

**Technical Collection of Issue Papers on Indicators
for the Seven Global Targets of
the Sendai Framework for Disaster Risk Reduction**

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The United Nations Office for Disaster Risk Reduction

For easy reference, this document compiles technical considerations made in:

- Annex B of “Background Paper: Indicators to monitor global targets of the Sendai Framework for Disaster Risk Reduction 2015-2030 - a technical review” (Technical Review) submitted to the first session of the Open-Ended Intergovernmental Expert Working Group on Indicators and Terminology relating to Disaster Risk Reduction, held in Geneva on 29-30 September 2015,
- Concept note on Methodology to Estimate Direct Economic Losses from Hazardous Events to Measure the Achievement of Target C of the Sendai Framework for Disaster Risk Reduction: A Technical Review (released at 11 November, 2015),
- Concept Note on Methodology to Estimate Progress of National and Local DRR Strategy to Measure the Achievement of Target E of the Sendai Framework for Disaster Risk Reduction: A Technical Review (released at 17 November, 2015)
- Suggested basic set of requirements for recording and reporting disaster loss from countries to UNISDR in order to monitor the Targets (a) through (d) (released as part of Technical Review)

The document also contains new technical considerations concerning the following issues:

- Suggested Critical infrastructure categorization related with Target D (newly introduced),
- Suggested List of hazard measured for the purpose of measuring global targets of the Sendai Framework (newly introduced)

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

Possible indicator suggested:

A1 - Number of [deaths / deceased – Cuba, Bangladesh] and [missing [persons – Bangladesh] / presumed dead – Bangladesh] due to hazardous events per 100,000 (This indicator should be computed based on indicators A-2, A-3 and population figures)

(SDG proposal: Consistency with SDG proposal needed)

[A2 - Number of [deaths / deceased – Cuba, Bangladesh] due to hazardous events- Ecuador delete]

(SDG proposal: Consistency with SDG proposal needed)

[A3 - Number of [missing [persons – Bangladesh] / presumed dead – Bangladesh] due to hazardous events- Ecuador delete]

(SDG proposal: Consistency with SDG proposal needed)

Indicator A-1 Number of deaths and missing due to hazardous events per 100,000. (This indicator should be computed based on indicators A-2, A-3 and population figures)

<p>Definitions</p>	<p>Death: The number of people who died during the disaster, or directly after/, as a direct result of the hazardous event</p> <p>Killed: People who lost their lives as a consequence of a hazardous event. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Missing: The number of people whose whereabouts is unknown since the hazardous event. It includes people who are presumed dead although there is no physical evidence. The data on number of deaths and number of missing are mutually exclusive.</p> <p>Hazardous event: The occurrence of a natural or human-induced phenomenon in a particular place during a particular period of time due to the existence of a hazard. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Hazard: A potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p>
<p>Method of computation</p>	<p>Summation of data on related indicators from national disaster loss databases. Make the sum a relative figure by using global population data (World Bank or UN Statistics information). Relativity is important because population growth (expected to be 9 billion in 2050) may translate into increased hazard exposure of population.</p>
<p>Rationale and interpretation</p>	<p>This indicator directly monitors the Target A.</p> <p>The disaster loss data on mortality is significantly influenced by large-scale catastrophic events, which represent important outliers in terms of mortality, as they normally imply considerable numbers of people killed (as it was the case in the Haiti earthquake in 2010, the Great East Japan Earthquake in 2011, and several countries after the Indian Ocean Tsunami in 2004). UNISDR recommends Countries to report the data by event, so complementary analysis can be done by both including and excluding such catastrophic events that can represent important outliers in terms of mortality.</p>
<p>Source and data collection</p>	<p>National disaster loss database, reported to UNISDR</p> <p>For Targets A through D, time dimension should be defined. When should the data be recorded and reported? Disaster dynamics make the data change (e.g. injured people might pass away after certain time from the event). This issue is especially critical when we need to record loss caused by slow-onset disasters such as drought. In the case of missing, a certain number of confirmations will occur after the disaster after which figures will remain stable.</p>

Disaggregation	<p>By country, by event, by hazard type (e.g. disaggregation by climatological, hydrological, meteorological, geophysical, biological and extra-terrestrial for natural hazards is possible following IRDR classification)</p> <p>By death/missing</p> <p>Additionally, the Expert Group recommended disaggregation by age, sex, location of residence and other characteristics (e.g. disability) as relevant and possible.</p> <p>Aggregation of “location of residence”: ideally by sub-national administrative unit similar to municipality.</p>
Comments and limitations	<p>Not every country has a comparable national disaster loss database that is consistent with the UNISDR guidelines (current coverage is 85 countries. Additional 32 countries are expected to be covered in 2015-16). Therefore, by 2020, it is expected that all countries will build/adjust the database according to the UNISDR guidelines and report the data to UNISDR.</p>
Main linkage with SDG targets	<p>Target 11.5: By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations</p> <p>Target 13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries</p> <p>Target 1.5: By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters</p> <p>Target 14.2: By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans</p> <p>Target 15.3: By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land-degradation-neutral world</p> <p>Target 3.9: By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination</p>

	<p>Target 3.6: By 2020, halve the number of global deaths and injuries from road traffic accidents</p> <p>Target 3.d: Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks</p>
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Indicator A-2 Number of deaths due to hazardous events

Definitions	<p>Death: The number of people who died during the disaster, or directly after, as a direct result of hazardous events</p> <p>Killed: People who lost their lives as a consequence of a hazardous event. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Hazardous event: The occurrence of a natural or human-induced phenomenon in a particular place during a particular period of time due to the existence of a hazard. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Hazard: A potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. (Proposed updated Terminology on Disaster Risk Reduction, August, 2015)</p>
Method of computation	Summation of data on related indicators from national disaster loss databases.
Rationale and interpretation	<p>This indicator monitors a category of the Target A.</p> <p>The disaster loss data on mortality is significantly influenced by large-scale catastrophic events, which represent important outliers in terms of mortality, as they normally imply considerable numbers of people killed (as it was the case in the Haiti earthquake in 2010, the Great East Japan Earthquake in 2011, and several countries after the Indian Ocean Tsunami in 2004). UNISDR recommends Countries to report the data by event, so complementary analysis can be done by both including and excluding such catastrophic events that can represent important outliers in terms of mortality.</p>
Source and data collection	<p>National disaster loss database, reported to UNISDR</p> <p>For Targets A through D, time dimension should be defined. When should the data be recorded and reported? Disaster dynamics make the data change (e.g. injured people might pass away after certain time from the event). This issue is especially critical when we need to record loss caused by slow-onset disasters such as drought. In the case of missing, a certain number of confirmations will occur after the disaster after which figures will remain stable.</p>
Disaggregation	<p>By country, by event, by hazard type (e.g. disaggregation by climatological, hydrological, meteorological, geophysical, biological and extra-terrestrial for natural hazards is possible following IRDR classification)</p> <p>Additionally, the Expert Group recommended disaggregation by age, sex, location of residence and other characteristics (e.g. disability) as relevant and possible.</p> <p>Aggregation of “location of residence”: ideally by sub-national administrative unit similar to municipality.</p>
Comments and limitations	Not every country has a comparable national disaster loss database that is consistent with the UNISDR guidelines (current coverage is 85 countries).

	<p>Additional 32 countries are expected to be covered in 2015-16). Therefore, by 2020, it is expected that all countries will build/adjust the database according to the UNISDR guidelines and report the data to UNISDR.</p>
<p>Main linkage with SDG targets</p>	<p>Target 11.5: By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations</p> <p>Target 13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries</p> <p>Target 1.5: By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters</p> <p>Target 14.2: By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans</p> <p>Target 15.3: By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land-degradation-neutral world</p> <p>Target 3.9: By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination</p> <p>Target 3.6: By 2020, halve the number of global deaths and injuries from road traffic accidents</p> <p>Target 3.d: Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks</p>

Indicator A-3 Number of missing due to hazardous events

Definitions	<p>Missing: The number of people whose whereabouts is unknown since the hazardous event. It includes people who are presumed dead although there is no physical evidence. The data on number of deaths and number of missing are mutually exclusive.</p> <p>Hazardous event: The occurrence of a natural or human-induced phenomenon in a particular place during a particular period of time due to the existence of a hazard. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Hazard: A potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p>
Method of computation	Summation of data on related indicators from national disaster loss databases.
Rationale and interpretation	<p>This indicator monitors a category of the Target A.</p> <p>The disaster loss data on mortality is significantly influenced by large-scale catastrophic events, which represent important outliers in terms of mortality, as they normally imply considerable numbers of people killed (as it was the case in the Haiti earthquake in 2010, the Great East Japan Earthquake in 2011, and several countries after the Indian Ocean Tsunami in 2004). UNISDR recommends Countries to report the data by event, so complementary analysis can be done by both including and excluding such catastrophic events that can represent important outliers in terms of mortality.</p>
Source and data collection	<p>National disaster loss database, reported to UNISDR</p> <p>For Targets A through D, time dimension should be defined. When should the data be recorded and reported? Disaster dynamics make the data change (e.g. injured people might pass away after certain time from the event). This issue is especially critical when we need to record loss caused by slow-onset disasters such as drought. In the case of missing, a certain number of confirmations will occur after the disaster after which figures will remain stable.</p>
Disaggregation	<p>By country, by event, by hazard type (e.g. disaggregation by climatological, hydrological, meteorological, geophysical, biological and extra-terrestrial for natural hazards is possible following IRDR classification). Additionally, the Expert Group recommended disaggregation by age, sex, location of residence and other characteristics (e.g. disability) as relevant and possible. Aggregation of “location of residence”: ideally by sub-national administrative unit similar to municipality.</p>
Comments and limitations	<p>Not every country has a comparable national disaster loss database that is consistent with the UNISDR guidelines (current coverage is 85 countries. Additional 32 countries are expected to be covered in 2015-16). Therefore, by 2020, it is expected that all countries will build/adjust the database according to the UNISDR guidelines and report the data to UNISDR.</p>

<p>Main linkage with SDG targets</p>	<p>Target 11.5: By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations</p> <p>Target 13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries</p> <p>Target 1.5: By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters</p> <p>Target 14.2: By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans</p> <p>Target 15.3: By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land-degradation-neutral world</p> <p>Target 3.9: By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination</p> <p>Target 3.6: By 2020, halve the number of global deaths and injuries from road traffic accidents</p> <p>Target 3.d: Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks</p>
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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 to 2005-2015.

