with stakeholders to clarify needs for data and statistics

308. To assess the adequacy of coverage, quality, timeliness, and accessibility of existing national HED-related data and statistics, ***the designated focal point should engage with national stakeholders***. All producers and users of official statistics and, specifically, representatives of the organisations involved should be consulted. It is especially important to consult with information producers associated with the top disaster risks given the national context.

309. For example, this consultation could include national DRMAs, environmental agencies, and other ministries that produce, collect or disseminate information relevant for measuring HED. Policy makers, researchers and civil society responsible for or active in DRM should also be included. This community (or network) of HED-related information producers and users should work closely together to adopt common objectives, clarify respective roles, and assign particular functions.

310. The focal point would ***review, with other members of the network, the main drivers and requirements of the statistical information needed***. All relevant international references and terms should be explained to adopt a common language when defining national goals. This includes international requirements, statistical frameworks, products and services, international standards and statistical classifications (SEEA-CF, FDES, ISIC rev. 4, CPC, among others), and standardised definitions and methods. The NSO focal point would also provide a preliminary analysis of national HED-related needs for data and statistics, and relevant official statistics as a starting point for further discussion with the group. Together, the group would review and clarify national priorities for development of HED-related statistics. Subgroups could be formed to further organise the work.

311. When engaging with stakeholders, national focal points should:

- ***Conduct a preliminary review*** to identify producers and users of related data and statistics, considering national context and needs for different phases of disaster risk management;
- ***Form a network of information producers and users***, discussing requirements and framework;
- ***Define common goals*** (short-, medium-, and long-term) within the network; and
- ***Coordinate the network and the development of work plans and working groups.***

312. Focal points are recommended in this activity to clarify the information needs and the role of each stakeholder concerning in disaster risk management, and in addition to identify existing knowledge networks on the subject to seek synergies and to avoid duplication of efforts.

8.3 Define the scope of hazardous event- and disaster-related needs for data and statistics relevant to the national context

313. The network of national producers and users of HED-related data and statistics can assist in developing a preliminary description of the scope of information needed. Such a review requires detailed identification of the (main) hazard risks faced given the national context. These risks will vary within and across each country because the geography and topography, demographic and population dynamics will differ. Land use and expansion, effects of climate change, and availability of resources will also differ. All these factors, alone and in combination,

can influence the type and intensity of risk by affecting the likelihood of a hazardous event, exposure and vulnerability.

314. The different phases of DRM should be considered when describing the scope of disaster statistics suitable for a given national context. A multi-hazard perspective (hydrological, meteorological, geophysical, climatological, organic, chemical, socio-natural, technological, and biological) should be incorporated.

315. It is also important to include information needs for international monitoring purposes, taking careful note of classification and metadata protocols required for comparability.

316. Therefore, when defining a preliminary scope of need for HED-related data and statistics relevant to the national context, ***focal points and their networks should:***

- ***Conduct a preliminary review*** to identify relevant hazard risks, considering national context, the different phases of disaster risk management, and a multi-hazard perspective; and
- ***Include needs for data and statistics for international monitoring purposes and any particular methodological requirements*** to ensure comparability.

8.4 Assess available information

317. Once the scope of HED-related information needs in the country is defined with input from stakeholders, these needs should be reviewed systematically to determine where data, statistics and metadata are available, and where gaps in quality or transparency should be addressed. NSO focal point is well suited to ***review the scope of needs for data and statistics*** by the stakeholder network and to "map" available information, consulting with all ministries that may also have relevant information.

318. All national and local ministries that may have relevant information should be consulted. Additionally, data collected by universities and nongovernmental organisations should be considered. International organisations and neighbouring countries may also have data relevant to DRM, given the transboundary nature of many hazardous events.

319. From this review, an initial set of available HED-related information should be identified. Metadata and data-provider contact information should also be gathered. This review will also identify information gaps—in availability, quality, transparency, accessibility, and metadata.

320. In summary, ***the initial assessment of available information should:***

- ***Identify the information available***, given the preliminary scope defined by the focal point and network of national producers and users of HED-related data and statistics;
- ***Reflect consultation with possible information sources*** in local and national ministries, universities, non-governmental organisations, international organisations, and neighbouring countries, as relevant;
- ***Be organised into an initial set of available information***, along with metadata and data provider contact information; and
- ***Generate a list of gaps*** in the availability, quality, transparency and accessibility of data and metadata.

8.5 Prioritise data gaps

321. As is often the case for emerging domains, it is likely that resources available for producing HED-related information will be limited. NSOs must target their efforts in meeting users' information requirements considering national priorities and available resources, and consider what is both relevant and feasible by comparing needs to the costs of responding to them.

322. ***When prioritizing among information gaps to be addressed, those most critical to reducing direct risk to the population should be given priority***. Vulnerability of populations and timeliness of data and statistics must be considered. Information for national DRM must be timelier than that for international monitoring and reporting purposes. Among the information needed for DRM, that required for an emergency data-kit to assist first responders in the immediate aftermath of a disaster should be prepared in advance so that it is immediately available. A strong understanding of the DRM cycle assists with assessing the timeliness needs for particular data and statistics.

323. ***Costs must also be considered***. To evaluate potential (new or additional) costs, a review of available and potential resources should be conducted. This includes statistical and subject-matter expertise of staff, available information systems and supporting hardware, IT, data science, and communication support services. Legal frameworks for data and cost sharing should also be explored. The network should be consulted for potential contributions. Other countries facing similar hazards and information needs may be consulted to share experiences, as well as international organisations whose work focuses in this domain.

324. In some cases, improvements could be achieved even with limited resources, such as:

- Demonstrating possible uses of existing HED-related official statistics;
- Facilitating access to information produced by others by creating national portals for HED-related information;
- Avoiding duplication of data collection through better collaboration with data producers and researchers; and
- Reviewing existing data collections to identify where changes could be made for the benefit of DRM.

325. In summary, ***identified gaps in the availability, quality, transparency and accessibility of information must be prioritised. This should consider***:

- ***Purpose of the information*** so that direct risk is reduced for populations;
- ***Timeliness of data and statistics and the vulnerability of the population;***
- ***Costs,*** acknowledging that even with limited resources steps can be taken to address information gaps; and
- ***Available resources*** from national networks, other countries with similar risk histories, and international organisations, such as experiences, training and information sources.

8.6 Prepare a development plan

326. Once information needs are prioritised, taking account the use of the information, timeliness requirements and potential costs, ***a statistical development plan for HED-related information should be prepared.*** The plan should address improvements needed for both existing information and that yet to be developed. This plan should formulate short-, medium-, and long-term actions.

8.6.1 Short-term actions: Improve existing information

327. Several actions can be taken to strengthen HED-related data and statistics in the short term. Efforts should be directed to improve the utility and accessibility of existing information. In most countries, such information is fragmented and not standardised using established classifications. Improving organisation in production of data and statistics and applying international classifications can yield great improvements to timeliness, utility and transparency without considerable costs.

328. Improvements to organisation and production processes for existing data and statistics should focus on the "basic range" of disaster risk statistics proposed in DRSF. NSOs possess most of the data and statistics needed before a disaster through their traditional domains. This basic range is very useful for constructing risk maps, including, for example, data on the occurrence of hazards, number of people killed, number of people affected by disasters, estimated direct economic loss, damages to critical infrastructure (housing and businesses) and public services, and all data losses. Within this basic range, greatest priority should be given to data and statistics needed for the emergency data-kit for use by first responders.

329. Among the most valuable improvements to HED-related information is geocoding existing data in whatever format is best suited to first responders' needs. Given the potential volume of data involved, this work should occur incrementally with priority given to data and statistics essential to the emergency data-kit.

330. In summary, ***short-term actions to improve DRM-related information include:***

- ***Improving coordination of operational, statistical, and geospatial infrastructure;***
- ***Improving classification of hazards, notation of data sources, and presentation formats for intended purpose; and***
- ***Beginning/continuing geocoding of existing statistics***.

8.6.2 Medium-term actions: Produce a strong "basic range"

331. As work continues to improve coordination and classification of existing information, actions suited to medium-term implementation should begin. The focus here should be on production of the complete basic range of disaster statistics in geocoded form. The core set should focus on specific hazards considering the national assessment.

332. Traditional and non-traditional information sources should be considered. In some cases, sources for existing data and statistics may be revised as improved methods are identified.

333. In addition to the basic range, additional areas could be addressed; for example, measuring impacts on ecosystems and public services and producing statistics for non-standard

geographical areas (such as flood- or drought-prone areas). More statistics related to urban areas and other small regions may be needed, especially in developing countries.

334. In summary, ***medium-term actions to improve DRM-related information include:***

- ***Beginning/continuing production of the basic range of DRM-related data and statistics;***
- ***Exploring new information sources and methods to improve quality and efficiency; and***
- ***Measurement of resilience, impacts, and non-standard geographic areas.***

8.6.3 Long-term actions: Strengthen infrastructure

335. Actions for the longer term should address governance and training needs. To strengthen governance, the production of HED-related data and statistics needs to be recognised in the national statistical law or, at least, in national statistical plans and work programmes.

336. ***Protocols could help for the emergency data-kit, to identify the data and statistics to be provided by NSO and its format and quality requirements.*** Formal agreements through laws, bilateral agreements or open data policies are needed with information producers and users to establish required information flows. Regulations relating to the exchange of information with DRMAs and other organisations may facilitate information flows.

337. Protocols and agreements for DRM-related information flows are complex. Given their particular specificity and sensitivity, DRM-related data are often confidential. They may identify sensitive information about individuals (such as age, relationships within household, health status, income and social service receipts) and businesses (such as income, number of employees and potential/actual losses). Information-sharing agreements between DRMAs and other agencies should be established. In some cases, legal and regulatory frameworks will require revision to enable efficient information sharing. Short-term or otherwise limited agreements may be pursued while broader legal revisions are in development.

338. For example, in the U.S., the Subcommittee on Disaster Reduction (SDR) serves in this coordinating capacity across many U.S. Federal agencies each with their own data holdings, practices and expertise. A subgroup of the SDR coordinated the agency experts and data to fulfill the Sendai Framework data requirements.

339. ***Information-sharing agreements with local authorities should also be arranged.*** Local authorities' own data collected through administrative registers may be valuable for planning efforts. Sharing national data and statistics with local authorities may aid first responders. In some cases, establishing efficient information sharing agreements between national and local authorities may require legal and regulatory revision.

340. ***Local data and statistics on disasters may also be improved.*** Often, data are gathered only in case of a declared disaster. Sometimes, local administrations are not timely in production or transmission of HED-related data. Additionally, these data may not conform to official statistics quality standards in terms of coding and classification.

341. Together, these constraints reduce the coverage, completeness and standardization of the information collected. Local administrations should be supported to enable efficient and robust

data collection and transmission. This could involve training provided by national authorities. Establishing mandatory data collections (and the funding for them) may also help (for example, Europe's flood directive).

342. The development of core professional capabilities and competencies should be fostered through ***training, workshops, sharing of best practices, and case studies. Innovative capacity-building mechanisms should be promoted. Training needs of NSO staff engaged in DRM should be reviewed and supplemented*** as needed. ***Briefing and training materials may be shared*** among DRMA and NSO to improve basic knowledge and coordination. NSOs may also ***consider hiring statisticians with particular expertise*** in disaster statistics and/or relevant methodologies.

343. In summary, ***long-term actions to improve DRM-related information include:***

- ***Improving information sharing*** among national agencies, and between national and local agencies engaged in DRM;
- ***Improving local data and statistics*** on disaster risk; and
- ***Improving skills and expertise of staff*** among agencies engaged in DRM.

8.7 Assign tasks for national statistical offices

344. At this stage, NSO focal point should be well aware of information needs, the priority of those needs, and the capacity of NSS to respond. To develop and implement the necessary actions, roles should be assigned to all agencies engaged in DRM.

345. Core NSO roles in DRM should stem from their traditional strengths. These roles, many of which are routinely conducted by NSOs in other domains, include providing baseline information in the form of a basic set of data and statistics, including an emergency data-kit for first responders. NSOs can also take on additional DRM roles, depending upon the national institutional context. Additional roles could include producing geographic information such as digital maps, and coordinating information across multiple agencies engaged in DRM.

346. NSO should assess its current role. Then, a clear description of the possible roles to be taken on by NSO and a detailed description of the potential contributions of all information producers in each phase of DRM should be defined. This role assignment should consider the national risk context, the time sensitivity of the information needed (by disaster phase), and the institutional setting.

347. The roles of NSO should be clearly established, defined, and affirmed by senior management. Specific tasks of NSO should be established and a work plan for their implementation defined.