- Categories of “affected people” need to be elaborated. Especially indicators to approach “affected people” from the perspective of livelihood needs to be examined.

Possible indicators suggested:

B1 - Number of affected people [by hazardous event-**Qatar**] per 100,000. (This indicator should be computed based on indicators B-2 to B-6).

(SDG proposal: Consistency with SDG proposal needed)

B-2 Number of injured or ill people due to hazardous events

(SDG proposal: Consistency with SDG proposal needed.)

B3 - Number of people who left their [places of residence/home -**Zimbabwe**][and places where they are-**Lesotho**] due to hazardous events.

(SDG proposal (in that this indicator combines B-3a and B-3b): Consistency with SDG proposal needed.)

B-3a Number of evacuated people due to hazardous events

(SDG proposal: Consistency with SDG proposal needed.)

B-3b Number of relocated people due to hazardous events

(SDG proposal: Consistency with SDG proposal needed.)

[B-3c – Number of people protected per 100,000 - **Cuba**]

[B4 - Number of people whose [houses / dwellings or homes – **Australia, Zimbabwe**] were damaged due to hazardous events.

B5 - Number of people whose [houses / dwellings or homes – **Australia, Zimbabwe**] were destroyed due to hazardous events. **Cuba** -- merge B4 and B5]

B6 - Number of people who [received / required – **Zimbabwe**] [food relief aid/aid including food and medical aid – **Morocco, Zimbabwe**] due to hazardous events.

Other indicators proposed in the 1st OEIWG

[B7 – Number of people whose livelihoods were disrupted, destroyed or lost due to hazardous events – **Zimbabwe**]

Indicator B-1 Number of affected people per 100,000. (This indicator should be computed based on indicators B-2 to B-6)

Definitions	<p>Affected people: People who are affected by a hazardous event. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Comment: People can be affected directly or indirectly. Affected people may experience short-term or long-term consequences to their lives, livelihoods or health and in the economic, physical, social, cultural and environmental assets.</p> <p>Directly affected: People 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.</p> <p>Indirectly affected: People who have suffered consequences, other than or in addition to direct effects, over time due to disruption or changes in economy, critical infrastructures, basic services, commerce, work or social, health and physiological consequences.</p> <p>In this indicator, given the difficulties in assessing the full range of all affected (directly and indirectly), UNISDR proposes the use of an indicator that would estimate “directly affected” as a proxy for the number of affected. This indicator, while not perfect, comes from data widely available and could be used consistently across countries and over time to measure the achievement of the Target B.</p> <p>From the perspective of data availability and measurability, it is proposed to build a composite indicator which consists of "directly affected", or those who are</p> <ul style="list-style-type: none"> • Injured or ill (B-2), • Evacuated (B-3a), • Relocated (B-3b) <p>and to measure the number who suffered direct damage to their livelihoods or assets,</p> <ul style="list-style-type: none"> • People whose houses were damaged or destroyed (B-4 and B-5) • People who received food relief aid (B-6). <p>Injured or ill: The number of people suffering from physical injuries, trauma or cases of disease requiring immediate medical assistance as a direct result of a hazardous event. (SDG Proposal)</p> <p>People suffering from a new or exacerbated physical or psychological harm, trauma or an illness as a result of a hazardous event. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Evacuated: The number of people who temporarily moved from where they were (including their places of residence, work places, schools, and hospitals) to safer locations in order to ensure their safety. (SDG Proposal)</p>
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	<p>People who, for different reasons or circumstances because of risk conditions or disaster, move temporarily to safer places before, during or after the occurrence of a hazardous event. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Relocated: The number of people who moved permanently from their homes to new sites due to hazardous event. (SDG Proposal)</p> <p>People who, for different reasons or circumstances because of risk or disaster, have moved permanently from their places of residence to new sites. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>People whose houses were damaged or destroyed due to hazardous events: The estimated number of inhabitants previously living in the houses (housing units) damaged or destroyed. All the inhabitants of these houses (housing units) are assumed to be affected being in their dwelling or by direct consequence of the destruction/damage to their housings (housing units). An average number of inhabitants per house (housing unit) in the country can be used to estimate the value.</p> <p>Houses destroyed: Houses (housing units) levelled, buried, collapsed, washed away or damaged to the extent that they are no longer habitable. (SDG Proposal)</p> <p>Houses damaged: Houses (housing units) with minor damage, not structural or architectural, which may continue to be habitable, although they may require some repair or cleaning. (SDG Proposal)</p> <p>People who received food relief aid: The number of persons who received food /nutrition, by government or as humanitarian aid, during or in the aftermath of a hazardous event.</p> <p>Hazardous event: The occurrence of a natural or human-induced phenomenon in a particular place during a particular period of time due to the existence of a hazard. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Hazard: A potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p>
Method of computation	<p>Summation of data on related indicators from national disaster loss databases. Make the sum a relative figure by using global population data (World Bank or UN Statistics information). Relativity is important because population growth (expected to be 9 billion in 2050) may translate into increased hazard exposure of population.</p> <p>The Expert Group recommends not using the indicators related with the people whose houses were damaged/destroyed (B-4 and B-5) in the computation. UNISDR and IRDR groups recommend using them as they can be estimated from widely available and verifiable data and reflect vulnerability and livelihood issues. Data on housing damage and destroyed is essential for</p>

	<p>economic loss, so using these indicators would not impose additional data collection burden.</p> <p>Double-counting: From practical perspective, double counting of affected people is unavoidable (for example, injured <u>and</u> relocated) in many countries. Minimum double counting is summing “number of injured” (B-2) and Number of people whose housings were damaged or destroyed (B-4 and B-5). Relocated (B-3b) is sub-set of number of people whose housings were destroyed (B-5).</p> <p>The Expert Group recommends mortality figures not to be counted in this category.</p>
Rationale and interpretation	<p>This indicator directly monitors the Target B.</p> <p>The disaster loss data is significantly influenced by large-scale catastrophic events, which represent important outliers. UNISDR recommends Countries to report the data by event, so complementary analysis can be done by both including and excluding such catastrophic events that can represent important outliers.</p>
Source and data collection	<p>National disaster loss database, reported to UNISDR</p> <p>For Targets A through D, time dimension should be defined. When should the data be recorded and reported? Disaster dynamics make the data change (e.g. injured people might pass away after certain time from the event). This issue is especially critical when we need to record loss caused by slow-onset disasters such as drought.</p>
Disaggregation	<p>By country, by event, by hazard type (e.g. disaggregation by climatological, hydrological, meteorological, geophysical, biological and extra-terrestrial for natural hazards is possible following IRDR classification)</p> <p>By injured or ill/evacuated/relocated/People whose houses were damaged/people whose houses were destroyed/people who received food relief aid</p> <p>Additionally, the Expert Group recommended disaggregation by age, sex, location of residence and other characteristics (e.g. disability) as relevant and possible.</p> <p>Aggregation of “location of residence”: ideally by sub-national administrative unit similar to municipality.</p>
Comments and limitations	<p>Not every country has a comparable national disaster loss database that is consistent with the UNISDR guidelines (current coverage is 85 countries. Additional 32 countries are expected to be covered in 2015-16). Therefore, by 2020, it is expected that all countries will build/adjust the database according to the UNISDR guidelines and report the data to UNISDR.</p>

<p>Main linkage with SDG targets</p>	<p>Target 11.5: By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations</p> <p>Target 13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries</p> <p>Target 1.5: By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters</p> <p>Target 1.3: Implement nationally appropriate social protection systems and measures for all, including floors, and by 2030 achieve substantial coverage of the poor and the vulnerable</p> <p>Target 14.2: By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans</p> <p>Target 15.3: By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land-degradation-neutral world</p> <p>Target 3.9: By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination</p> <p>Target 3.6: By 2020, halve the number of global deaths and injuries from road traffic accidents</p> <p>Target 3.d: Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks</p>
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Indicator B-2 Number of injured or ill people due to hazardous events