348. These roles and tasks must consider the resources available and the investments that could be made. Additional design elements and cost structure would also need to be in place to deliver the required information in time to inform emergency protocols. For the most part, official statistics are not intended to be produced or accessed quickly; rather the emphasis is on accuracy, maintenance of confidentiality, and transparency. If official statistics were used to inform immediate decision-making at the time of a disaster, it would be important to clearly define the roles of NSO in the emergency protocol so that the required information can be provided quickly and with the necessary disaggregation and quality.

349. One possible source of funding is the savings associated with modernising statistical production processes and services in other domains. This may allow re-allocation of human and financial resources to new areas, including HED-related information, and development of new methods for using multiple data sources.

350. At the moment, modernising statistical production is a priority for many NSOs and for CES. Improvements are being sought by harmonising and streamlining processes based on international standards such as the *Generic Statistical Business Process Model* (GSBPM) and the *Generic Statistical Information Model* (GSIM), and by aligning the methods and technology of statistical production across countries. According to the vision of the *UNECE High-level Group for the Modernization of Official Statistics*, "the challenge for statistical organisations is to be sufficiently flexible and agile to provide statistics according to user needs, at an acceptable cost." The group states that "in some specific statistical domains, only cross-border data make sense; for example, globalization, enterprise groups and climate change."

351. In summary***, when assigning tasks for NSO:***

- ***The current role of NSO and other agencies engaged in DRM should be assessed;***
- ***Roles should be assigned to all partners*** and affirmed by senior management, considering traditional strengths of NSOs, the national context, and institutional framework; and
- ***Specific tasks and work plans should be defined***.

8.8 Manage and disseminate compiled statistics

352. NSOs are well suited coordinating the production and dissemination of HED-related statistics. They routinely manage national information flows, quality assurance and the use of internationally agreed standards and methodologies. This expertise can be leveraged when coordinating flows and quality of HED-related statistics.

353. HED-related statistics should be managed in a multi-purpose system comprising microdata, metadata, statistics and indicators in a national database. All relevant information flows from producers should contribute to this system. Information needs include those data and statistics required for national DRM purposes and for international monitoring and reporting. Both can, and should, be efficiently managed within a common system. The frameworks guiding both national management and international monitoring and reporting, and the types of information needed for both purposes overlap in many places.

354. Progress in gathering high-priority data and statistics and compiling related metadata should be monitored. This should include data and statistics relevant to national and sub-national needs. Progress in providing information for international reporting requirements should also be monitored. To ensure that the information is fit for purpose, it is important to identify and address the level of detail and format required by users. The scope and frequency of dissemination should be evaluated given the purpose of the information and the phase in the disaster risk management cycle.

355. These plans should be incorporated into a dissemination strategy covering short-, medium- and long-term goals for improving the timeliness, transparency and accessibility of information. Relevant information can be gradually added (demographic, social, territorial) matching that

from different domains. This integration would allow to study event dynamics, analyse connected issues and evaluate impacts.

356. Dissemination plans should consider information sharing agreements with relevant agencies. These plans should account for the required level of information detail so that appropriate confidentiality controls are put in place. To maximise utility and accessibility, tables of available indicators, risk maps, and related geospatial data should be described for potential users. Multi-hazard maps should be considered.

357. Receiving feedback from users is essential to ensure the utility and improvement of information. A system for exchanging best practises, information platforms and experiences among users and producers should be designed to strengthen the standardization of concepts, methodologies and dissemination platforms. Neighbouring countries should work together on cross-border hazards. These discussions can reinforce cooperation across expert communities and help reach agreement on common standards.

358. In summary, ***actions related to managing and disseminating compiled information include:***

- ***Define a plan for dissemination*** of HED-related statistics;
- ***Promptly disseminate available statistics;***
- ***Improve accessibility and interpretability of statistics;***
- ***Identify the level of detail needed*** for different users;
- ***Construct a multipurpose information system*** serving all needs; and
- ***Implement different tools***, for example, databases, indicators, risk maps, and geospatial data.

9 Conclusions, list of issues for further work and possible next steps

9.1 Conclusions

359. This report provides recommendations for NSOs to begin production of or improve existing information related to hazardous events and disasters. The recommendations are the first to have been developed to help NSOs build this capacity. They cannot, therefore, be taken as the final word on this topic. NSOs can be expected to require further guidance to help them meet HED-related information needs. It is an incremental process.

360. To address the demand for HED-related information, different steps can be taken: reviewing the information that already exists in NSS; making existing information fit for purpose; identifying what new information is needed and developing it; and reviewing the required statistical infrastructure. Development of a repository of geo-statistical information with the same datum could be a first step to address the increased need for geospatial information and small-scale analysis.

361. In some countries, NSOs have a specific role in producing HED-related information, but in most countries this is not the case. Recent international agreements have highlighted the possible roles of NSOs in this area. The monitoring requirements of the Sendai Framework, the 2030 Agenda, as well as the Paris Agreement call for countries to produce official statistics related to hazardous events and disasters for global progress reports and policy-making.

362. Often there is a lack of coordination and cooperation between NSOs and DRMAs as DRMAs are not part of NSS. This results in important official statistics not being used for DRM. This may lead to inconsistencies in, for example, post-disaster assessments provided by different national agencies.

363. Considering the traditional strengths of NSOs within the institutional context for DRM, a set of roles and tasks can be identified for NSOs. These can be grouped into: 1) core roles and tasks that should be assumed by all NSOs; and 2) additional roles and tasks that NSOs could incorporate into their functions and responsibilities, which some NSOs have already taken on. The core roles reflect typical strengths of NSOs: providing baseline information fit for purpose for DRM, and supporting assessments of social, environmental and economic impacts, for example. The additional roles may include leading impact assessments, coordinating geographical information services, maintaining HED databases, and conducting risk assessments.

9.2 List of issues for further work

364. The Task Force on Measuring Extreme Events and Disasters identified the following issues that should be addressed to further improve statistics for measuring hazardous events and disasters:

A. Implementation guidelines

365. This document, together with the DRSF, provides a useful tool helping to begin or to improve producing official statistics related to hazardous events and disasters. However, **more practical guidance for implementation** is needed, taking into account the different national priorities, institutional settings and already available data. This guidance could be in form of a road map and it should help to prioritise the required actions.

366. The implementation guidelines should also address which measures can be taken to use the required statistical information for disaster-risk management while preserving statistical confidentiality. National case studies could be useful for that purpose.

B. Statistical operationalisation of terms, definitions and classifications used in disaster risk management

367. Many of the terms, definitions and classifications used in disaster-risk management and in the Sendai Framework are not fully operational from a statistical perspective. During the electronic consultation on the Recommendations before their endorsement by CES, a number of countries emphasized the importance of statistical operationalisation of the key terms, definitions and classifications used in DRM. DRSF already addresses some of these issues, but further work is needed, for example to:

a) Develop a single internationally agreed hazard classification, following the principles of a statistical classification;
b) Define the spatial and temporal dimension of hazards and disasters;
c) Develop an internationally comparable way of scaling of hazards and disasters;
d) Draft recommendations for measuring multiple-hazard events; and
e) Further develop a globally unified coding of hazardous events, which could be based on the *Identifiers for Cataloguing Extreme Weather, Water and Climate Events.* These identifiers were developed by WMO based on a decision of the Seventeenth Session of the World Meteorological Congress in 2015.

368. The Task Force concluded that more work is needed towards aligning the DRSF and Sendai Framework indicator methodologies with the existing classification systems and statistical frameworks, such as the System of National Accounts (SNA), the System of Environmental-Economic Accounting (SEEA), the International Statistical Classification of Diseases and Related Health Problems (ICD) and the International Standard Classification of Occupations (ISCO).

369. A review of the statistical standards, methods and classifications could be also needed from the viewpoint of better supporting the production of hazardous events and disaster related information.

C. Set of core statistics and indicators

370. Several countries are developing indicator sets for HED policy purposes. This work should be internationally coordinated to ensure availability of comparable official statistics and to maximise its use. A recommended set of core statistics and indicators could help countries to prioritise their implementation efforts and to have an internationally comparable set of information on hazardous events and disasters. The set of statistics and indicators should be complementary with the already existing UNECE set of core climate change-related statistics and indicators.

371. The set of core statistics should also include the official statistics required quickly and in sufficient quality in emergency situations (“emergency data kit”). The disaggregations of information needed for the different uses, such as disaggregation by sex, age-group, income, economic activity, etc., should be identified and taken into account.

D. Establishing a community of practice, exchange of experience and knowledge

372. During the course of its work, the Task Force has established good working relationships with ECLAC, ESCAP, Eurostat, FAO, WMO, UNDRR, UNFCCC, UNSD, UN-GGIM and other key players working on this emerging issue. NSOs and other members of NSS need to continue engaging with these and other organisations to further define and establish the role of official statistics in this area. However, as noted in the report on disaster-related statistics to the 2019 meeting of the UN Statistical Commission (UNSD et.al., 2019), there is currently no formalised mechanism in place to ensure long-lasting cooperation across disciplines and organisations for this kind of information. Presently, coordination and cooperation occur on an ad-hoc basis within technical expert groups with different mandates. Formalisation of the coordination and cooperation efforts may be needed to develop common strategies, to address the diverse community of practice, to jointly develop methodologies and terminologies, and to efficiently support sustainable implementation.

373. To support these efforts the Task Force suggests creation of a forum for regular exchange of knowledge and experience on HED-related information similar to the UNECE Expert Forum for Producers and Users of Climate Change Related Statistics. Such a forum would provide an opportunity for sharing ideas, experience and good practices, identifying challenges and possible solutions, and discussing collaboration, coordination and roles among the statistical community, other involved agencies and the relevant international organizations.

9.3 Possible next steps

374. The Task Force that prepared the Recommendations was set up in 2015. Its members would be interested to continue the work to help implement some of the Recommendations that they have developed. Therefore, it is proposed to renew the mandate of the existing Task Force.

375. Under a renewed mandate, the Task Force could address several of the issues listed above as follows:

a) Drafting implementation guidelines;
b) Recommending a set of core statistics and indicators for measuring hazardous events and disasters, including an “emergency data kit”;
c) Organizing an expert meeting for exchange of experience and knowledge across different communities (e.g. statisticians, DRM experts, international organisations, academia, NGOs etc.), possibly jointly with other Regional Commissions, UNSD and UNDRR; and
d) Providing contributions to global efforts to improve the statistical operationalisation of Sendai Framework terminology and indicator methodologies.

376. A close collaboration of the Task Force with other Regional Commissions, UNDRR, UNSD and other key players is needed to use synergies, ensure complementarity of work and to avoid duplication.

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Case Studies

Case Study 1. Brazil: Population in risk areas[22]

In 2011, Brazil witnessed the greatest disaster of this century, the mountain region of Rio de Janeiro floods and mudslides, culminating in the death of approximately 900 people and affecting more than 300,000. Economic losses were of the order of 2.9 billion USD according to the World Bank. The devastating consequences of this event corroborated the consensus among experts that the magnitude of a disaster is intrinsically related to the intersection of social, economic and demographic phenomena, among others, which contribute to increasing vulnerability and exposure of the population to natural disasters.

In view of the tragic events of 2011, the federal government established a multi-sectorial program focused on risk management and response to disasters associated to natural hazards, in an integrated manner and prioritizing prevention and mitigation actions. In 2012, this program was improved by the National Plan for Risk Management and Disaster Response to include four axes of government action: 1) mapping of risk areas, under the responsibility of the Research Company and Mineral Resources / Ministry of Mines and Energy; 2) structuring of the monitoring and alert system through the National Center for Natural Disaster Monitoring and Alerts (CEMADEN)/ Ministry of Science, Technology, Innovations and Communications; 3) structural works of the Ministry of Cities and 4) strengthening of civil defence agencies via the National Civil Defence Secretariat (SEDEC / Ministry of National Integration).

NSO of Brazil (IBGE) plays an important role in this work by providing information from the IBGE Demographic Census 2010 to the risk areas monitored by CEMADEN. This cooperation is based on a Technical Cooperation Agreement signed in 2013 between IBGE and CEMADEN.

Currently, in Brazil, the main source of information about the population available for the whole national territory and with intra-urban disaggregation comes from the Demographic Census, that are carried out every 10 years. The last one was conducted in 2010. However, information on the spatial distribution and characteristics of the exposed and vulnerable population in disaster risk areas is not available on a national scale; therefore, considering the importance of knowing this population in detail, it became urgent to develop a methodology that integrated information from the Demographic Census and the mapping of disaster risk areas in Brazil. In the proposed methodology, socio-demographic data and risk areas of floods, flash floods and landslides were linked using a new territorial entity, called Statistical Territorial Base of Risk Areas or Base Territorial Estatística de Áreas de Risco – BATER, in Portuguese. The research involved 872 municipalities which are monitored by CEMADEN.

There is no spatial correspondence among census sectors and risk areas. Thus, in methodological and operational terms, the association of census information to risk areas could not be made directly and automatically due to geometric differences between the features of the risk areas and the socioeconomic databases of IBGE. The BATER polygon is the smallest intersection area of the risk areas with the census tracts.

One of the products of this research is the Interactive Geographic Platform. It was developed by IBGE for spatial information analysis. It allows the incorporation of tables, texts, graphs and maps into interactive environment of geospatial information, which enables geographic analysis. It

[22] Source: Brazilian Institute of Geography and Statistics (IBGE).

aims to serve users with little or no familiarity in the use of GIS applications, as well as to expert users.

Some potential uses of the database, lessons learned, and recommendations are highlighted below:

- In the context of the structuring of a natural disaster monitoring and alert system, the identification and characterization of the population residing in areas at risk is fundamental to support actions to reduce damages.
- Prevention actions that can be directed to the profiles of the resident population in risk areas.
- Integrate a national database on the exposed population and subsidise intersectoral actions, such as health, education, and housing.
- Information on the areas of special attention, considering the concentration of vulnerable groups (children, elderly), as well as actions response, prioritizing the removal of these groups of people in the event of a disaster, in addition to identifying the areas with the highest concentration of exposed people.
- Contingency plans can also be more efficient if they include information on the age profiles of the population.
- The differences in the geometry of the census sectors in relation to risk areas led to a process of spatial generalizing to produce the new territorial entity (BATER). The accuracy of information should be considered especially in studies and work on a local scale.
- The demographic information is for 2010. Thus, there may have been some changes in population due to the households or densification of the occupation. The updating of information at smaller intervals is desirable given the dynamics of risk areas.
- The impacts of a natural disaster may exceed the limits of the polygons of risk areas. The delimitation of the BATER, often, includes the immediate surroundings of these areas, contemplating, in these cases, populations that may suffer indirect impacts from a disaster.
- The use of different risk area delimitation patterns, as mappings from various sources were used. The results obtained using this methodology are related to the quality of risk mappings, in particular as to the accuracy on the delimitation of risk areas.

In addition, IBGE has other studies and surveys dealing with the topic of disaster risk and environmental information. The Department of Population and Social Indicators at the Directorate of Surveys for example asked the 5570 Brazilian local governments about disaster risk management at the 2013 and 2017 Surveys of Basic Municipal Information – MUNIC. Also, the Coordination of Natural Resources and Environmental Studies has a wide variety of studies and environmental information such as land use and cover, geomorphology, pedology and vegetation.

Case Study 2. Turkey: Disaster statistics, related institutions, legislative framework and role of NSO[23]

Turkey is a disaster-prone country which is affected by many natural and manmade hazards due to its geomorphic structure, climatic diversity and industrial installations. Turkey ranks third in the world in terms of earthquake-related casualties and eighth with regard to the total number of people affected. More than 95% of the country lies in one of the most active earthquake and landslide regions in the world. Every year, the country experiences at least one 5+ magnitude earthquake which renders the proper management and coordination of disasters absolutely crucial. Landslides and floods exacerbated by deforestation, avalanches and technological disasters are among the risks that the country faces. Since 2014, severe flooding has occurred in Ankara, Artvin, Izmir, and Mersin. In 2016, the Cukurova region suffered the third heavy rainfall in 50 years which led to urban flooding, blocked access roads to the port, and shut down port operations.

National Disaster Management Authority

Turkey's disaster policy dates back to the aftermath of the 1939 Erzincan earthquake, which claimed nearly 33,000 lives and left at least 100,000 injured. However, the 7.1 magnitude Marmara Earthquake in 1999 marked the turning point in disaster management and coordination since it resulted in over 18,000 deaths and estimated losses of over 28 billion USD. This devastating disaster clearly demonstrated the need to reform disaster management and compelled the country to establish a single government institution to coordinate and exercise legal authority in cases of disaster and emergencies. In line with this approach, the Turkish Parliament passed Law No.5902 in 2009 to form the Disaster and Emergency Management Authority (AFAD) - an institution working to prevent disasters and minimize disaster-related damages, plan and coordinate post-disaster response, and promote cooperation among various government agencies. Turkey adopted a presidential system of governance after a referendum that took place on April 16, 2017 and the new executive presidential system entered into force with the June 24 elections. The Disaster and Emergency Management Authority (previously an agency under the office of Prime Ministry) re-formed as an agency under the Ministry of Interior with Presidential Decree No. 4 which was published in the Official Gazette on July 15, 2018.AFAD introduced a new ‘‘Integrated Disaster Management System’’ first time in the country shifting the priority from ‘‘Crisis Management’’ to ‘‘Risk Management’’.

In 2013, AFAD prepared Turkey’s National Disaster Response Plan (TAMP) which outlines the roles and responsibilities for every involved party (ministries, the public institutions and non-governmental organizations) in disaster and emergency response situations to determine the basic principles of response plan in all three phases: before, during and after the disaster and emergency situations. Besides TAMP, Turkey Disaster Risk Reduction Plan (TARAP) and Integrated Hazard Maps Project are some of the other projects that have been carried out within this context.

AFAD currently has 81 provincial branches across Turkey in addition to 11 search and rescue units. Notwithstanding its position as the sole authority on disasters and emergencies, AFAD cooperates with a range of government institutions and non-governmental organizations depending on the nature and severity of individual cases.

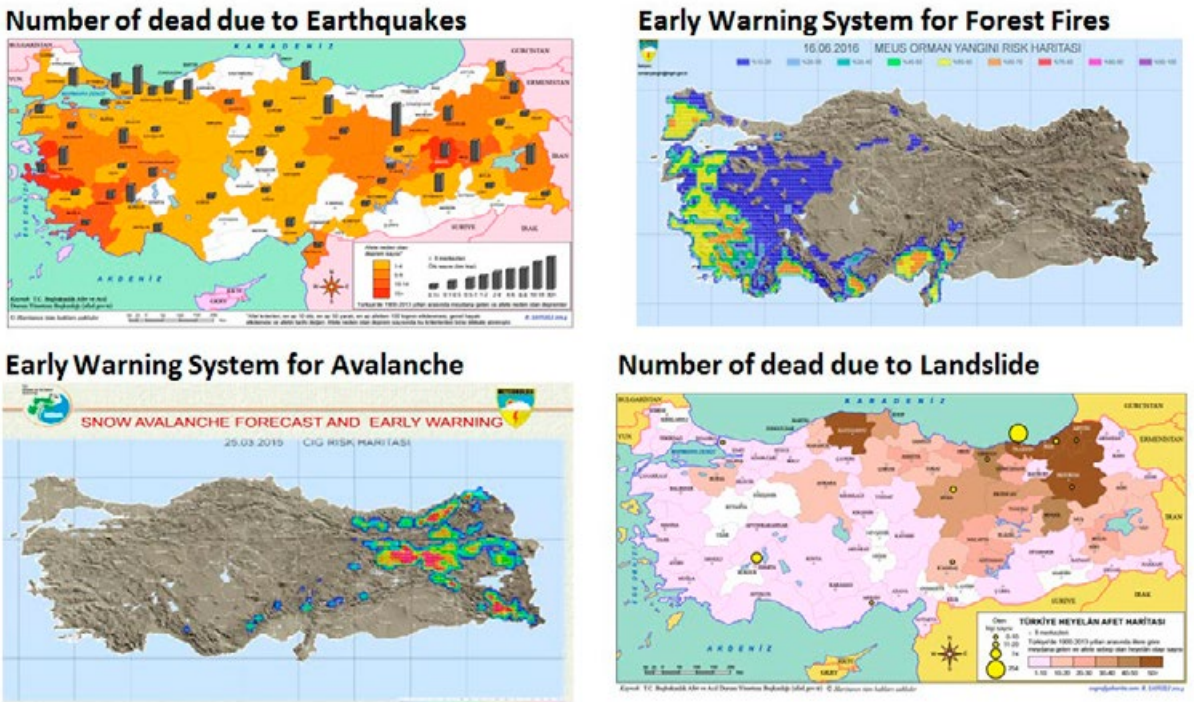
[23] Source: Turkish Statistical Institute.

Disaster Data

Many public institutions and ministries have already produced data on hazardous events and disasters in areas of their duties such as; extreme hot/cold and excessive rain data by Turkish State Meteorological Service (MGM), flood data and especially river flood data by General Directorate of State Hydraulic Works (DSİ), desertification and erosion data by General Directorate of Combating Desertification and Erosion (ÇEM), road traffic accidents by Ministry of Interior, forest fires by General Directorate of Forestry (OGM), epidemics by Ministry of Health, industrial accidents by Ministry of Environment and Urbanization (ÇŞB), earthquake and landslide by General Directorate of Mineral Research and Exploration (MTA), effects of desertification and excessive rain on farmland and data about epidemic diseases related to animals etc. by Ministry of Food, Agriculture and Livestock (GTHB). In addition to all these institutions, AFAD collects data on natural disasters like earthquake, flood, landslide, rock fall, avalanche etc. by its provincial branches in cooperation with the institutions and its local branches mentioned above.

Disaster data are also depicted in some maps and early warning systems for some disasters are established by these public institutions for monitoring, assessment, planning and preparedness purposes. Some of these maps and systems are illustrated as below.

Figure 5: Disaster data produced by public institutions and ministries



Landslide Susceptibility Map (AFAD)

Turkey Earthquake Hazard Map (AFAD)

Turkey Disaster Database

To have direct access to all the hazardous events and disasters data via a single database, AFAD established a user friendly, web based and publicly available disaster database (TABB) which contains all disasters data from 1900 up to now. Some of the hazardous events and disaster data in TABB has been compiled by AFAD and some are gathered from local administrations, universities and NGOs producing these kinds of data. TABB is being updated to meet the requirements of Sendai Disaster Risk Reduction framework and institutional needs, and to ensure the sustainability and development of the system.

Official Statistical Programme

The Turkish Statistical Institute (TurkStat) is authorized to determine the statistical methods, definitions, classifications and standards to be used in the production of official statistics in line with national and international norms, to compile, evaluate, analyze and publish statistics in the required areas and to prepare Official Statistics Programme and monitor it by the Statistics Law of Turkey No 5429 enacted in 2005.

The Official Statistics Programme (OSP) is prepared for a 5-year-period to determine the basic principles and standards dealing with the production and dissemination of official statistics and to produce reliable, timely, transparent and impartial data required at national and international level. The main aim of OSP is to create a regular statistical production process by implementing a disciplined statistical management. The program avoids duplication in the production and publication of official statistics, reduces the burden on respondents, and increases public confidence in official statistics by saving manpower and resources.

OSP identifies the subject areas, responsible institutions, classifications used, geographical coverage, publication frequently and format of official statistics.

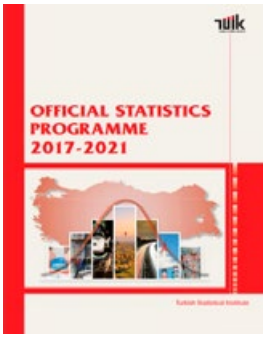
OSP working groups are established to improve data quality and compliance with international standards, identify new statistical data to be produced and needs for improving data submitted to international organizations. Every OSP Working Group prepares relevant parts of OSP and monitors its implementation.

Revisions in OSP can be made regarding the addition of new statistical studies, changes in classifications, changes in dissemination frequency, changes in estimation levels and changes in dissemination period etc.

TurkStat prepares every year an *OSP Annual Monitoring Report* to evaluate implementation of the program. The results are presented to the Statistical Council and announced to the public.

OSP contains 7 domains:

- Statistical infrastructure;
- Social and demographic statistics;
- Macroeconomic statistics;
- Business statistics;
- Agricultural statistics;
- Environmental statistics; and
- Multi-domain statistics.



Some hazardous events and disasters related statistics are covered in OSP, such as

- ***Road traffic accidents statistics, Aviation accident statistics, Maritime accident statistics and Railway accident statistics*** under Business statistics;
- ***Desertification statistics*** under Environmental statistics; and
- ***Forest fires statistics*** under Agriculture Statistics.

In addition to all these, disaster statistics (all natural hazards except forest fires) are included under Environmental Statistics domain for the first time in the OSP 3rd Programme Period (2017-2021).

Role of TurkStat in disaster statistics

TurkStat has a coordination role in disaster statistics as well as all the statistics produced in the country following the Statistics Law of Turkey. Also, TurkStat is supporting and ensuring the maintenance of the registry of hazardous events and disasters in line with national and international standards and timely publishing the related statistics. TurkStat has played an important role in the inclusion of disaster statistics in OSP by setting up many meetings with AFAD and has been monitoring the publication of these statistics by the responsible institution, AFAD.

Moreover, TurkStat may provide technical assistance or advice on statistical processes, provide economic, social and environmental data/statistics for disaster risk assessment and in case of occurrence of a hazardous event or disaster, if required.