Definitions	<p>Injured or ill: The number of people suffering from physical injuries, trauma or cases of disease requiring immediate medical assistance as a direct result of a hazardous event. (SDG Proposal)</p> <p>People suffering from a new or exacerbated physical or psychological harm, trauma or an illness as a result of a hazardous event. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Hazardous event: The occurrence of a natural or human-induced phenomenon in a particular place during a particular period of time due to the existence of a hazard. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Hazard: A potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p>
Method of computation	Summation of data on related indicators from national disaster loss databases.
Rationale and interpretation	<p>This indicator measures a category of affected people addressed in Target B.</p> <p>The disaster loss data is significantly influenced by large-scale catastrophic events, which represent important outliers. UNISDR recommends Countries to report the data by event, so complementary analysis can be done by including and excluding such catastrophic events that can represent important outliers.</p>
Source and data collection	<p>National disaster loss database, reported to UNISDR</p> <p>For Targets A through D, time dimension should be defined. When should the data be recorded and reported? Disaster dynamics make the data change (e.g. injured people might pass away after certain time from the event). This issue is especially critical when we need to record loss caused by slow-onset disasters such as drought.</p>
Disaggregation	<p>By country, by event, by hazard type (e.g. disaggregation by climatological, hydrological, meteorological, geophysical, biological and extra-terrestrial for natural hazards is possible following IRDR classification)</p> <p>Additionally, Expert Group recommended Disaggregation by age, sex, location of residence and other characteristics (e.g. disability) as relevant and possible.</p> <p>Aggregation of “location of residence”: ideally by sub-national administrative unit similar to municipality.</p>
Comments and limitations	<p>Not every country has a comparable national disaster loss database that is consistent with the UNISDR guidelines (current coverage is 85 countries. Additional 32 countries are expected to be covered in 2015-16). Therefore, by 2020, it is expected that all countries will build/adjust the database according to the UNISDR guidelines and report the data to UNISDR.</p>

<p>Main linkage with SDG targets</p>	<p>Target 11.5: By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations</p> <p>Target 13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries</p> <p>Target 1.5: By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters</p> <p>Target 1.3: Implement nationally appropriate social protection systems and measures for all, including floors, and by 2030 achieve substantial coverage of the poor and the vulnerable</p> <p>Target 14.2: By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans</p> <p>Target 15.3: By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land-degradation-neutral world</p> <p>Target 3.9: By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination</p> <p>Target 3.6: By 2020, halve the number of global deaths and injuries from road traffic accidents</p> <p>Target 3.d: Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks</p>
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Indicator B-3 Number of people who left their places of residence due to hazardous events

<p>Definitions</p>	<p>People left their places of residence: The number of people forced or obliged to leave their places of residence due to the threat or impact of hazardous events. This can be alternatively worded as people displaced. In this indicator it consists of people who are evacuated and relocated.</p> <p>Displaced: Persons who, for different reasons and circumstances because of risk or disaster, have to leave their place of residence. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Evacuated: The number of people who <i>temporarily</i> moved from where they were (including their places of residence, work places, schools, and hospitals) to safer locations in order to ensure their safety. (SDG Proposal)</p> <p>People who, for different reasons or circumstances because of risk conditions or disaster, move temporarily to safer places before, during or after the occurrence of a hazardous event. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Relocated: The number of people who moved <i>permanently</i> from their homes to new sites due to hazardous event. (SDG Proposal)</p> <p>People who, for different reasons or circumstances because of risk or disaster, have moved permanently from their places of residence to new sites. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Hazardous event: The occurrence of a natural or human-induced phenomenon in a particular place during a particular period of time due to the existence of a hazard. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Hazard: A potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. (Proposed updated Terminology on Disaster Risk Reduction)</p>
<p>Method of computation</p>	<p>Summation of data on related indicators from national disaster loss databases.</p> <p>The Expert Group recommends the term <u>“Number of people who are forced to leave their places of residence”</u>, and proposes merging B-3a and B-3b, and adding to the definition the wording to allow the inclusion of “people that have been displaced directly by disasters or risk but not included in “evacuated” and “relocated” (e.g. people becoming homeless due to disasters)” to create new B-3 indicator. How to count the new category of people would be a challenge. The OEIWG should decide if the categories B3a and B3b should rather be used. In any case UNISDR recommends that national reporting includes these categories (B-3a and B-3b) for DRR policy making.</p>
<p>Rationale and interpretation</p>	<p>This indicator measures a category of affected people addressed in the Target B.</p> <p>The disaster loss data is significantly influenced by large-scale catastrophic</p>

	<p>events, which represent important outliers. UNISDR recommends Countries to report the data by event, so complementary analysis can be done by both including and excluding such catastrophic events that can represent important outliers.</p>
Source and data collection	<p>National disaster loss database, reported to UNISDR</p> <p>For Targets A through D, time dimension should be defined. When should the data be recorded and reported? Disaster dynamics make the data change (e.g. injured people might pass away after certain time from the event). This issue is especially critical when we need to record loss caused by slow-onset disasters such as drought.</p>
Disaggregation	<p>By country, by event, by hazard type (e.g. disaggregation by climatological, hydrological, meteorological, geophysical, biological and extra-terrestrial for natural hazards is possible following IRDR classification)</p> <p>By evacuated/relocated</p> <p>Additionally, the Expert Group recommended disaggregation by age, sex, location of residence and other characteristics (e.g. disability) as relevant and possible.</p> <p>Aggregation of “location of residence”: ideally by sub-national administrative unit similar to municipality.</p>
Comments and limitations	<p>Not every country has a comparable national disaster loss database that is consistent with the UNISDR guidelines (current coverage is 85 countries. Additional 32 countries are expected to be covered in 2015-16). Therefore, by 2020, it is expected that all countries will build/adjust the database according to the UNISDR guidelines and report the data to UNISDR.</p>
Main linkage with SDG targets	<p>Target 11.5: By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations</p> <p>Target 13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries</p> <p>Target 1.5: By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters</p> <p>Target 1.4: By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance</p>

	<p>Target 1.3: Implement nationally appropriate social protection systems and measures for all, including floors, and by 2030 achieve substantial coverage of the poor and the vulnerable</p> <p>Target 14.2: By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans</p> <p>Target 15.3: By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land-degradation-neutral world</p> <p>Target 3.d: Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks</p>
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Indicator B-3a Number of evacuated people due to hazardous events

<p>Definitions</p>	<p>Evacuated: The number of people who <i>temporarily</i> moved from where they were (including their places of residence, work places, schools, and hospitals) to safer locations in order to ensure their safety. (SDG Proposal)</p> <p>People who, for different reasons or circumstances because of risk conditions or disaster, move temporarily to safer places before, during or after the occurrence of a hazardous event. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Hazardous event: The occurrence of a natural or human-induced phenomenon in a particular place during a particular period of time due to the existence of a hazard. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Hazard: A potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p>
<p>Method of computation</p>	<p>Summation of data on related indicators from national disaster loss databases.</p>
<p>Rationale and interpretation</p>	<p>This indicator measures a category of affected people addressed in Target B.</p> <p><u>The indicator can also function as a success indicator of the target G as the early warning system will help evacuation.</u></p> <p>The disaster loss data is significantly influenced by large-scale catastrophic events, which represent important outliers. UNISDR recommends Countries to report the data by event, so complementary analysis can be done by both including and excluding such catastrophic events that can represent important outliers.</p>
<p>Source and data collection</p>	<p>National disaster loss database, reported to UNISDR</p> <p>For Targets A through D, time dimension should be defined. When should the data be recorded and reported? Disaster dynamics make the data change (e.g. evacuated people might relocate after certain time from the event). This issue is especially critical when we need to record loss caused by slow-onset disasters such as drought. In the case of missing, a certain number of confirmations will occur after the disaster after which figures will remain stable.</p>
<p>Disaggregation</p>	<p>By country, by event, by hazard type (e.g. disaggregation by climatological, hydrological, meteorological, geophysical, biological and extra-terrestrial for natural hazards is possible following IRDR classification)</p> <p>Additionally, the Expert Group recommended disaggregation by age, sex, location of residence and other characteristics (e.g. disability) as relevant and possible.</p>

	Aggregation of “location of residence”: ideally by sub-national administrative unit similar to municipality.
Comments and limitations	Not every country has a comparable national disaster loss database that is consistent with the UNISDR guidelines (current coverage is 85 countries. Additional 32 countries are expected to be covered in 2015-16). Therefore, by 2020, it is expected that all countries will build/adjust the database according to the UNISDR guidelines and report the data to UNISDR.
Main linkage with SDG targets	<p>Target 11.5: By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations</p> <p>Target 13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries</p> <p>Target 1.5: By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters</p> <p>Target 1.3: Implement nationally appropriate social protection systems and measures for all, including floors, and by 2030 achieve substantial coverage of the poor and the vulnerable</p> <p>Target 1.4: By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance</p> <p>Target 14.2: By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans</p> <p>Target 15.3: By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land-degradation-neutral world</p> <p>Target 3.d: Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks</p>

	<p>Target 13.3: Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning</p> <p>Target 2.4: By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality</p>
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Indicator B-3b Number of relocated people due to hazardous events

Definitions	<p>Relocated: The number of people who moved <i>permanently</i> from their homes to new sites due to hazardous event. (SDG Proposal) <u>Note: this definition excludes preventive relocation before the event.</u></p> <p>People who, for different reasons or circumstances because of risk or disaster, have moved permanently from their places of residence to new sites. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Hazardous event: The occurrence of a natural or human-induced phenomenon in a particular place during a particular period of time due to the existence of a hazard. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Hazard: A potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p>
Method of computation	Summation of data on related indicators from national disaster loss databases.
Rationale and interpretation	<p>This indicator measures a category of affected people addressed in Target B.</p> <p>The disaster loss data is significantly influenced by large-scale catastrophic events, which represent important outliers. UNISDR recommends Countries to report the data by event, so complementary analysis can be done by both including and excluding such catastrophic events that can represent important outliers.</p>
Source and data collection	<p>National disaster loss database, reported to UNISDR</p> <p>For Targets A through D, time dimension should be defined. When should the data be recorded and reported? Disaster dynamics make the data change (e.g. evacuated people might relocate after certain time from the event). This issue is especially critical when we need to record loss caused by slow-onset disasters such as drought.</p>
Disaggregation	<p>By country, by event, by hazard type (e.g. disaggregation by climatological, hydrological, meteorological, geophysical, biological and extra-terrestrial for natural hazards is possible following IRDR classification)</p> <p>Additionally, the Expert Group recommended disaggregation by age, sex, location of residence and other characteristics (e.g. disability) as relevant and possible.</p> <p>Aggregation of “location of residence”: ideally by sub-national administrative unit similar to municipality.</p>
Comments and limitations	Not every country has a comparable national disaster loss database that is consistent with the UNISDR guidelines (current coverage is 85 countries. Additional 32 countries are expected to be covered in 2015-16). Therefore, by

	2020, it is expected that all countries will build/adjust the database according to the UNISDR guidelines and report the data to UNISDR.
Main linkage with SDG targets	<p>Target 11.5: By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations</p> <p>Target 13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries</p> <p>Target 1.5: By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters</p> <p>Target 1.4: By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance</p> <p>Target 1.3: Implement nationally appropriate social protection systems and measures for all, including floors, and by 2030 achieve substantial coverage of the poor and the vulnerable</p> <p>Target 14.2: By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans</p> <p>Target 15.3: By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land-degradation-neutral world</p> <p>Target 3.d: Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks</p>

Indicator B-4 Number of people whose houses were damaged due to hazardous events

Definitions	<p>People whose houses were damaged due to hazardous events: The estimated number of inhabitants who were previously living in the houses (housing units) damaged. All the inhabitants of these houses (housing units) are assumed to be affected being in their dwelling or by direct consequence of the damage and destruction to their housings (housing units). An average number of inhabitants per house (housing units) in the country can be used to estimate the value.</p> <p>Houses damaged: Houses (housing units) with minor damage, not structural or architectural, which may continue to be habitable, although they may require some repair or cleaning. (SDG Proposal)</p> <p>Hazardous event: The occurrence of a natural or human-induced phenomenon in a particular place during a particular period of time due to the existence of a hazard. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Hazard: A potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p>
Method of computation	<p>Summation of data on damaged housing from national disaster loss databases. An average number of inhabitants per house (housing units) in the country can be used to estimate the value.</p> <p>B-4 and B-5 use the same data set as C-5 and C-6. B-4 (people whose housing are damaged) and B-5 (people whose housing are destroyed) are mutually exclusive because original C-5 and C-6 are mutually exclusive.</p>
Rationale and interpretation	<p>This indicator measures a category of affected people addressed in the Target B. Housing damage and destruction affects both the lives and livelihoods of most urban and rural households.</p> <p>The increase of the value can be explained from (a) number of housing units damaged and destroyed; and (b) average number of people living in a housing unit in the country. UNISDR expects (b) is relatively stable over time.</p> <p>The disaster loss data is significantly influenced by large-scale catastrophic events, which represent important outliers. UNISDR recommends Countries to report the data by event, so complementary analysis can be done by both including and excluding such catastrophic events than can represent important outliers.</p>
Source and data collection	<p>National disaster loss database, reported to UNISDR Official statistics for average number of people living in a housing unit.</p>
Disaggregation	<p>By country, by event, by hazard type (e.g. disaggregation by climatological, hydrological, meteorological, geophysical, biological and extra-terrestrial for natural hazards is possible following IRDR classification)</p>

	<p>Additionally, the Expert Group recommended disaggregation by age, sex, location of residence and other characteristics (e.g. disability) as relevant and possible.</p> <p>Aggregation of “location of residence”: ideally by sub-national administrative unit similar to municipality.</p>
<p>Comments and limitations</p>	<p>Not every country has a comparable national disaster loss database that is consistent with the UNISDR guidelines (current coverage is 85 countries. Additional 32 countries are expected to be covered in 2015-16). By 2020, it is expected that all countries will build/adjust the database according to the UNISDR guidelines and report the data to UNISDR.</p> <p>The national disaster loss databases developed in many countries have historic data on housing damaged/destroyed. To establish baseline data, it is necessary to identify an average number of inhabitants per house in the country.</p>
<p>Main linkage with SDG targets</p>	<p>Not proposed for the SDGs but related with the following targets.</p> <p>Target 11.5: By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations</p> <p>Target 13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries</p> <p>Target 1.5: By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters</p> <p>Target 11.1: By 2030, ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums</p> <p>Target 1.4: By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance</p> <p>Target 1.3: Implement nationally appropriate social protection systems and measures for all, including floors, and by 2030 achieve substantial coverage of the poor and the vulnerable</p>

	<p>Target 14.2: By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans</p> <p>Target 15.3: By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land-degradation-neutral world</p> <p>Target 3.d: Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks.</p> <p>Target 11.c: Support least developed countries, including through financial and technical assistance, in building sustainable and resilient buildings utilizing local materials</p>
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Indicator B-5 Number of people whose houses were destroyed due to hazardous events

Definitions	<p>People whose houses were destroyed due to hazardous events: The estimated number of inhabitants previously living in the houses (housing units) destroyed. All the inhabitants of these houses (housing units) are assumed to be affected being in their dwelling or by direct consequence of the damage and destruction to their housings (housing units). An average number of inhabitants per house (housing units) in the country can be used to estimate the value.</p> <p>Houses destroyed: Houses (housing units) levelled, buried, collapsed, washed away or damaged to the extent that they are no longer habitable. (SDG Proposal)</p> <p>Hazardous event: The occurrence of a natural or human-induced phenomenon in a particular place during a particular period of time due to the existence of a hazard. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Hazard: A potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p>
Method of computation	<p>Summation of data on destroyed housings from national disaster loss databases. An average number of inhabitants per house (housing units) in the country can be used to estimate the value.</p> <p>B-4 and B-5 use the same data set as C-5 and C-6. B-4 (people whose housing are damaged) and B-5 (people whose housing are destroyed) are mutually exclusive because original C-5 and C-6 are mutually exclusive.</p>
Rationale and interpretation	<p>This indicator measures a category of affected people addressed in the Target B. Housing damage and destruction affects both the lives and livelihoods of most urban and rural households.</p> <p>The increase of the value can be explained from (a) number of housing units damaged and destroyed; and (b) average number of people living in a housing unit in the country. UNISDR expects (b) is relatively stable over time.</p> <p>The disaster loss data is significantly influenced by large-scale catastrophic events, which represent important outliers. UNISDR recommends Countries to report the data by event, so complementary analysis can be done by both including and excluding such catastrophic events that can represent important outliers.</p>
Source and data collection	<p>National disaster loss database, reported to UNISDR Official statistics for average number of people living in a housing unit</p>
Disaggregation	<p>By country, by event, by hazard type (e.g. disaggregation by climatological, hydrological, meteorological, geophysical, biological and extra-terrestrial for natural hazards is possible following IRDR classification)</p>

	<p>Additionally, the Expert Group recommended disaggregation by age, sex, location of residence and other characteristics (e.g. disability) as relevant and possible.</p> <p>Aggregation of “location of residence”: ideally by sub-national administrative unit similar to municipality.</p>
<p>Comments and limitations</p>	<p>Not every country has a comparable national disaster loss database that is consistent with the UNISDR guidelines (current coverage is 85 countries. Additional 32 countries are expected to be covered in 2015-16). By 2020, it is expected that all countries will build/adjust the database according to the UNISDR guidelines and report the data to UNISDR.</p> <p>The national disaster loss databases developed in many countries have historic data on housing damaged/destroyed. To establish baseline data, it is necessary to identify an average number of inhabitants per house during the baseline period in the country.</p>
<p>Main linkage with SDG targets</p>	<p>Not proposed for the SDGs but related with the following targets.</p> <p>Target 11.5: By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations</p> <p>Target 13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries</p> <p>Target 1.5: By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters</p> <p>Target 11.1: By 2030, ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums</p> <p>Target 1.4: By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance</p> <p>Target 1.3: Implement nationally appropriate social protection systems and measures for all, including floors, and by 2030 achieve substantial coverage of the poor and the vulnerable</p>

	<p>Target 14.2: By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans</p> <p>Target 15.3: By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land-degradation-neutral world</p> <p>Target 3.d: Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks</p> <p>Target 11.c: Support least developed countries, including through financial and technical assistance, in building sustainable and resilient buildings utilizing local materials</p>
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Indicator B-6 Number of people who received food relief aid due to hazardous events

Definitions	<p>People who received food relief aid: The number of persons who received food /nutrition, by government or as humanitarian aid, during or in the aftermath of a hazardous event.</p> <p>Hazardous event: The occurrence of a natural or human-induced phenomenon in a particular place during a particular period of time due to the existence of a hazard. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Hazard: A potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p>
Method of computation	Summation of data on related indicators from national disaster loss databases.
Rationale and interpretation	<p>This indicator measures a category of affected people addressed in Target B.</p> <p>The increase of the value can be explained from (a) number of people affected by the event and (b) number of people who satisfies the condition of being compensated. Conditions of receiving compensation should be often defined by law or government rules and are therefore different across Countries and not easy for international comparison. The condition should be clarified every time when the value is reported, in order to allow interpretation of the meaning of value. As compensation regimes change frequently over time, data is difficult to meaningfully compare across time in a country.</p> <p>The disaster loss data is significantly influenced by large-scale catastrophic events, which represent important outliers. UNISDR recommends Countries to report the data by event, so complementary analysis can be done by both including and excluding such catastrophic events than can represent important outliers.</p>
Source and data collection	National disaster loss database, reported to UNISDR
Disaggregation	<p>By country, by event, by hazard type (e.g. disaggregation by climatological, hydrological, meteorological, geophysical, biological and extra-terrestrial for natural hazards is possible following IRDR classification)</p> <p>Additionally, the Expert Group recommended disaggregation by age, sex, location of residence and other characteristics (e.g. disability) as relevant and possible.</p> <p>Aggregation of “location of residence”: ideally by sub-national administrative unit similar to municipality.</p>
Comments and limitations	<p>The Expert Group recommended “Number of people in need of (who received) relief or compensation during or after hazardous events”. Defining “People in need of relief or compensation” is technically difficult. The element will always be an estimate, difficult to verify and to be in consistent across countries. People that “received relief or compensation” may reflect a subset of those in</p>