Case Study 3. Armenia: Information needs, role of national statistical office and national scope of disaster-related statistics[24]

Armenia is a typical mountain country with a well-defined mountain relief and ramified river drainage. Approximately half of the country's territory and 80% of the population is exposed to catastrophic events. Armenia is deemed one of the most disaster-prone countries in the world. It is prone to all types of disasters, except those of marine origin. Severe earthquakes, frequent landslides, hail storms, droughts and floods threaten the safety of people and cause considerable damage. As Armenia is in one of the most seismically active regions of the world. Earthquakes represent a continuous threat that impact most communities. Meteorological disasters have become more frequent and intense in the last few decades, with increasing flood, landslides, and mudslides. Droughts, accentuated by climate change, occur almost every year.

These disasters impede the sustainable development of the country. The UNISDR Global Assessment Report includes Armenia in the group of countries with the highest relative economic loss and worse economic resilience to natural hazards.

Armenia has taken a wide range of pro-active measures to reduce risk and vulnerability to disasters in the country. Guidance was provided by global frameworks such as: International Decade for Natural Disaster Reduction (IDNDR, 1990-1999); Yokohama Strategy 'A Safer World in the 21st Century: Disaster and Risk Reduction' (1994); Millennium Development Goals (2000-2015); International Strategy for Disaster Reduction (ISDR, 2001); Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters; Sendai Framework for Disaster Risk Reduction 2015-2030; and Sustainable Development Goals (2015-2030).

Data and statistics important to understanding the impact and cost of disasters have been prioritised. The use of systematic data collection and analysis are desired to inform policy decisions that help reduce disaster risks and build resilience. The mainstreaming of disaster risk management into development planning is desired to reverse the current trend of rising disaster impact.

These pro-active measures require access to historical and real time data. Historical data are needed for risk management, early warning systems, and disaster impact assessment. There is also an urgent demand for real time data on population, businesses and infrastructure when extreme events and disasters occur in specific areas.

Participation of Statistical Committee

The Statistical Committee of the Republic of Armenia has data that can be used for disaster relief, preparedness, and risk reduction. The Statistical Committee is now involved in actions designed to:

- Improve the usefulness of existing statistics and to develop new statistics;
- Enhance their contribution to fill data gaps;
- Produce consistent and comparable statistics and indicators;
- Describe status, and trends and socio-economic interactions between human and natural systems; and
- To analyse the main data needs related to extreme events and disasters of the various stakeholders.

[24] Source: Statistical Committee of Armenia (Armstat).

The Statistical Committee has actively contributed to the consultation process for formulating the Sendai Framework for Disaster Risk Reduction, endorsed at the Third UN World Conference on Disaster Risk Reduction (WCDRR) in March 2015.

The Statistical Committee is involved in actions to implement the Sendai Framework in several important areas, such as:

- Reviewing and revising national DRR plans in line with the Priorities of Action of the Sendai Framework
- Developing strategies and reviewing legislation; strengthening the institutional and coordination mechanisms, or
- Working in the areas of disaster risk assessments, critical infrastructure, preparedness for response.

A national mechanism is in place to collect, analyse, and disseminate information on disaster losses and risk. Sex, age, and disability data are aggregated to ensure the recommendations on social inclusion and the 'all of society approach' of the Sendai Framework are addressed.

The Statistical Committee has also established and strengthened multi-sectoral and multi-stakeholder coordination mechanisms (national platforms for DRR) as tools for building stronger linkages with SDGs, national development, and resilience building.

Participation of Statistical Committee in Interdepartmental Commission on extreme events and natural disasters

The Statistical Committee also participates in interdepartmental commission activities, including:

- Discussions on compilation of relevant glossaries of concepts;
- Development of national plans of actions for information management of disaster risk management and other programs;
- Discussions on cooperation with other stakeholders;
- Discussions on accordance issues between relevant conventions and state, as well as departmental programs;
- Assistance in provision of information availability;
- Assistance in development and conduction of joint system of databases on extreme events and natural disasters;
- Assistance in metadata development and provision of comparability of data; and
- Development of mechanisms and tools for the collection, processing, and sharing of statistical information.

Legislative framework

The legislation related to disaster risk reduction exists; however, it needs to be continuously improved based on contemporary challenges. Several laws of the Republic of Armenia already exist, such as: "Population Protection in Emergency Situations", "Fire Safety", "Hydro-meteorological Activities", "Seismic Protection", "Civil Protection", "Rescue Forces and Status of Rescuers", "State Regulation of Provision of Technical Safety", "Armenian Rescue Service", and "Sub-divisions of Civil Protection", as well as many other decrees and legal acts of the Government of the Republic of Armenia.

The national strategy and action plan on disaster risk management are of particular interest. Authorities of the republican executive bodies, other state agencies, regional administrative bodies and local self-government bodies are defined for emergency situations.

The Republic of Armenia is active within international disaster risk management activities. Specifically, Armenia has:

- Joined several conventions and agreements signed within the United Nations, the Council of Europe, and the European Union on management of phenomena causing emergency situations, reduction of disaster consequences, and recovery;
- Cooperated with the UN Office for the Coordination of Humanitarian Affairs, bordering countries, and regional countries on response to and mutual support for emergency situations;
- Joined new agreements in the field of emergency situations and implemented joint actions with other countries.;
- Joined the Sendai Framework for Disaster Risk Reduction 2015 - 2030 that defines necessary disaster risk reduction sectorial and inter-sectorial targeted actions for countries on local, national, regional and global levels;
- Joined the United Nations Framework Convention on Climate Change (Paris Agreement) in 2016 that envisages improving capacities for climate change impact resilience, reducing greenhouse gas emissions and limiting temperature rise; and
- Joined the Worldwide Initiative for Safe Schools in 2015 aimed at increasing school safety.

Challenges

There are many issues and concerns which increase the vulnerability and exposure of the Armenian population to the above-mentioned hazards. These include:

- Need for a comprehensive approach to disaster risk reduction;
- Imperfect DRR legislative field;
- Lack of clarity in roles and responsibilities of DRR stakeholders;
- Poor coordination among various stakeholders in DRR sector;
- Insufficient level of cooperation in DRR sector;
- Insufficient level of knowledge and education in DRR sector;
- Imperfect awareness raising process;
- Inefficient use of resources;
- Insufficient level of analytical capacities;
- Absence of common DRR methodology;
- Imperfect DRR monitoring system;
- Lack of comprehensive understanding of DRR in the development perspective; and
- Need for multi-stakeholder partnership on DRR.

Further steps

Taking into consideration the current situation, these further developments of DRM are foreseen:

- Clarify the role of official statistics;
- Identify practical steps for the Statistical Committee to support disaster management and risk reduction;
- Identify main data needs and data sources;
- Identify needs for harmonization of classifications, terms and definitions
- Combine statistical information with geographical information;
- Improve institutional cooperation between the Statistical Committee and mapping agencies;
- Improve the disaster risk management legal and organisation field, including improvement of the legislation, clarification of regulations and procedures, and effective cooperation with international partners;
- Strengthen the disaster risk management at institutional level, including improving distribution and coordination of organisational responsibilities, raising the effectiveness of operation and communication, expanding international cooperation, and targeting decentralization of decision making, resource distribution, and responsibilities;
- Develop human resources, including improvement of knowledge, skills, and capacities of the staff of relevant institutions and partner structures and implementation of innovative programmes with partner organisations; and
- Improve information through continuous development and modernization of the information bases of the disaster risk management sector, including improved availability for the sector specialists and the population.

NSO of Armenia (Armstat) regularly publishes statistics on disasters resulting from natural hazards and man-made disasters. The published attributes are number of events and number of affected persons (perished, injured, temporary evacuated).The following natural hazards are covered:

- Strong breeze, tornado, storm, sandstorm, dust tornado;
- Thunderstorm, lightning;
- Hail;
- Downpour;
- Landslide;
- Heavy shower;
- Abundant snowfall, frost, snowstorm;
- Glaze;
- Forest fire;
- High water of rivers and flood;
- Destruction;
- Collapse; and
- Earthquake (1 and upper mark-force by Richter table).

The following man-made disasters are covered:

- Accidents in passenger and subway trains;
- Air crashes;
- Accidents (catastrophes) on highways;
- Accidents on the water-supply pipeline network;
- Fire (explosion) in industrial units;
- Fire (explosion) in transport;
- Fire (explosion) in dwellings and buildings;
- Fire in agricultural units, territories;
- Fire in permanent and temporally landfills;
- Fire in places of warehoused fodder, planting-covered places (territories);
- Fire (explosion) in organisations;
- Fire (explosion) in social and public units;
- Transportation routes structural elements collapse;
- Destruction of dwellings, social-domestic buildings, and constructions;
- Accidents in sewage system by massive leakage of hazardous substances;
- Accidents in heating networks in cold seasons of the year;
- Accidents in drinking water supply systems;
- Accidents in communal gas pipelines;
- Accidents in energy system accompanied by violation of the power supply of main consumers and large spaces for more than 6 hours; and
- Cracked dams (dike, water barriers, hedge), which lead to water floods and catastrophic waves.

Furthermore, Armstat also publishes statistics on socio-domestic disasters:

- Poisoning (food, alcohol, drugs, communal and industrial chemical substances, smog gas, natural gas, other sources);
- Drowned in artificial and natural water basins;
- Alarm for setting explosive facilities;
- Detection of weapon, ammunition; and
- Epidemic (population) area, epizootic (animals).

Case Study 4. The Philippines: Role of the Philippine Statistics Authority in measuring hazardous events and disasters[25]

In addition to providing baseline statistics for other agencies involved in disaster risk management, the main tasks of the Philippine Statistics Authority (PSA) in regard to measuring hazardous events and disasters are to:

- Compile the biennial Compendium of Philippine Environment Statistics (CPES) including a chapter on hazardous events and disasters; and
- Coordinate government bodies, research, and NGOs to produce the required statistics.

In PSA, the Environment and Natural Resources Accounts Division (ENRAD) is one of the 6 divisions of the Macroeconomic Accounts Service (MAS) that is mainly tasked to generate the environmental accounts, environmental statistics, climate change statistics, disaster statistics, and greenhouse gas emission inventory.

One major task of ENRAD is to compile CPES, wherein one component relates to hazardous events and disasters. This component compiles statistics on the occurrence of hazardous events and disasters and their impacts on human well-being and the infrastructure of the human subsystem. The source of basic data for the core set of statistics is obtained from the National Disaster Risk Reduction and Management Council (NDRRMC), a government agency created in 2010 through the Philippine Disaster Risk Reduction and Management Act of 2010 or Republic Act No. 10121. Its mandate is to develop and implement disaster risk reduction programs that are incorporated in the development plans of various levels of government.

Another important task of PSA is to provide the secretariat for two interagency groups that were established in 2015, the Interagency Committee on Environment and Natural Resources and the Technical Working Group on Disaster Statistics, and to coordinate all bodies participating.

Interagency Committee on Environment and Natural Resources

The Committee serves as a body to discuss and resolve issues related to the improvement of environment and natural resources and other related statistics. This includes serving as a forum for the exchange of views and expertise to resolve technical issues and problems arising from the production, dissemination and use of environment and disaster statistics.

The Committee is chaired by the Department of Environment and Natural Resources and the Climate Change Commission. Other members are the National Economic and Development Authority; Philippine Atmospheric, Geophysical, and Astronomical Services Administration; Department of Interior and Local Government; and the National Disaster Risk Reduction and Management Council.

Technical Working Group on Disaster Statistics

The Technical Working Group serves as a forum for discussion and resolution of concerns and issues in the compilation, processing, and dissemination of disaster-related statistics and other related indicators in terms of accuracy, completeness, timeliness and relevance. It also prioritises outputs and provides support to various end users of the data.

[25] Source: Philippine Statistics Authority.

The Technical Working Group is chaired by the Office of Civil Defence and the National Economic and Development Authority. The technical working group also includes members from other governmental bodies, NGOs (such as the Red Cross/Red Crescent) and Research Institutes.

Case Study 5. Mexico: Role of national statistical office in measuring hazardous events and disasters[26]

The National Institute of Statistics and Geography (INEGI) of Mexico coordinates the National System of Statistical and Geographical Information of the country.

INEGI's legal authority and organisational structure are particularly well suited to the production of official statistics related to hazardous events and disasters. Since 1983, statistical and geospatial information has been managed jointly within the same institution, with constitutional level autonomy established in 2008. The National Geostatistical Framework (MGN) provides the conceptual measurement instrument through which it is possible to integrate statistical information from national information subsystems.

INEGI coordinates the National System of Statistical and Geographic Information (SNIEG), which comprises four subsystems:

- Demographic and social (12 specialised technical committees);
- Economic (11 specialised technical committees);
- Government, public security, and justice (7 specialised technical committees); and
- Geographic, environment and land and urban planning (9 specialised technical committees).