	<p>need, but nothing would be recorded in countries where no relief was distributed. Relief policy (condition to receive relief) tends to change when administration changes and not be stable across time frame.</p> <p>Not every country has a comparable national disaster loss database that is consistent with the UNISDR guidelines (current coverage is 85 countries. Additional 32 countries are expected to be covered in 2015-16). By 2020, it is expected that all countries will build/adjust the database according to the UNISDR guidelines and report the data to UNISDR.</p> <p>The national disaster loss database developed does not have historic data on number of people who received relief or compensation after disasters. Establishing baseline data is a challenge.</p>
<p>Main linkage with SDG targets</p>	<p>Not proposed for the SDGs but related with the following targets.</p> <p>Target 11.5: By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations</p> <p>Target 13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries</p> <p>Target 1.5: By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters</p> <p>Target 1.4: By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance</p> <p>Target 1.3: Implement nationally appropriate social protection systems and measures for all, including floors, and by 2030 achieve substantial coverage of the poor and the vulnerable</p> <p>Target 3.8: Achieve universal health coverage, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all</p>

	<p>Target 14.2: By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans</p> <p>Target 15.3: By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land-degradation-neutral world</p> <p>Target 3.d: Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks</p>
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Target C: Reduce *direct disaster economic loss* in relation to global gross domestic product (GDP) by 2030.

- Expert Group recommends monitoring both direct and indirect economic losses. However, the Target clearly limits the scope to “direct” economic losses. Direct Economic Loss is basically economic evaluation of physical damage, which is relatively more tangible and measurable. Methodology to measure indirect economic loss is more complicated and less standardized.
- Expert Group also recommended utilizing SNA (System of National Accounting). UNISDR needs to do research how to isolate the impact of disasters from other macro-economic impacts by simplified and understandable method.

Possible indicators suggested:

C-1 Direct economic loss due to hazardous events in relation to global gross domestic product. This indicator should be computed based on indicators C-2 to C-7.

(SDG proposal: Consistency with SDG proposal needed.)

C-2 Direct agricultural loss due to hazardous events

(SDG proposal: Consistency with SDG proposal needed.)

C-3 Direct economic loss due to Industrial facilities damaged or destroyed by hazardous events

C-4 Direct economic loss due to commercial facilities damaged or destroyed by hazardous events

[C5 - Direct economic loss due to houses damaged by hazardous events events – **Switzerland** -- merge C5 and C6; **Cuba**-- delete C5 and C6; **Japan** -- retain C5 and C6]

(SDG proposal: Consistency with SDG proposal needed.)

[C6 - Direct economic loss due to houses destroyed by hazardous events – **Switzerland** -- merge C5 and C6; **Cuba**-- delete C5 and C6; **Japan** -- retain C5 and C6]

(SDG proposal: Consistency with SDG proposal needed.)

C7 - Direct economic loss due to damage to [critical infrastructure/public infrastructure- **Bhutan, Kenya**] caused by hazardous events. (This indicator should be computed based on indicators D-2, D-3 and D-4 (road)).

(SDG proposal: Consistency with SDG proposal needed.)

Other indicators proposed in the 1st OEIWG

[C8 –Direct economic loss due to cultural heritage damaged or destroyed by hazardous events - **Bhutan**]

[C9 – Direct economic loss due to environment degraded by hazardous events –**Morocco, Ecuador**]

[C10-Financial transfer and access to insurance-**Colombia**]

Indicator C-1 Direct economic loss due to hazardous events in relation to global gross domestic product (This indicator should be computed based on indicators C-2 to C-7.)

Definitions	<p>Direct economic loss: Direct loss is nearly equivalent to physical damage. Examples include loss to physical assets such as damaged housings, factories and infrastructure. Direct 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. Direct Economic loss in this indicator framework consists of agriculture loss, damage to industrial and commercial facilities, damage to housings and critical infrastructures (Indicator C-2 through C-7).</p> <p>The monetary value of total or partial destruction of physical assets existing in the affected area.(Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Global gross domestic product: Summation of GDP of Countries. GDP definition according to the World Bank.</p> <p>Hazardous event: The occurrence of a natural or human-induced phenomenon in a particular place during a particular period of time due to the existence of a hazard. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Hazard: A potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p>
Method of computation	<p>The original national disaster loss databases usually register physical damage value (housing unit loss, infrastructure loss etc.). Need conversion from physical value to monetary value according to the UNISDR methodology. After converted, divide global direct economic loss by global GDP (inflation adjusted, constant USD) calculated from World Bank Development Indicators.</p>
Rationale and interpretation	<p>This indicator directly monitors the Target C.</p> <p>The disaster loss data is significantly influenced by large-scale catastrophic events, which represent important outliers. UNISDR recommends Countries to report the data by event, so complementary analysis can be done by both including and excluding such catastrophic events that can represent important outliers in terms of mortality.</p>
Source and data collection	<p>National disaster loss database, reported to UNISDR</p>
Disaggregation	<p>By country, by event, by hazard type (e.g. disaggregation by climatological, hydrological, meteorological, geophysical, biological and extra-terrestrial for natural hazards is possible following IRDR classification)</p> <p>By asset loss category</p> <p>Ideally, in addition, by sub-national administrative unit</p>
Comments and limitations	<p>Not every country has a comparable national disaster loss database that is consistent with the UNISDR guidelines (current coverage is 85 countries.</p>

	<p>Additional 32 countries are expected to be covered in 2015-16). By 2020, it is expected that all countries will build/adjust the database according to the UNISDR guidelines and report the data to UNISDR.</p> <p>Many countries do not have historic data of C-3 and C-4 and it is difficult to establish baseline data for these components.</p>
<p>Main linkage with SDG targets</p>	<p>Target 11.5: By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations</p> <p>Target 13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries</p> <p>Target 1.5: By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters</p> <p>Target 2.4: By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality</p> <p>Target 14.2: By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans</p> <p>Target 15.3: By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land-degradation-neutral world</p> <p>Target 3.d: Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks</p> <p>Target 13.b: Promote mechanisms for raising capacities for effective climate change-related planning and management, in least developed countries, including focusing on women, youth, local and marginalized communities</p>

Indicator C-2 Direct agricultural loss due to hazardous events

<p>Definitions</p>	<p>Direct economic loss: Direct loss is nearly equivalent to physical damage. Examples include loss to physical assets such as damaged housings, factories and infrastructure. Direct 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. Direct Economic loss in this indicator framework consists of agriculture loss, damage to industrial and commercial facilities, damage to housings and critical infrastructures (Indicator C-2 through C-7).</p> <p>The monetary value of total or partial destruction of physical assets existing in the affected area. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Direct agriculture loss: Direct agricultural loss consists of crops (estimated from agricultural lands affected) and livestock loss.</p> <p>UNISDR originally proposed measuring crops (estimated from agricultural land affected) and livestock loss from the perspective of standardized measurability. The Expert Group proposes to widen the scope including poultry, fishery and forestry. UNISDR needs research on how to universally standardize methodology, in consistent with PDNA.</p> <p>Agricultural lands affected: The area of cultivated or pastoral land damaged or destroyed due to hazardous event (unit: hectare). (SDG Proposal)</p> <p>Livestock loss: The number of 4-legged domestic animals (e.g. cow, pig, sheep, goat, cattle) lost due to hazardous event. (SDG Proposal)</p> <p>Hazardous event: The occurrence of a natural or human-induced phenomenon in a particular place during a particular period of time due to the existence of a hazard. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Hazard: A potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p>
<p>Method of computation</p>	<p>Summation of data from national disaster loss databases to summarize the physical damage.</p> <p>Need conversion from physical value to monetary value according to the UNISDR methodology.</p>
<p>Rationale and interpretation</p>	<p>This indicator monitors an element included in the direct economic loss (Target C).</p> <p>Agriculture is the foundation of food security, and also continues to be the main source of income and employment in many developing countries. The indicator is a proxy for the value added produced in agricultural sector.</p>

	<p>The disaster loss data is significantly influenced by large-scale catastrophic events, which represent important outliers. UNISDR recommends Countries to report the data by event, so complementary analysis can be done by both including and excluding such catastrophic events that can represent important outliers.</p>
Source and data collection	National disaster loss database, reported to UNISDR
Disaggregation	<p>By country, by event, by hazard type (e.g. disaggregation by climatological, hydrological, meteorological, geophysical, biological and extra-terrestrial for natural hazards is possible following IRDR classification)</p> <p>By crops/livestock</p> <p>Ideally, in addition, by sub-national administrative unit</p>
Comments and limitations	<p>Not every country has a comparable national disaster loss database that is consistent with the UNISDR guidelines (current coverage is 85 countries. Additional 32 countries are expected to be covered in 2015-16). By 2020, it is expected that all countries will build/adjust the database according to the UNISDR guidelines and report the data to UNISDR.</p> <p>Collaboration with FAO and UNCCD can be expected. FAO is currently developing measurement method for indirect agriculture loss.</p>
Main linkage with SDG targets	<p>Target 2.4: By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality</p> <p>Target 15.3: By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land-degradation-neutral world</p> <p>Target 1.5: By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters</p> <p>Target 13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries</p> <p>Target 11.5: By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic</p>