Notable throughout is the integration of statistical and geographic information within each subsystem. For example, the National Housing Inventory and population census are geo-referenced, and the National Statistical Directory of Economic Units is geocoded. This level of integration is possible through the National Geostatistical Framework (MGN).

The National Subsystem of Geographical Information, Environment, Land and Urban Planning represents the geographic and environmental component of SNIEG in a spatial data infrastructure. MGN allows this component to integrate and associate statistical information from other national information subsystems, and to generate statistics and indicators for multiple purposes, including disaster risk management.

[26] Source: National Institute of Statistics and Geography (INEGI).

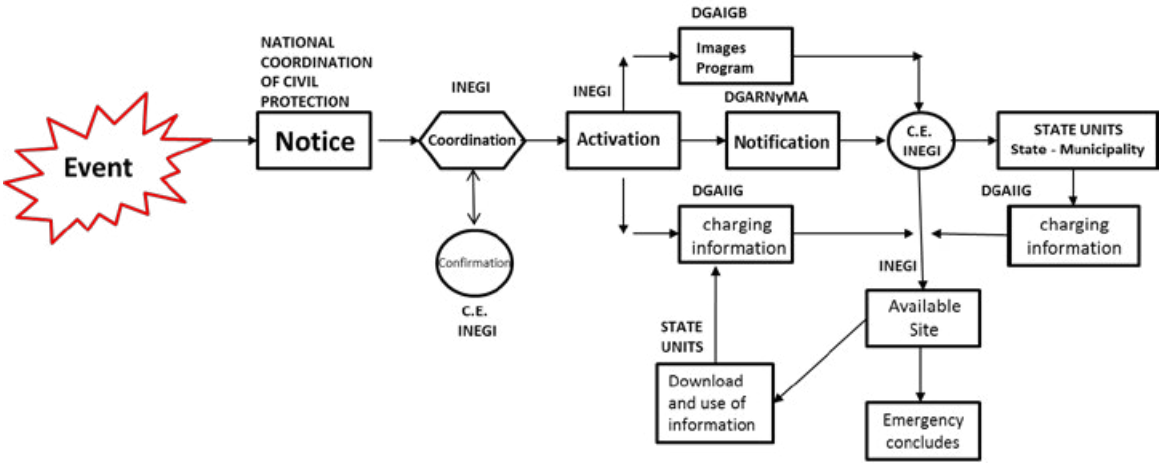
Figure 6: Composition of the National Geostatistical Framework

In addition to coordinating SNIEG, INEGI manages the Collaborative Site for Disaster Attention (http://geoweb2.inegi.org.mx/sicade/incio.jsp). It allows different units of the Mexican State engaged in disaster management to make statistical and geographic information available to ensure informed decision making throughout the full cycle of emergency response. Multiple national information agencies contribute content directly to this site.

The information presented is used to implement six core strategies to address hazardous events and disasters:

- Awareness, capacity building, and training;
- Standards, protocols, and common processes;
- Coordination, collaboration, and communication;
- Alignment of global, regional, and local policies;
- Support of infrastructure and common services; and
- Resource mobilization.

Figure 7: INEGIs Collaborative Site for Disaster Attention and how it operates



Case Study 6. Italy: Istat and integrated information - The Casa Italia[27]

The Italian National Institute of Statistics (Istat) and Casa Italia, Department of the Council Presidency, make available an integrated information framework on natural risks in Italy. This is an example of improving the use of existing data and relevance of official statistics and of meeting information needs related to hazardous events and disasters on a systematic basis.

Casa Italia was established by the Italian Government with a mission dedicated to prevention and security against natural risks following the tragic series of earthquakes that occurred in central Italy in August 2016. It represents a broad plan for the protection of the national building stock of the Italian territory and of its urban areas, with the final aim of improving the safety of citizens and of public and private assets. The primary task is defining the national policies for reduction of natural risks and outlining the structure that will take on the task of implementing these policies.

Casa Italia is structured into four major areas of intervention:

- Data alignment and integration;
- Experimentation with innovative solutions for prevention;
- Definition of financial needs and financing instruments; and
- Adoption of an information and training policy.

Istat is mainly involved in the first area, data alignment and integration, as explained below.

Quality of living was identified as of primary importance for the mission of Casa Italia. There was a particular emphasis on policies for the promotion of security of residential buildings against natural risks (seismic, hydrogeological, volcanic and meteorological).

The key idea is that of a multi-hazard approach to risk, focusing on the security of places where people live, rather than on individuals. The aim is to provide a useful overview of the risks of exposure to earthquakes, volcanic eruptions, landslides, and floods.

For each municipality the data on seismic, hydrogeological and volcanic risk are accompanied by demographic, housing, territorial and geographical information. This requires the integration and enhancing of information on natural risk that is already available, including data from Istat, National Institute of Geophysics and Volcanology, Italian National Institute for Environmental Protection and Research, Ministry of Cultural Heritage and Activities and Tourism, and others.

Databases were organised by official and national research institutes. They cover the entire national territory and have a spatial resolution sufficient to allow identification and comparison of local municipalities. The available information is rich but highly fragmented, dispersed and is not always homogeneous.

The Istat website provides two dedicated section: Indicators and Cartography. This section has appeared online since August 2017 and was updated in 2018 and 2019.

The Indicators section of the website allows the visualization and extraction of over 140 variables at the municipal level related to: surface and other territorial characteristics; seismic, hydrogeological (landslides and floods) and volcanic risks; state of buildings for residential use and housing (type of material used for construction, number of floors above ground, period of

[27] Source: Italian National Institute of Statistics (Istat).

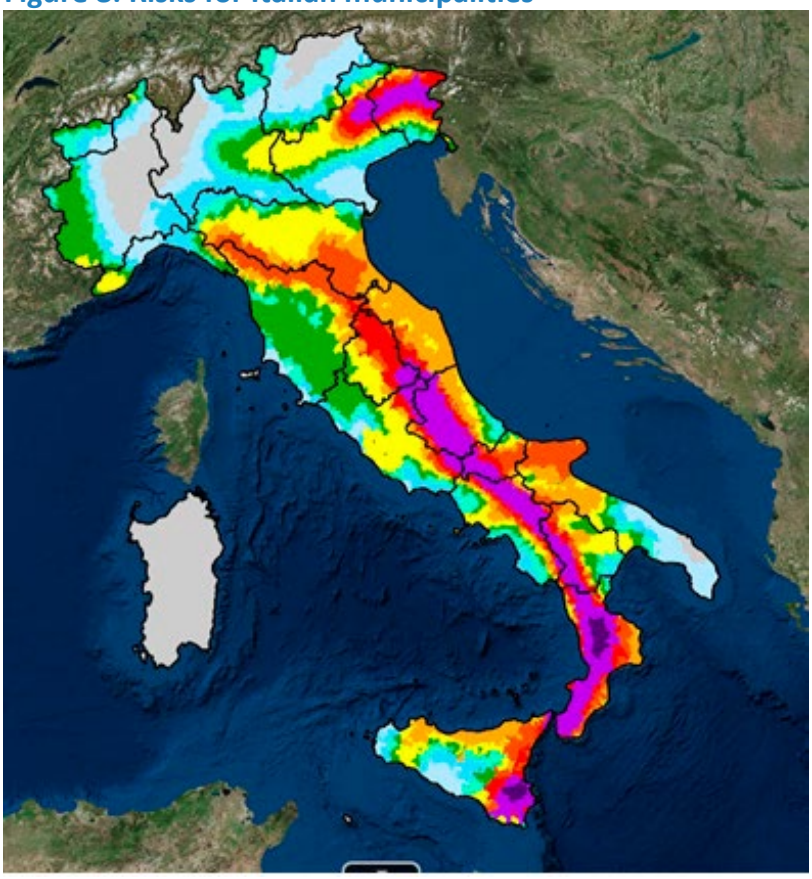
construction of buildings, and distribution of housing by type of occupants); number of cultural assets in the municipal territory; and demographic indicators of context (population variation, population density, old age and structural dependence indices, social and material vulnerability, and numerous other variables).

A summary report can be viewed and downloaded to provide a view of the risks of exposure to natural hazards (earthquakes, volcanic eruptions, landslides, and floods) in Italian municipalities. Graphical displays are available.

The Cartography section of the website allows production of interactive maps of municipal level variables on over 20 main information topics.

The first product of this broad collaboration is shown in the map below.

Figure 8: Risks for Italian municipalities



Future developments will aim at refining the space resolution to the scale of a single building. This will require intense data integration and fusion activity, associated with non-trivial statistical and computational issues.

Case Study 7. Ireland: Climate data rescue project[28]

The Central Statistical Office of Ireland (CSO) and Met Éireann (Meteorological Office of Ireland) are collaborating on a Climate Data Rescue Project which involves CSO keying daily data recorded by Met Éireann Meteorological Officers. There are around 40 variables to be keyed for each station month. Characteristics such as air and grass temperatures, air pressure, humidity, wind force and direction, cloud formation, rainfall, and sunshine hours are entered for each weather station on a monthly basis. The first station to be rescued, Phoenix Park in Dublin, has daily data in manuscript form from the mid-nineteenth century to 1959. As of mid-August 2018, data for 1898-1925 and 1931-1959 have been computerised but not yet fully checked.

Media articles were researched as part of the Project's extreme weather events investigation. It was discovered that a flooding occurred during a period of prolonged heavy rainfall in December 1954 in the area of Fairview near the Phoenix Park station. Further research revealed that the cause of the flooding was likely due to the collapse of a structurally unsound bridge, leading to a local river bursting its banks. This example exposes the uncertainty surrounding whether this event can be considered a natural disaster or a man-made disaster caused by an extreme weather event.

More information about this project can be found at https://www.cso.ie/en/methods/climate/csoclimatedatarescue.

Case Study 8. France: Categorisation of damaging natural events[29]

For categorisation of disasters, France uses the following gravity scale of damaging natural events, which is based on the human impacts and material damages of the events.

Table 2: Categories for disasters

Gravity class	Human impacts	Material damages
0: Incident	No injuries	Less than 0,3 million euros
1: Accident	1 or more injured	0.3 - 3 million euros
2: Serious accident	1 – 9 dead	3 - 30 million euros
3: Very serious accident	10 – 99 dead	30 - 300 million euros
4: Disaster	100 – 999 dead	300 million - 3 billion euros
5: Major disaster	1,000 or more dead	3 billion euros or more

Note: The material damages are evaluated every year in constant euros.
Source: Mission d'inspection spécialisée de l'environnement, 1999

[28] Source: Central Statistical Office of Ireland.
[29] Source: French Ministry of the Ecological and Solidary Transition

Case Study 9. Belarus: Criteria for classification of emergencies[30]

The Belarussian Ministry of Emergencies jointly with Belstat defined major emergencies as disasters based on the following criteria:

- 10 or more deaths;
- 100 or more injured or sick persons;
- 100 or more temporarily resettled and evacuated persons;
- Emergencies that resulted in the declaration of a disaster; and
- Emergencies the liquidation of which required international assistance.

Case Study 10. United States of America: OnTheMap for emergency management and Census Business Builder Regional Analyst[31]

The U.S. Census Bureau has tools that provide statistics quickly. These tools are available 24/7 365 days a year on the Census.gov website. The Census Bureau provides training, on how to use these tools, to anyone that wants it. Training comes in many forms including in-person and Webinars. Many of these trainings are recorded for public access at a later time. The Census Bureau promotes these tools to all other federal, state, local and private sector emergency management workers, the news media and the public.

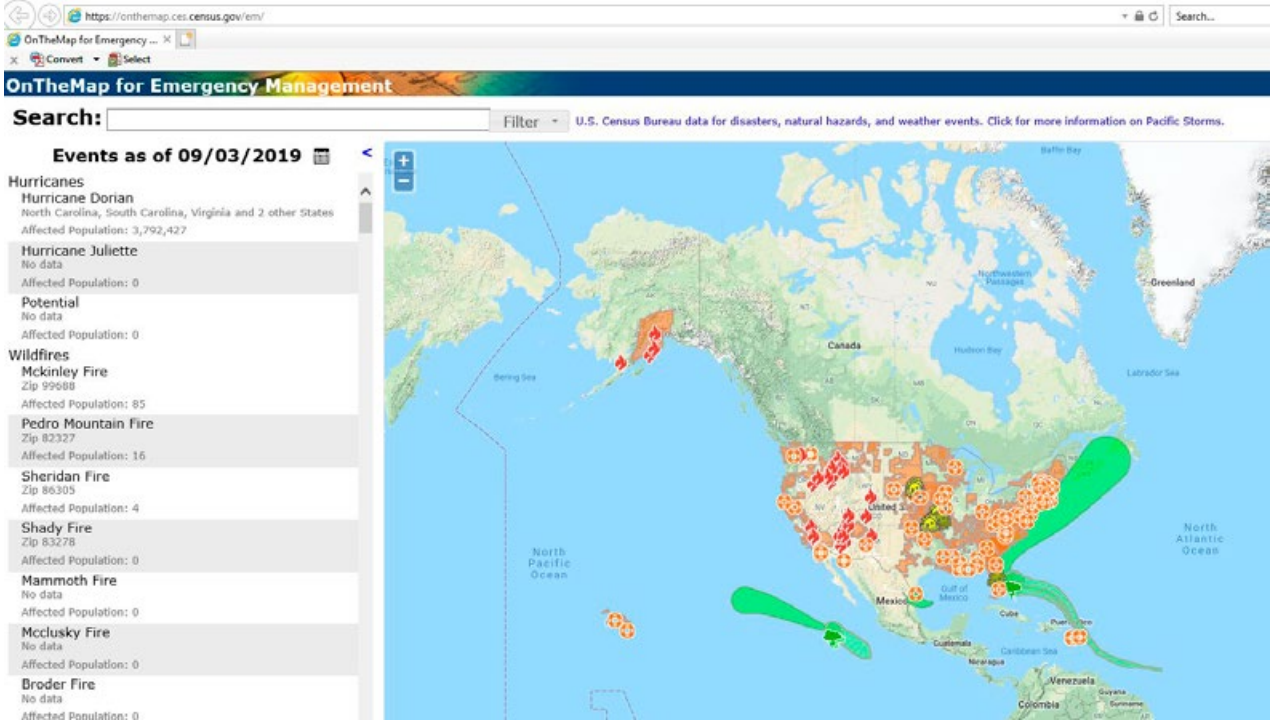
The two primary Census Bureau tools used in Emergency Management are a) OnTheMap for Emergency Management; and b) Census Business Builder: Regional Analyst Edition.

These tools provide quick, almost instant, access to hundreds of demographic and economic data variables.

[30] Source: National Statistical Committee of the Republic of Belarus (Belstat)
[31] Source: U.S. Census Bureau

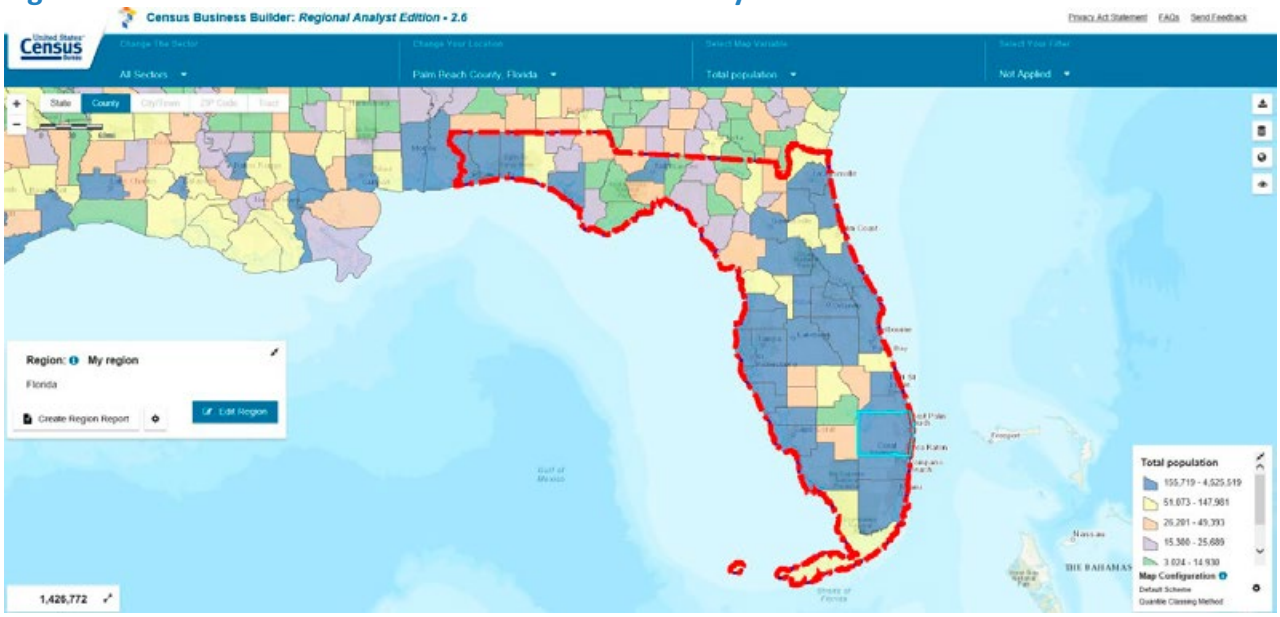
- OnTheMap for Emergency Management https://onthemap.ces.census.gov/em/ (see screenshot below)

Figure 9: Screenshot of OnTheMap website



- Census Business Builder Regional Analyst: https://www.census.gov/data/data-tools/cbb.html (see screenshot below)

Figure 10: Screenshot of Census Business Builder Analyst website



Case Study 11. Norway: Sharing of responsibilities between national statistical office and disaster risk management agency[32]

The Norwegian Directorate for Civil Protection, which is responsible for implementing the Sendai Framework, is in process of building a national knowledge bank with information from various sources, including data from official statistics. The Directorate stresses the need for collecting data from private sources (e.g. insurance companies).

Statistics Norway has been given access to the reporting log-in for Norway to the Sendai, to fill in relevant data if needed. However, the basic indicators when it comes to population numbers, GDP etc., are extracted from Statistics Norway's web service.

[32] Source: Statistics Norway

Annex I. Terms of Reference for Task Force on Measuring Extreme Events and Disasters

I. Background

The CES Bureau created the Task Force on measuring extreme events and disasters in February 2015 as a follow-up to the in-depth review conducted in October 2014.

The current terms of reference are a revised version of the original terms of reference of the Task Force to take into account the related international developments that influence the Task Force's work, and to extend the mandate until June 2019.

II. Mandate

The work of the Task Force is conducted within the framework of the Conference of European Statisticians and its Bureau. The Task Force will be extended for a period of two years (until June 2019), after which it will submit a final report with concrete recommendations. The work of the Task Force will be coordinated with the Steering Group on climate change-related statistics.

III. Objectives

The main objective of the Task Force is to clarify the role of official statistics in providing data related to extreme events and disasters, and identify practical steps for NSOs, in coordination with national agencies responsible for disaster risk reduction, to support disaster management and risk reduction.

The Task Force will also contribute to the development of a disaster-related statistics framework (by UN-ESCAP) and to the drafting of guidance documents for the operationalization of the indicators of the Sendai Framework by the United Nations Office for Disaster Risk Reduction (UNISDR). This will help to establish the role of official statistics in serving the information needs related to disaster risk management and reporting, and the Sendai Framework, consistent with information needs of other policy frameworks such as Sustainable Development Goals (SDGs) and the Paris Agreement on Climate Change.

In pursuing these objectives, the Task Force should cooperate with the UN agencies and other international organisations working in this area.

IV. Planned activities and outputs

Based on the survey carried out in April-May 2016, the Task Force obtained information on the current role of NSOs, including in institutional cooperation, the use of main data sources and data sharing. The survey also helped to identify user needs, challenges of NSOs, existing key statistics, and the current use of geospatial information for statistics on extreme events and disasters.

The Task Force will undertake the following activities:

a) Mapping of the outcomes of the survey with the recommendations (Advance Unedited Version A/71/644, December 2016) of the Open-ended Intergovernmental Expert Working on Indicators and Terminology Relating to Disaster Risk Reduction (OIEWG) to identify gaps and to draft recommendations on the possible future role of NSOs in measuring extreme events and disasters; and

b) Activities carried over from the previous terms of reference, adapted to the context provided by the OIEWG recommendations:

i) Identify needs for harmonisation of classifications, terms and definitions. This activity will also analyse which of the OIEWG recommendations can be used as statistical terms and classifications.
ii) Identify and consider recent and upcoming developments that have implications for statistics on extreme events and disasters, such as Global Geospatial Information Management (GGIM), System of Environmental-Economic Accounting (SEEA) and Ecosystem Accounting;
iii) Draft recommendations on the measurement of extreme events and disasters within the realm of official statistics.

Furthermore, the Task Force will contribute to the work on:

a) Development of a framework for disaster-related statistics (UN-ESCAP);
b) Development of methodologies for Sendai Framework Indicators (UNISDR); and
c) Drafting of guidance documents on national monitoring and data exchange frameworks (UNISDR).

The Task Force will contribute, to the extent possible, to the newly established global partnership on disaster-related statistics.

The main output of the work of the Task Force will be *Recommendations on the measurement of extreme events and disasters*, including:

a) Clarification of the role of NSOs and statistical systems;
b) Statistical and geographical data needs of stakeholders related to prevention, care and measurement of impact of extreme events and disasters;
c) A statistical glossary of most relevant terms and definitions, consistent with other glossaries (e.g. the OIEWG recommendations);
d) A draft statistical typology of extreme events and disasters which at a later stage can be further developed towards a flexible and adaptable international classification on disasters;
e) List of recommended disaster-related statistics and indicators to be produced by NSOs as part of official statistics; and
f) Examples from NSOs and international organisations.

V. Timetable

The Task Force is foreseen to work until June 2019. A detailed work plan for 2017-2019 (including milestones and interim deliverables) will be drafted in the first two months after extending the mandate of the Task Force. The work is planned to finish with the approval of the Recommendations by CES in June 2019.

VI. Methods of work

The Task Force will work primarily by e-mail, wiki workspace and telephone conferences. Physical meetings of the Task Force could be organised back-to-back with other meetings that would be attended by a significant number of Task Force members, such as the Expert Forum on climate change-related statistics.

VII. Membership

The following countries and international organisations are members of the Task Force: Italy (chair), Armenia, Kazakhstan, Mexico, Republic of Moldova, New Zealand, Nigeria, South Africa and Turkey, as well as the Food and Agriculture Organization of the United Nations (FAO), the Joint Research Centre of the European Commission (JRC), Eurostat, UN-ECLAC, UN-ESCAP, UNISDR, the World Health Organization (WHO), and the World Meteorological Organization (WMO).

The membership continues to be open for representatives and experts from all countries and international organisations.

UNECE will act as Secretariat of the Task Force.

Annex II. Glossary of main terms

Affected	People who are affected, either directly or indirectly, by a hazardous event. Directly affected are those who have suffered injury, illness or other health effects; who were evacuated, displaced, relocated or have suffered direct damage to their livelihoods, economic, physical, social, cultural and environmental assets. Indirectly affected are people who have suffered consequences, other than or in addition to direct effects, over time, due to disruption or changes in economy, critical infrastructure, basic services, commerce or work, or social, health and psychological consequences. People can be affected directly or indirectly. Affected people may experience short term or long-term consequences to their lives, livelihoods or health and to their economic, physical, social, cultural and environmental assets. In addition, people who are missing or dead may be considered as directly affected (UNISDR, 2017).
Area affected	The area of land (cultivated, pastoral and forest) damaged or destroyed due to hazardous event (unit: hectare). This also includes water used for fishing and water used for aquaculture (ponds, pens, cages) impacted due to hazardous events (unit: hectare or km^2) (UNISDR, 2018).
Basic services	Services that are needed for all of society to function effectively or appropriately. Examples of basic services include water supply, sanitation, health care, and education. They also include services provided by critical infrastructure such as electricity, telecommunications, transport, and waste management that are needed for all of society to function (UNISDR, 2018).
Big data	There are numerous existing definitions of Big Data available. These definitions are usually split into two parts: 1. A breakdown of the different data sources that can be viewed as Big Data; and 2. The IT techniques and methodologies applied to the data that differ from the traditional treatment of data. It is proposed that statistical organizations regard Big Data as: *Data that are difficult to collect, store or process within the conventional systems of statistical organisations. Either, their volume, velocity, structure or variety requires the adoption of new statistical software processing techniques and/or IT infrastructure to enable cost-effective insights to be made.* (UNECE, 2014b).