	<p>losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations</p> <p>Target 14.2: By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans</p> <p>Target 3.d: Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks</p> <p>Target 2.1: By 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round</p> <p>Target 2.2: By 2030, end all forms of malnutrition, including achieving, by 2025, the internationally agreed targets on stunting and wasting in children under 5 year of age, and address the nutritional needs of adolescent girls, pregnant and lactating women and older persons</p> <p>Target 2.3: By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment</p>
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Indicator C-3 Direct economic loss due to industrial facilities damaged or destroyed by hazardous events

<p>Definitions</p>	<p>Direct economic loss: Direct loss is nearly equivalent to physical damage. Examples include loss to physical assets such as damaged housings, factories and infrastructure. Direct 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. Direct Economic loss in this indicator framework consists of agriculture loss, damage to industrial and commercial facilities, damage to housings and critical infrastructures (Indicator C-2 through C-7).</p> <p>The monetary value of total or partial destruction of physical assets existing in the affected area. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Industrial facilities damaged or destroyed: The number of manufacturing and industrial facilities directly affected (damaged or destroyed).</p> <p>Manufacturing: classified in ISIC Code C (manufacturing) (Rev.4). The establishment, not the firm, is the statistics used.</p> <p>Hazardous event: The occurrence of a natural or human-induced phenomenon in a particular place during a particular period of time due to the existence of a hazard. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Hazard: A potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p>
<p>Method of computation</p>	<p>Summation of data from national disaster loss databases to summarize the physical damage.</p> <p>Need conversion from physical value to monetary value. Methodology should be developed.</p>
<p>Rationale and interpretation</p>	<p>This indicator monitors an element included in the direct economic loss (Target C).</p> <p>Industry constitutes major part of economy and continues to be the main source of income and employment in many countries. The indicator is a proxy for the value added produced in industrial sector.</p> <p>The disaster loss data is significantly influenced by large-scale catastrophic events, which represent important outliers. UNISDR recommends Countries to report the data by event, so complementary analysis can be done by both including and excluding such catastrophic events that can represent important outliers.</p>
<p>Source and data</p>	<p>National disaster loss database, reported to UNISDR</p>

collection	
Disaggregation	<p>By country, by event, by hazard type (e.g. disaggregation by climatological, hydrological, meteorological, geophysical, biological and extra-terrestrial for natural hazards is possible following IRDR classification)</p> <p>By damaged/destroyed</p> <p>Ideally, in addition, by sub-national administrative unit</p>
Comments and limitations	<p>Not every country has a comparable national disaster loss database that is consistent with the UNISDR guidelines (current coverage is 85 countries. Additional 32 countries are expected to be covered in 2015-16). By 2020, it is expected that all countries will build/adjust the database according to the UNISDR guidelines and report the data to UNISDR.</p> <p>The national disaster loss database developed does not necessarily have historic data on damage to industrial facilities. Establishing baseline data is a challenge.</p>
Main linkage with SDG targets	<p>Not proposed for the SDGs but related with the following targets.</p> <p>Target 11.5: By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations</p> <p>Target 13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries</p> <p>Target 1.5: By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters</p> <p>Target 13.b: Promote mechanisms for raising capacities for effective climate change-related planning and management, in least developed countries, including focusing on women, youth, local and marginalized communities</p> <p>Target 9.4: By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities</p>

Indicator C-4 Direct economic loss due to commercial facilities damaged or destroyed by hazardous events

Definitions	<p>Direct economic loss: Direct loss is nearly equivalent to physical damage. Examples include loss to physical assets such as damaged housings, factories and infrastructure. Direct 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. Direct Economic loss in this indicator framework consists of agriculture loss, damage to industrial and commercial facilities, damage to housings and critical infrastructures (Indicator C-2 through C-7).</p> <p>The monetary value of total or partial destruction of physical assets existing in the affected area.(Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Commercial facilities damaged or destroyed: The number of individual commercial establishments (individual stores, warehouses, etc.) damaged or destroyed.</p> <p>Commerce: classified in ISIC Code G (wholesale and retail trade) (Rev.4). The commercial establishment, not the firm, is the statistics used.</p> <p>Hazardous event: The occurrence of a natural or human-induced phenomenon in a particular place during a particular period of time due to the existence of a hazard. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Hazard: A potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p>
Method of computation	<p>Summation of data from national disaster loss databases to summarize the physical damage.</p> <p>Need conversion from physical value to monetary value. Methodology should be developed.</p>
Rationale and interpretation	<p>This indicator monitors an element included in the direct economic loss (Target C).</p> <p>Commerce constitutes major part of economy and the main source of income and employment in increasing number of countries. The indicator is a proxy for the value added produced in commerce sector.</p> <p>The disaster loss data is significantly influenced by large-scale catastrophic events, which represent important outliers. UNISDR recommends Countries to report the data by event, so complementary analysis can be done by both including and excluding such catastrophic events that can represent important outliers.</p>
Source and data collection	National disaster loss database, reported to UNISDR

Disaggregation	<p>By country, by event, by hazard type (e.g. disaggregation by climatological, hydrological, meteorological, geophysical, biological and extra-terrestrial for natural hazards is possible following IRDR classification)</p> <p>By damaged/destroyed</p> <p>Ideally, in addition, by sub-national administrative unit</p>
Comments and limitations	<p>Not every country has a comparable national disaster loss database that is consistent with the UNISDR guidelines (current coverage is 85 countries. Additional 32 countries are expected to be covered in 2015-16). By 2020, it is expected that all countries will build/adjust the database according to the UNISDR guidelines and report the data to UNISDR.</p> <p>The national disaster loss database developed does not necessarily have historic data on damage to commercial facilities. Establishing baseline data is a challenge.</p>
Main linkage with SDG targets	<p>Not proposed for the SDGs but related with the following targets.</p> <p>Target 11.5: By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations</p> <p>Target 13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries</p> <p>Target 1.5: By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters</p> <p>Target 13.b: Promote mechanisms for raising capacities for effective climate change-related planning and management, in least developed countries, including focusing on women, youth, local and marginalized communities</p>

Indicator C-5 Direct economic loss due to houses damaged by hazardous events

<p>Definitions</p>	<p>Direct economic loss: Direct loss is nearly equivalent to physical damage. Examples include loss to physical assets such as damaged housings, factories and infrastructure. Direct 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. Direct Economic loss in this indicator framework consists of agriculture loss, damage to industrial and commercial facilities, damage to housings and critical infrastructures (Indicator C-2 through C-7).</p> <p>The monetary value of total or partial destruction of physical assets existing in the affected area.(Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Houses damaged: Houses (housing units) with minor damage, not structural or architectural, which may continue to be habitable, although they may require some repair or cleaning. (SDG Proposal)</p> <p>Note: Houses damaged (C-5) and houses destroyed (C-6) are mutually exclusive.</p> <p>Hazardous event: The occurrence of a natural or human-induced phenomenon in a particular place during a particular period of time due to the existence of a hazard. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Hazard: A potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p>
<p>Method of computation</p>	<p>Summation of data from national disaster loss databases to summarize the physical damage.</p> <p>Need conversion from physical value to monetary value according to the UNISDR methodology.</p>
<p>Rationale and interpretation</p>	<p>This indicator monitors an element included in the direct economic loss (Target C).</p> <p>Housings constitute major part of private asset in any economy.</p> <p>The disaster loss data is significantly influenced by large-scale catastrophic events, which represent important outliers. UNISDR recommends Countries to report the data by event, so complementary analysis can be done by both including and excluding such catastrophic events that can represent important outliers.</p>
<p>Source and data collection</p>	<p>National disaster loss database, reported to UNISDR</p> <p>In case of multi-family structure, count housing units, not number of building structure.</p>

Disaggregation	<p>By country, by event, by hazard type (e.g. disaggregation by climatological, hydrological, meteorological, geophysical, biological and extra-terrestrial for natural hazards is possible following IRDR classification)</p> <p>Ideally, in addition, by sub-national administrative unit</p>
Comments and limitations	<p>Not every country has a comparable national disaster loss database that is consistent with the UNISDR guidelines (current coverage is 85 countries. Additional 32 countries are expected to be covered in 2015-16). By 2020, it is expected that all countries will build/adjust the database according to the UNISDR guidelines and report the data to UNISDR.</p>
Main linkage with SDG targets	<p>Target 11.5: By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations</p> <p>Target 13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries</p> <p>Target 1.5: By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters</p> <p>Target 11.1: By 2030, ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums</p> <p>Target 3.d: Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks</p> <p>Target 11.c: Support least developed countries, including through financial and technical assistance, in building sustainable and resilient buildings utilizing local materials</p>

Indicator C-6 Direct economic loss due to houses destroyed by hazardous events

<p>Definitions</p>	<p>Direct economic loss: Direct loss is nearly equivalent to physical damage. Examples include loss to physical assets such as damaged housings, factories and infrastructure. Direct 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. Direct Economic loss in this indicator framework consists of agriculture loss, damage to industrial and commercial facilities, damage to housings and critical infrastructures (Indicator C-2 through C-7).</p> <p>The monetary value of total or partial destruction of physical assets existing in the affected area. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Houses destroyed: Houses (housing units) levelled, buried, collapsed, washed away or damaged to the extent that they are no longer habitable. (SDG Proposal)</p> <p>Hazardous event: The occurrence of a natural or human-induced phenomenon in a particular place during a particular period of time due to the existence of a hazard. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Hazard: A potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p>
<p>Method of computation</p>	<p>Summation of data from national disaster loss databases to summarize the physical damage.</p> <p>Need conversion from physical value to monetary value according to the UNISDR methodology.</p>
<p>Rationale and interpretation</p>	<p>This indicator monitors an element included in the direct economic loss (Target C).</p> <p>Housings constitute major part of private asset in any economy.</p> <p>The disaster loss data is significantly influenced by large-scale catastrophic events, which represent important outliers. UNISDR recommends Countries to report the data by event, so complementary analysis can be done by both including and excluding such catastrophic events that can represent important outliers.</p>
<p>Source and data collection</p>	<p>National disaster loss database, reported to UNISDR</p> <p>In case of multi-family structure, count housing units, not number of building structure.</p>
<p>Disaggregation</p>	<p>By country, by event, by hazard type (e.g. disaggregation by climatological, hydrological, meteorological, geophysical, biological and extra-terrestrial for</p>