Biological hazards	Hazards of organic origin or conveyed by biological vectors, including pathogenic microorganisms, toxins and bioactive substances. Examples are bacteria, viruses or parasites, as well as venomous wildlife and insects, poisonous plants and mosquitoes carrying disease-causing agents (UNISDR, 2017).
Capacity	The combination of all the strengths, attributes and resources available within an organisation, community or society to manage and reduce disaster risks and strengthen resilience. Capacity may include infrastructure, institutions, human knowledge and skills, and collective attributes such as social relationships, leadership and management (UNISDR, 2017).
Climatological hazards	Drought, glacial lake outburst, wildfire (UNISDR, 2018).
Critical infrastructure	The physical structures, facilities, networks and other assets which provide services that are essential to the social and economic functioning of a community or society (UNISDR, 2017).
Data (as used in this report)	By data, the reader should understand large amounts of unprocessed observations and measurements collected via statistical surveys, administrative records, geographic databases, registers, inventories, monitoring networks, thematic mapping, remote sensing, scientific research and field studies.
Death attributed to a disaster	People who died during the disaster (hazard event), or directly after, as a direct result of the disaster (hazard event) (UNISDR, 2018).
Direct economic loss	The monetary value of total or partial destruction of physical assets existing in the affected area. Direct economic loss is nearly equivalent to physical damage. Examples of physical assets that are the basis for calculating direct economic loss include homes, schools, hospitals, commercial and governmental buildings, transport, energy, telecommunications infrastructures and other infrastructure; business assets and industrial plants; production such as crops, livestock and production infrastructure. They may also encompass environmental assets and cultural heritage. Direct economic losses usually happen during the event or within the first few hours after the event and are often assessed soon after the event to estimate recovery cost and claim insurance payments. These are tangible and relatively easy to measure (UNISDR, 2017).

Disaster	A serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability and capacity, leading to one or more of the following: human, material, economic and environmental losses and impacts (UNISDR, 2017).
Disaster damage	Damage that occurs during and immediately after a disaster. This is usually measured in physical units (e.g., area of housing or length of roads destroyed), and describes the total or partial destruction of physical assets, the disruption of basic services and damages to sources of livelihood in the affected area (UNISDR, 2017).
Disaster impact	The total effect, including negative effects (e.g., economic losses) and positive effects (e.g., economic gains), of a hazardous event or a disaster. The term includes economic, human and environmental impacts, and may include death, injuries, disease and other negative effects on human physical, mental and social well-being (UNISDR, 2017).
Disaster risk	The potential loss of life, injury, or destroyed or damaged assets which could occur to a system, society or a community in a specific period of time, determined probabilistically as a function of hazard, exposure, vulnerability, and capacity (UNISDR, 2017).
Disaster risk assessment	A qualitative or quantitative approach to determine the nature and extent of disaster risk by analysing potential hazards and evaluating existing conditions of exposure and vulnerability that together could harm people, property, services, livelihoods and the environment on which they depend. Disaster risk assessments include the identification of hazards; a review of the technical characteristics of hazards such as their location, intensity, frequency and probability; the analysis of exposure and vulnerability, including the physical, social, health, environmental and economic dimensions; and the evaluation of the effectiveness of prevailing and alternative coping capacities with respect to likely risk scenarios (UNISDR, 2017).
Disaster risk information	Comprehensive information on all dimensions of disaster risk, including hazards, exposure, vulnerability and capacity, related to persons, communities, organisations and countries and their assets. Disaster risk information includes all studies, information and mapping required to understand the disaster risk drivers and underlying risk factors (UNISDR, 2017).

Disaster risk management	The application of disaster risk reduction policies and strategies to prevent new disaster risk, reduce existing disaster risk and manage residual risk contributing to the strengthening of resilience and reduction of disaster losses (UNISDR, 2017).
Disaster risk reduction	Efforts at preventing new and reducing existing disaster risk and managing residual risk, all of which contribute to strengthening resilience and therefore to the achievement of sustainable development (UNISDR, 2017).
Disaster risk reduction strategies and policies	Goals and objectives defined across different timescales and with concrete targets, indicators and time frames. In line with the Sendai Framework for Disaster Risk Reduction 2015-2030, these should be aimed at preventing the creation of disaster risk, the reduction of existing risk and the strengthening of economic, social, health and environmental resilience (UNISDR, 2017).
Economic loss	Total economic impact. Equal to the sum of direct economic loss and indirect economic loss (UNISDR, 2017).
Environmental hazards	Chemical, natural and biological hazards created by environmental degradation or physical or chemical pollution in the air, water and soil. However, many of the processes and phenomena that fall into this category may be termed drivers of hazard and risk rather than hazards in themselves, such as soil degradation, deforestation, loss of biodiversity, salinization and sea-level rise (UNISDR, 2017).
Evacuation	Moving people and assets temporarily to safer places before, during or after the occurrence of a hazardous event in order to protect them (UNISDR, 2017).
Exposure	The situation of people, infrastructure, housing, production capacities and other tangible human assets located in hazard-prone areas (UNISDR, 2017).
Extra-terrestrial hazards	Hazards 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 (UNISDR, 2017).

Frequent and infrequent disasters	Terms depending on the probability of occurrence and the return period of a given hazard and its impacts. The impact of frequent disasters could be cumulative or become chronic for a community or a society (UNISDR, 2017).
Geological or geophysical hazards	Hazards originating from internal earth processes. Examples are earthquakes, volcanic activity and emissions, and related geophysical processes such as mass movements, landslides, rockslides, surface collapses and debris or mud flows. Hydrometeorological factors are important contributors to some of these processes. Tsunamis are difficult to categorize: although they are triggered by undersea earthquakes and other geological events, they essentially become an oceanic process that is manifested as a coastal water-related hazard (UNISDR, 2017).
Hazard	A process, phenomenon or human activity that may cause loss of life, injury or other health impacts, property damage, social and economic disruption or environmental degradation. Hazards include: biological, environmental, geological, hydrometeorological, and technological processes and phenomena (UNISDR, 2017).
Hazardous event	The manifestation of a hazard in a particular place during a particular period of time (UNISDR, 2017).
Hydro-meteorological hazards	Hazards of atmospheric, hydrological or oceanographic origin. Examples are tropical cyclones (also known as typhoons and hurricanes); floods, including flash floods; drought; heatwaves and cold spells; and coastal storm surges. Hydrometeorological conditions may also be a factor in other hazards such as landslides, wildland fires, locust plagues, epidemics and in the transport and dispersal of toxic substances and volcanic eruption material (UNISDR, 2017).
Indicators (as used in this report)	By indicators, the reader should understand statistics that have been selected for their ability to depict important phenomena or dynamics in a simple, direct, clear and relevant way.
Indirect economic loss	A decline in economic value added as a consequence of direct economic loss and/or human and environmental impacts. Indirect economic loss includes micro-economic impacts (e.g. revenue declines owing to business interruption, impacts on natural assets, loss of revenue or income due to missing assets, interruptions to transportation networks, supply chains or temporary unemployment)

	and macroeconomic impacts (e.g. price increases, increases in government debt, negative impact on stock market prices, and decline in GDP). Indirect losses can occur inside or outside of the hazard area and often with a time lag. As a result, they may be intangible or difficult to measure (UNISDR, 2017).
Information (as used in this report)	Quantitative and qualitative facts describing the state of the environment, economy and society and their changes. Quantitative information is generally produced in the form of data, statistics and indicators. Qualitative information consists of descriptions (maps or written narratives, for example) of facts that cannot be adequately represented quantitatively.
Injured or ill	People suffering from a new or exacerbated physical or psychological harm, trauma or an illness as a result of a disaster (UNISDR, 2018).
Large-scale disaster	A type of disaster affecting a society which requires national or international assistance (UNISDR, 2017).
Missing persons	People whose whereabouts are unknown since the hazardous event. It includes people who are presumed dead, for whom there is no physical evidence such as a body, and for which an official/legal report has been filed with competent authorities (UNISDR, 2018).
Multi-hazard	1) The selection of multiple major hazards a country faces and 2) the specific contexts where hazardous events may occur simultaneously, cascadingly or cumulatively over time, and considering the potential interrelated effects (UNISDR, 2017).
National Statistical System	The national statistical system consists of producers of official statistics comprising: (a) the national statistical office which is the leading authority of the national statistical system; (b) other producers of official statistics, consisting of organizational entities of national authorities as identified in accordance with the statistical law and that develop, produce, disseminate and communicate official statistics in accordance with the statistical law. (UNECE, 2018a)
Official statistics	Official statistics are statistics describing the economic, demographic, social and environmental phenomena which are developed, produced, disseminated and communicated in compliance with the *United Nations Fundamental Principles of Official Statistics,* as well as internationally agreed statistical standards and recommendations.

	These statistics are produced by the national statistical system and should be clearly indicated as official statistics. (UNECE, 2018a) Depending on the context, the term "official statistics" is sometimes used to denote the group of organizations that collectively produce official statistics (the national statistical system).
Preparedness	The knowledge and capacities developed by governments, response and recovery organisations, communities and individuals to effectively anticipate, respond to and recover from the impacts of likely, imminent or current disasters (UNISDR, 2017).
Prevention	Activities and measures to avoid existing and new disaster risks (UNISDR, 2017).
Reconstruction	The medium and long-term rebuilding and sustainable restoration of resilient critical infrastructures, services, housing, facilities, and livelihoods required for the full functioning of a community or a society affected by a disaster, aligning with the principles of sustainable development and "build back better," to avoid or reduce future disaster risk (UNISDR, 2017).
Recovery	The restoring or improving of livelihoods and health, as well as economic, physical, social, cultural and environmental assets, systems and activities, of a disaster-affected community or society, aligning with the principles of sustainable development and "build back better," to avoid or reduce future disaster risk (UNISDR, 2017).
Relocated persons	People who moved permanently from their homes to new sites due to disaster (hazard event) (UNISDR, 2018).
Resilience	The ability of a system, community or society exposed to hazards to resist, absorb, accommodate, adapt to, transform and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions through risk management (UNISDR, 2017).
Slow-onset disaster	A disaster that emerges gradually over time. Slow-onset disasters could be associated with drought, desertification, sea-level rise, or epidemic diseases, among others (UNISDR, 2017).

Small-scale disaster	A type of disaster only affecting local communities which require assistance beyond the affected community (UNISDR, 2017).
Statistics (as used in this report)	By statistics, the reader should understand data that have been structured, synthesized and aggregated according to statistical methods, standards and procedures.
Sudden-onset disaster	A disaster triggered by a hazardous event that emerges quickly or unexpectedly. Sudden-onset disasters could be associated with, e.g., earthquake, volcanic eruption, flash flood, chemical explosion, critical infrastructure failure, transport accident (UNISDR, 2017).
Technological hazards	Hazards originating from technological or industrial conditions, dangerous procedures, infrastructure failures or specific human activities. Examples include industrial pollution, nuclear radiation, toxic wastes, dam failures, transport accidents, factory explosions, fires and chemical spills. Technological hazards also may arise directly as a result of the impacts of a natural hazard event (UNISDR, 2017).
Vulnerability	The conditions determined by physical, social, economic, and environmental factors or processes which increase the susceptibility of an individual, a community, assets or systems to the impacts of hazards (UNISDR, 2017).

Annex III. Sendai Framework indicators

The following indicators were developed by the Open-ended Intergovernmental Expert Working Group (OIEWG) to measure global progress in the implementation of the Sendai Framework.

Global Target A: Substantially reduce global disaster mortality by 2030, aiming to lower average per 100,000 global mortality between 2020-2030 compared with 2005-2015.

A-1 (compound) Number of deaths and missing persons attributed to disasters, per 100,000 population.

A-2 Number of deaths attributed to disasters, per 100,000 population.

A-3 Number of missing persons attributed to disasters, per 100,000 population.

(The scope of disaster in this and subsequent targets is defined in paragraph 15 of the Sendai Framework for Disaster Risk Reduction 2015-2030 and applies to small-scale and large-scale, frequent and infrequent, sudden and slow-onset disasters caused by natural or man-made hazards, as well as related environmental, technological and biological hazards and risk.)

Global Target B: Substantially reduce the number of affected people globally by 2030, aiming to lower the average global figure per 100,000 between 2020-2030 compared with 2005-2015.

B-1 (compound) Number of directly affected people attributed to disasters, per 100,000 population.

B-2 Number of injured or ill people attributed to disasters, per 100,000 population.

B-3 Number of people whose damaged dwellings were attributed to disasters.

B-4 Number of people whose destroyed dwellings were attributed to disasters.

B-5 Number of people whose livelihoods were disrupted or destroyed, attributed to disasters.

Global Target C: Reduce direct disaster economic loss in relation to global gross domestic product (GDP) by 2030.

C-1 (compound) Direct economic loss attributed to disasters in relation to global gross domestic product.

C-2 Direct agricultural loss attributed to disasters (methodology developed by FAO).

(Agriculture is understood to include the crops, livestock, fisheries, apiculture, aquaculture and forest sectors as well as associated facilities and infrastructure.)

C-3 Direct economic loss to all other damaged or destroyed productive assets attributed to disasters.

(Productive assets would be disaggregated by economic sector, including services, according to standard international classifications. Countries would report against those economic sectors relevant to their economies. This would be described in the associated metadata.)

C-4 Direct economic loss in the housing sector attributed to disasters.

(Data would be disaggregated according to damaged and destroyed dwellings.)