	<p>natural hazards is possible following IRDR classification)</p> <p>Ideally, in addition, by sub-national administrative unit</p>
Comments and limitations	<p>Not every country has a comparable national disaster loss database that is consistent with the UNISDR guidelines (current coverage is 85 countries. Additional 32 countries are expected to be covered in 2015-16). By 2020, it is expected that all countries will build/adjust the database according to the UNISDR guidelines and report the data to UNISDR.</p>
Main linkage with SDG targets	<p>Target 11.5: By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations</p> <p>Target 13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries</p> <p>Target 1.5: By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters</p> <p>Target 11.1: By 2030, ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums</p> <p>Target 3.d: Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks</p> <p>Target 11.c: Support least developed countries, including through financial and technical assistance, in building sustainable and resilient buildings utilizing local materials</p>

Indicator C-7 Direct economic loss due to damage to critical infrastructure caused by hazardous events. (This indicator should be computed based on indicators D-2, D-3 and D-4 (road).)

<p>Definitions</p>	<p>Direct economic loss: Direct loss is nearly equivalent to physical damage. Examples include loss to physical assets such as damaged housings, factories and infrastructure. Direct 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. Direct Economic loss in this indicator framework consists of agriculture loss, damage to industrial and commercial facilities, damage to housings and critical infrastructures (Indicator C-2 through C-7).</p> <p>The monetary value of total or partial destruction of physical assets existing in the affected area. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Disaster damage: Total or partial destruction of physical assets existing in the affected area. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Critical infrastructure: The physical structures, facilities, networks and other assets that support services that are socially, economically or operationally essential to the functioning of a society or community (Proposed updated Terminology on Disaster Risk Reduction, August 2015). In this indicator framework, it consists of education, healthcare and roads from the perspective of availability of good quality of data.</p> <p>Note: Expert Group recommends widening the scope of critical infrastructure beyond education, healthcare and roads.</p> <p>Educational facilities damaged or destroyed: The number of play schools, kindergartens, primary, secondary or middle schools, technical-vocational schools, colleges, universities, training centres, adult education, military schools and prison schools damaged or destroyed by the hazardous event. (Revision from the SDG Proposal)</p> <p>Health facilities damaged or destroyed: The number of health centres, clinics, local and regional hospitals, outpatient centres and in general facilities used by primary health providers damaged or destroyed by the hazardous event. (Revision from the SDG Proposal)</p> <p>Roads damaged or destroyed: The length of road networks damaged or destroyed due to the hazardous event, in kilometres. (SDG Proposal)</p> <p>Hazardous event: The occurrence of a natural or human-induced phenomenon in a particular place during a particular period of time due to the existence of a hazard. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Hazard: A potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p>
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Method of computation	<p>Summation of data from national disaster loss databases to summarize the physical damage.</p> <p>Need conversion from physical value to monetary value according to the UNISDR methodology.</p>
Rationale and interpretation	<p>This indicator monitors an element included in the direct economic loss (Target C) and also monitors the element of “damage to critical infrastructures” in Target D.</p> <p>The indicator is a proxy for damage to public services provided by public/private sectors. These three categories are selected because more than 80 countries currently have historic data of these categories of asset damages.</p> <p>The disaster loss data is significantly influenced by large-scale catastrophic events, which represent important outliers. UNISDR recommends Countries to report the data by event, so complementary analysis can be done by both including and excluding such catastrophic events that can represent important outliers.</p>
Source and data collection	National disaster loss database, reported to UNISDR
Disaggregation	<p>By country, by event, by hazard type (e.g. disaggregation by climatological, hydrological, meteorological, geophysical, biological and extra-terrestrial for natural hazards is possible following IRDR classification)</p> <p>By asset (health/education/road)</p> <p>Ideally, in addition, by sub-national administrative unit</p>
Comments and limitations	Not every country has comparable national disaster loss database consistent with the UNISDR guidelines (current coverage is 85 countries. Additional 32 countries are expected to be covered in 2015-16). By 2020, all countries will be expected to build/adjust the database according to the standard guideline.
Main linkage with SDG targets	<p>Target 9.1: Develop quality, reliable, sustainable and resilient infrastructure, including regional and trans border infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all</p> <p>Target 1.5: By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters</p> <p>Target 11.5: By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations</p>

	<p>Target 13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries</p> <p>Target 1.4: By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance</p> <p>Target 11.1: By 2030, ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums</p> <p>Target 4.a: Build and upgrade education facilities that are child, disability and gender sensitive and provide safe, non-violent, inclusive and effective learning environments for all</p> <p>Target 15.3: By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land-degradation-neutral world</p> <p>Target 3.6: By 2020, halve the number of global deaths and injuries from road traffic accidents</p> <p>Target 11.2: By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons</p> <p>Target 3.c: Substantially increase health financing and the recruitment, development, training and retention of the health workforce in developing countries, especially in least developed countries and small island developing States</p> <p>Target 3.d: Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks</p>
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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.

- Expert Group recommends widening the scope to include different kinds of critical infrastructures such as water, energy, ICT and transport in general (e.g. port and rail).
- Expert Group also expressed a strong concern to focus on “disruption of basic services” and the impact of such service disruption on people, which shows the relationship of the Target D with the Target B “Affected People”. Data collection would be a practical challenge for this soft and intangible element.

Possible indicators suggested:

D-1 Damage to critical infrastructure due to hazardous events. This indicator should be computed based on indicators D-2, D-3 and D-4 (road).

(SDG proposal: Consistency with SDG proposal needed.)

D-2 Number of health facilities destroyed or damaged by hazardous events

(SDG proposal: Consistency with SDG proposal needed.)

D-3 Number of educational facilities destroyed or damaged by hazardous events

(SDG proposal: Consistency with SDG proposal needed.)

D-4 Number of transportation infrastructures destroyed or damaged by hazardous events

(SDG proposal: Consistency with SDG proposal needed.)

D5 – [Number / Length – **Australia, Argentina, El Salvador**] of time basic services have been disrupted due to hazardous events

Other indicators proposed in the 1st OEIWG

[D6-Number of education or health facilities removed from risk areas- **Brazil, Mexico, Czech Republic**]

[D7-Number of security service structures destroyed or damaged by hazardous events-**Qatar**]

[D8-Number of tourist infrastructure facilities destroyed or damaged by hazardous events- **Morocco**]

[D9- Number of states with resilience programmes or strategies for health and education facilities- **Czech Republic**]

Indicator D-1 Damage to critical infrastructure due to hazardous events (This indicator should be computed based on indicators D-2, D-3 and D-4 (road)).

<p>Definitions</p>	<p>Disaster damage: Total or partial destruction of physical assets existing in the affected area. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Critical infrastructure: The physical structures, facilities, networks and other assets that support services that are socially, economically or operationally essential to the functioning of a society or community(Proposed updated Terminology on Disaster Risk Reduction, August 2015).</p> <p>In this indicator framework, it consists of healthcare (D-2), education (D-3), and roads (part of D-4) from the perspective of availability of good quality of historic data for establishing baseline.</p> <p>Note: Expert Group recommends widening the scope of critical infrastructure beyond education, healthcare and roads.</p> <p>Health facilities damaged or destroyed: The number of health centres, clinics, local and regional hospitals, outpatient centres and in general facilities used by primary health providers damaged or destroyed by the hazardous event. (Revision from the SDG Proposal)</p> <p>Educational facilities damaged or destroyed: The number of play schools, kindergartens, primary, secondary or middle schools, technical-vocational schools, colleges, universities, training centres, adult education, military schools and prison schools damaged or destroyed by the hazardous event. (Revision from the SDG Proposal)</p> <p>Roads damaged or destroyed: The length of road networks damaged or destroyed due to the hazardous event, in kilometres. (SDG Proposal)</p> <p>Hazardous event: The occurrence of a natural or human-induced phenomenon in a particular place during a particular period of time due to the existence of a hazard. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Hazard: A potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p>
<p>Method of computation</p>	<p>Summation of data from national disaster loss databases</p> <p>Methodology to create composite index should be developed.</p>
<p>Rationale and interpretation</p>	<p>This indicator directly monitors the element of “damage to critical infrastructures” and indirectly monitors “disruption of basic services” in the Target D and also monitors an element included in direct economic loss (the Target C) and affected people (the Target B).</p>