C-5 Direct economic loss resulting from damaged or destroyed critical infrastructure attributed to disasters.

(The decision regarding those elements of critical infrastructure to be included in the calculation will be left to the Member States and described in the accompanying metadata. Protective infrastructure and green infrastructure should be included where relevant.)

C-6 Direct economic loss to cultural heritage damaged or destroyed attributed to disasters.

Global Target D: Substantially reduce disaster damage to critical infrastructure and disruption of basic services, among them health and educational facilities, including through developing their resilience by 2030.

D-1 (compound) Damage to critical infrastructure attributed to disasters.

D-2 Number of destroyed or damaged health facilities attributed to disasters.

D-3 Number of destroyed or damaged educational facilities attributed to disasters.

D-4 Number of other destroyed or damaged critical infrastructure units and facilities attributed to disasters.

(The decision regarding those elements of critical infrastructure to be included in the calculation will be left to the Member States and described in the accompanying metadata. Protective infrastructure and green infrastructure should be included where relevant.)

D-5 (compound) Number of disruptions to basic services attributed to disasters.

D-6 Number of disruptions to educational services attributed to disasters.

D-7 Number of disruptions to health services attributed to disasters.

D-8 Number of disruptions to other basic services attributed to disasters.

(The decision regarding those elements of basic services to be included in the calculation will be left to the Member States and described in the accompanying metadata.)

Global Target E: Substantially increase the number of countries with national and local disaster risk reduction strategies by 2020.

E-1 Number of countries that adopt and implement national disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015-2030.

E-2 Percentage of local governments that adopt and implement local disaster risk reduction strategies in line with national strategies.

(Information should be provided on the appropriate levels of government below the national level with responsibility for disaster risk reduction.)

Global Target F: Substantially enhance international cooperation to developing countries through adequate and sustainable support to complement their national actions for implementation of this framework by 2030.

F-1 Total official international support, (official development assistance (ODA) plus other official flows), for national disaster risk reduction actions.

(Reporting of the provision or receipt of international cooperation for disaster risk reduction shall be done in accordance with the modalities applied in respective countries. Recipient countries are encouraged to provide information on the estimated amount of national disaster risk reduction expenditure.)

F-2 Total official international support (ODA plus other official flows) for national disaster risk reduction actions provided by multilateral agencies.

F-3 Total official international support (ODA plus other official flows) for national disaster risk reduction actions provided bilaterally.

F-4 Total official international support (ODA plus other official flows) for the transfer and exchange of disaster risk reduction-related technology.

F-5 Number of international, regional and bilateral programmes and initiatives for the transfer and exchange of science, technology and innovation in disaster risk reduction for developing countries.

F-6 Total official international support (ODA plus other official flows) for disaster risk reduction capacity-building.

F-7 Number of international, regional and bilateral programmes and initiatives for disaster risk reduction-related capacity-building in developing countries.

F-8 Number of developing countries supported by international, regional and bilateral initiatives to strengthen their disaster risk reduction-related statistical capacity.

Global Target G: Substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to the people by 2030.

G-1 (compound G2-G5) Number of countries that have multi-hazard early warning systems.

G-2 Number of countries that have multi-hazard monitoring and forecasting systems.

G-3 Number of people per 100,000 that are covered by early warning information through local governments or through national dissemination mechanisms.

G-4 Percentage of local governments having a plan to act on early warnings.

G-5 Number of countries that have accessible, understandable, usable and relevant disaster risk information and assessment available to the people at the national and local levels.

G-6 Percentage of population exposed to or at risk from disasters protected through pre-emptive evacuation following early warning.

(Member States in a position to do so are encouraged to provide information on the number of evacuated people.)

Annex IV. Correspondence between Sendai Framework indicators and SDG indicators

In its 2017 report to the United Nations Statistical Commission, the Inter-agency and Expert Group on Sustainable Development Goal Indicators (2017) proposed to use the Sendai Framework indicators recommended by OIEWG to measure the targets of the following SDGs:

- **Goal 1** - End poverty in all its forms everywhere
- **Goal 11** - Make cities and human settlements inclusive, safe, resilient and sustainable, and
- **Goal 13** - Take urgent action to combat climate change and its impacts.

The proposal was agreed to by the Statistical Commission and subsequently by the UN General Assembly in July 2017.

The correspondence between the SDGs and the Sendai Framework indicators is shown in the following table.

Table 3: Correspondence between SDG and Sendai Framework indicators

Indicator	SDG indicator		Sendai Framework indicator
	No.	Tier[4]	No.
Number of deaths, missing persons and directly affected person attributed to disasters per 100,000 population[1]	1.5.1 11.5.1 13.1.1	II	A-1
Direct economic loss attributed to disasters in relation to global gross domestic product (GDP)	1.5.2	II	C-1
Direct economic loss in relation to global GDP, damage to critical infrastructure, and Number of disruptions of basic services, attributed to disasters[2]	11.5.2	II	C-1 D-1
Number of countries that adopt and implement national disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015-2030	1.5.3 11.b.1 13.1.2	II	E-1
Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies[3]	1.5.4 11.b.2 13.1.3	II	E-2

Notes:
1. In Sendai Framework: "Number of deaths and missing persons attributed to disasters, per 100,000 population"
2. In Sendai Framework: "Direct economic loss attributed to disasters in relation to global gross domestic product" and "Damage to critical infrastructure attributed to disasters"
3. In Sendai Framework: "Percentage of local governments that adopt and implement local disaster risk reduction strategies in line with national strategies"
4. Tier status of the indicators as of 20 November 2019.

Annex V. Proposed hazard classification in the Sendai Framework

(Annex I of Technical Guidance for Monitoring and Reporting on Progress in Achieving the Global Targets of the Sendai Framework for Disaster Risk Reduction)

Family	Hazards
Geophysical	Earthquake, Tsunami
	Mass movement mostly triggered by geophysical events (overlaps with hydrological category), landslide, avalanche, rock fall, mud flow, debris flow, subsidence
	Volcanic activity, eruption, lava flow, ash fall, pyroclastic flow, lahar
Hydrological	Flood, riverine flood, coastal flood, ponding flood, urban flood, flash flood
	Mass movement mostly triggered by hydrological events (overlaps with geophysical category), landslide, avalanche, rock fall, mud flow, debris flow, subsidence
	Wave action, coastal erosion, shoreline change
Meteorological	Convective storm, rain, wind, hail, snow, ice, blizzard, lightning, sand, dust, derecho, tornado
	Extra-tropical storm
	Extreme temperature, cold wave, heat wave, frost, freeze
	Fog
	Tropical cyclone, cyclonic wind, cyclonic rain, cyclone surge
Climatological	Drought
	Glacial lake outburst (GLOF)
	Wildfire
Extra-terrestrial	Impact
	Space weather
Environment degradation	Erosion
	Deforestation
	Salinization
	Sea level rise
	Desertification
	Asian dust cloud
	Wetland loss/degradation
	Glacier retreat/melting
Biological hazards	Epidemics
	Pandemics
	Epizootics
	Pest
	Insect infestation, plague
	Animal Incidents
	Pollution
Technological hazards	Industrial disaster
	Structural collapse
	Power outage
	Fire
	Explosion
	Mine disaster
	Chemical spill
	Oil spill
	Radiation contamination, nuclear incident
	Aviation accident
	Rail accident
	Road accident
	Navigation accident
	Space accident

Annex VI. Structure of the basic range of disaster-related statistics (DRSF)

The tables of the *Basic Range of Disaster-Related Statistics* can be found at http://communities.unescap.org/system/files/drsf_final_tables_190918.pdf. The following gives an overview on the statistical tables and their organisation.

Basic Range of Disaster-related Statistics Tables

Statistical tables are organised into worksheets according to basic components in DSRF. The variables represent queries from a disaster-related statistics database. The tables are comprehensive of the Basic Range of Disaster-related Statistics and can be used by national agencies as a tool for assessing gaps and identifying opportunities to produce new statistics for disaster risk reduction.

Geo-regions are officially designated geographic regions of relevance to the reporting, such as national (aggregate), regional or province (admin 02), district (admin 03), or other geographic regions important to the compilation or analysis, e.g. river catchments.

The relevant time period varies by tables and according to the analysis. For most impact statistics, a time period of at least 3-5 years is the most relevant given randomness and large year-to-year fluctuations in disaster occurrences and their impacts. DRRE tables, on the other hand, should be compiled annually, as with other national accounts.

A Summary tables of disaster occurrences

A1 Summary table of disaster occurrences, by hazard types, scale, and geographic region

A table count numbers of occurrences according to the hazards, scale and geographical classifications. Disaster occurrences are background statistics, i.e. they are useful for providing context variables for statistics in other tables.

B Selected background statistics and exposure to hazards

B1a Population background statistics and hazard exposure by geographic regions
B1b Population exposure by social groups
B2 Exposure of land and infrastructure by hazard type
B3 Coping capacity background statistics

B tables are for assessing availability of background statistics (sometimes also called "baseline statistics") as well as hazard exposure statistics, which are compiled prior to disaster occurrences, and updated over time according to the relevant categories (hazard types and geographic zonings). Exposure statistics serve multiple purposes, in particular for calculating indicators of risk, as well for assessing impacts.

C Summary tables of human impacts

C1 Summary table of human impacts by hazard types
C2 Summary table of human impacts by geographic regions
C3 Summary table of human impacts by demographic and social categories

C tables are for compiling data related to affected populations (impacts on people) according to hazard types, geographic regions (national total, regions/states, municipalities, or river catchments), and demographic and social categories (age, gender, urban and rural, poor, and disabled). Selected optional sub-categories of impacts (e.g. major or minor injuries) are included in the table for compilation and compilers may wish to insert additional sub-categories according to the data availability and demand for statistics.

D Summary tables of direct material impacts in physical terms

D1a Summary table of direct material impacts by hazard types
D1b Summary table of direct material impacts by hazard types and geographic regions
D1c Summary of agricultural impacts by hazard types and geographical regions
D2a Disruption of basic services from a disaster by hazard type
D2b Disruption of basic services from a disaster by geographic region

D tables are for recording direct material impacts in "physical" terms, such as area or number of buildings. The supplemental category of "critical infrastructure" is included in the tables as an initial proposal for measuring the critical material impacts of disasters from the disaster risk reduction perspective.

E Summary tables of direct material impacts in monetary terms

E1a Summary table of direct material impacts by hazard types
E1b Summary table of direct material impacts by hazard types and geographic regions

E tables mostly replicate the D tables and are for recording the impacts in monetary values, when it is relevant and possible, to calculate the direct economic losses, aligned with the Sendai Framework definition.

F Agriculture

F1 Summary of material impacts to Agriculture by hazards types

F1 corresponds to the methodology developed by FAO for indicator C-2 of the Sendai Framework and also presented in DRSF.

G Summary tables of direct environmental impacts

G1 Summary table of direct environmental impacts by hazards types
G2 Summary table of direct environmental impacts by hazards types and geographic regions

G tables extend the compilations on direct material impacts to include impacts to the environment.

DRRE Disaster risk reduction expenditure account

DRRE_Activ. Production expenditure account (current plus investment) by characteristic activities

DRRE_Trans. Transfers expenditure account and DRR National Expenditure

DRRE are satellite accounting tables developed to assess the feasibility for compiling DRR expenditure accounts based on existing data sources used in the national accounts or based on reporting from NDMA and other partner agencies.

Recommendations on the Role of Official Statistics in Measuring Hazardous Events and Disasters

Many countries and regions are facing two increasingly stark trends: rapid urbanization and a growing number of natural disasters caused by climate change-related hazards. Combined, they substantially increase the risk to which many people are exposed.

The increasing number and magnitude of disasters and their impacts on people, the economy and the environment have led to the adoption of global policy frameworks to reduce disaster risk and ensure sustainable development, most importantly the United Nations 2030 Agenda for Sustainable Development, the Paris Agreement on climate change and the Sendai Framework for Disaster Risk Reduction 2015-2030.

National efforts to manage and reduce disaster risk are high on the policy agenda in many countries.

Disaster-risk management on the national level is usually a task of specialised agencies or line ministries, with only limited or no involvement of national statistical offices (NSOs) or other members of the national statistical system (NSS). However, the work of Disaster Risk Management Agencies (DRMAs) is largely dependent on data produced by NSS, such as statistics on population, economy, agriculture, etc. Due to lack of collaboration between DRMAs and NSOs official statistics are often not used as much as they could be, or they are not fit for purpose, e.g. due to time lags or confidentiality issues that need to be considered for small scale analysis.

This publication clarifies the role of NSOs and other members of NSS in providing information related to hazardous events and disasters, and identifies practical steps that these organisations can take, in coordination with national agencies responsible for disaster risk management, to better support disaster risk management efforts.

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