	<p>The indicator is a proxy for damage to public services provided by public/private sectors. These three categories are selected because more than 80 countries have historic data.</p> <p>The disaster loss data is significantly influenced by large-scale catastrophic events, which represent important outliers. UNISDR recommends Countries to report the data by event, so complementary analysis can be done by both including and excluding such catastrophic events that can represent important outliers.</p>
Source and data collection	National disaster loss database, reported to UNISDR
Disaggregation	<p>By country, by event, by hazard type (e.g. disaggregation by climatological, hydrological, meteorological, geophysical, biological and extra-terrestrial for natural hazards is possible following IRDR classification)</p> <p>By asset (health/education/road)</p> <p>Ideally, in addition, by sub-national administrative unit</p>
Comments and limitations	<p>Not every country has comparable national disaster loss database consistent with the UNISDR guidelines (current coverage is 85 countries. Additional 32 countries are expected to be covered in 2015-16). Therefore, by 2020, all countries will be expected to build/adjust the database according to the standard guideline.</p> <p>Counting the number of facilities does not necessarily reflect the size of the facility and related impact on the communities.</p>
Main linkage with SDG targets	<p>Target 9.1: Develop quality, reliable, sustainable and resilient infrastructure, including regional and trans border infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all</p> <p>Target 1.5: By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters</p> <p>Target 11.5: By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations</p> <p>Target 13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries</p>

	<p>Target 1.4: By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance</p> <p>Target 11.1: By 2030, ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums</p> <p>Target 4.a: Build and upgrade education facilities that are child, disability and gender sensitive and provide safe, non-violent, inclusive and effective learning environments for all</p> <p>Target 3.6: By 2020, halve the number of global deaths and injuries from road traffic accidents</p> <p>Target 11.2: By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons</p> <p>Target 3.c: Substantially increase health financing and the recruitment, development, training and retention of the health workforce in developing countries, especially in least developed countries and small island developing States</p> <p>Target 3.d: Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks</p>
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Indicator D-2 Number of health facilities destroyed or damaged by hazardous events

Definitions	<p>Health facilities damaged or destroyed: The number of health centres, clinics, local and regional hospitals, outpatient centres and in general facilities used by primary health providers damaged or destroyed by the hazardous event. (Revision from the SDG Proposal)</p> <p>Hazardous event: The occurrence of a natural or human-induced phenomenon in a particular place during a particular period of time due to the existence of a hazard. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Hazard: A potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p>
Method of computation	Summation of data from national disaster loss databases
Rationale and interpretation	<p>This indicator monitors an element of “damage to critical infrastructures” and indirectly monitors an element of “disruption of basic services” in the Target D and also monitors an element included in direct economic loss (the Target C) and affected people (the Target B).</p> <p>More than 80 countries have historic data.</p> <p>The disaster loss data is significantly influenced by large-scale catastrophic events, which represent important outliers. UNISDR recommends Countries to report the data by event, so complementary analysis can be done by both including and excluding such catastrophic events that can represent important outliers.</p>
Source and data collection	National disaster loss database, reported to UNISDR
Disaggregation	<p>By country, by event, by hazard type (e.g. disaggregation by climatological, hydrological, meteorological, geophysical, biological and extra-terrestrial for natural hazards is possible following IRDR classification)</p> <p>Ideally, in addition, by sub-national administrative unit</p>
Comments and limitations	<p>Not every country has comparable national disaster loss database consistent with the UNISDR guidelines (current coverage is 85 countries. Additional 32 countries are expected to be covered in 2015-16). By 2020, all countries will be expected to build/adjust the database according to the standard guideline.</p> <p>Counting the number of facilities does not necessarily reflect the size of the facility and related impact on the communities.</p>
Main linkage with SDG targets	<p>Target 9.1: Develop quality, reliable, sustainable and resilient infrastructure, including regional and trans border infrastructure, to support</p>

	<p>economic development and human well-being, with a focus on affordable and equitable access for all</p> <p>Target 1.5: By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters</p> <p>Target 11.5: By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations</p> <p>Target 13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries</p> <p>Target 1.4: By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance</p> <p>Target 11.1: By 2030, ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums</p> <p>Target 3.6: By 2020, halve the number of global deaths and injuries from road traffic accidents</p> <p>Target 3.c: Substantially increase health financing and the recruitment, development, training and retention of the health workforce in developing countries, especially in least developed countries and small island developing States</p> <p>Target 3.8: Achieve universal health coverage, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all</p> <p>Target 3.d: Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks</p>
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Indicator D-3 Number of educational facilities destroyed or damaged by hazardous events

Definitions	<p>Educational facilities destroyed or damaged: The number of play schools, kindergartens, primary, secondary or middle schools, technical-vocational schools, colleges, universities, training centres, adult education, military schools and prison schools damaged or destroyed by the hazardous event. (Revision from the SDG Proposal)</p> <p>Hazardous event: The occurrence of a natural or human-induced phenomenon in a particular place during a particular period of time due to the existence of a hazard. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Hazard: A potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p>
Method of computation	Summation of data from national disaster loss databases
Rationale and interpretation	<p>This indicator monitors an element of “damage to critical infrastructures” and indirectly monitors an element of “disruption of basic services” in the Target D and also monitors an element included in direct economic loss (the Target C) and affected people (the Target B).</p> <p>More than 80 countries have historic data.</p> <p>The disaster loss data is significantly influenced by large-scale catastrophic events, which represent important outliers. UNISDR recommends Countries to report the data by event, so complementary analysis can be done by both including and excluding such catastrophic events that can represent important outliers.</p>
Source and data collection	National disaster loss database, reported to UNISDR
Disaggregation	<p>By country, by event, by hazard type (e.g. disaggregation by climatological, hydrological, meteorological, geophysical, biological and extra-terrestrial for natural hazards is possible following IRDR classification)</p> <p>By destroyed/damaged</p> <p>Ideally, in addition, by sub-national administrative unit</p>
Comments and limitations	<p>Not every country has comparable national disaster loss database consistent with the UNISDR guidelines (current coverage is 85 countries. Additional 32 countries are expected to be covered in 2015-16). By 2020, all countries will be expected to build/adjust the database according to the standard guideline.</p> <p>Counting the number of facilities does not necessarily reflect the size of the facility and related impact on the communities.</p>

<p>Main linkage with SDG targets</p>	<p>Target 9.1: Develop quality, reliable, sustainable and resilient infrastructure, including regional and trans border infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all</p> <p>Target 4.a: Build and upgrade education facilities that are child, disability and gender sensitive and provide safe, non-violent, inclusive and effective learning environments for all</p> <p>Target 1.5: By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters</p> <p>Target 11.5: By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations</p> <p>Target 13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries</p> <p>Target 1.4: By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance</p> <p>Target 11.1: By 2030, ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums</p>
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Indicator D-4 Number of transportation infrastructures destroyed or damaged by hazardous events

<p>Definitions</p>	<p>Transportation infrastructure: The basic physical and organizational structures and facilities needed for taking or carrying people or goods from one place to another by means of a vehicle, aircraft, or ship (Oxford Dictionary)</p> <p>In this indicator, it consists of roads, railways, ports and airports.</p> <p>Roads damaged or destroyed: The length of road networks damaged or destroyed due to the hazardous event, in kilometres. (SDG Proposal)</p> <p>Railways damaged or destroyed: The lengths of railway networks damaged or destroyed due to the hazardous events, in kilometres.</p> <p>Ports damaged or destroyed: The number of facilities damaged or destroyed due to hazardous events.</p> <p>Airports damaged or destroyed: The number of facilities damaged or destroyed due to hazardous events.</p> <p>Hazardous event: The occurrence of a natural or human-induced phenomenon in a particular place during a particular period of time due to the existence of a hazard. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Hazard: A potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p>
<p>Method of computation</p>	<p>Summation of data from national disaster loss databases Compounding methodology should be developed.</p>
<p>Rationale and interpretation</p>	<p>This indicator monitors an element of “damage to critical infrastructures” and indirectly monitors an element of “disruption of basic services” in the Target D and also monitors an element included in direct economic loss (the Target C) and affected people (Target B).</p> <p>More than 80 countries have historic data regarding damage to roads.</p> <p>The disaster loss data is significantly influenced by large-scale catastrophic events, which represent important outliers. UNISDR recommends Countries to report the data by event, so complementary analysis can be done by both including and excluding such catastrophic events that can represent important outliers.</p>
<p>Source and data collection</p>	<p>National disaster loss database, reported to UNISDR</p>
<p>Disaggregation</p>	<p>By country, by event, by hazard type (e.g. disaggregation by climatological, hydrological, meteorological, geophysical, biological and extra-terrestrial for natural hazards is possible following IRDR classification)</p>

	<p>By transportation mode</p> <p>Ideally, in addition, by sub-national administrative unit</p>
Comments and limitations	<p>Not every country has comparable national disaster loss database consistent with the UNISDR guidelines (current coverage is 85 countries. Additional 32 countries are expected to be covered in 2015-16). By 2020, all countries will be expected to build/adjust the database according to the standard guideline.</p> <p>Measuring the lengths of roads and railways does not necessarily reflect the quality and function of roads/railways and related impact on the communities.</p> <p>Counting the number of port/airport facilities does not necessarily reflect the size of the facility and related impact on the communities.</p> <p>The national disaster loss database developed does not have historic data on damage to railways, ports and airports. Establishing baseline data is a challenge.</p>
Main linkage with SDG targets	<p>Target 9.1: Develop quality, reliable, sustainable and resilient infrastructure, including regional and trans border infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all</p> <p>Target 11.2: By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons</p> <p>Target 1.5: By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters</p> <p>Target 11.5: By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations</p> <p>Target 13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries</p> <p>Target 1.4: By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as</p>

	<p>access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance</p> <p>Target 11.1: By 2030, ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums</p> <p>Target 3.6: By 2020, halve the number of global deaths and injuries from road traffic accidents</p>
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Indicator D-5 Number of time basic services have been disrupted due to hazardous events

<p>Definitions</p>	<p>Basic Services: Services that are needed for all of society to function effectively. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>For this indicator, disruption of basic services is measured in the following public services.</p> <p>Interruption or lower quality of service in any of the public services: The interruptions or lower quality of service observed in the healthcare services, education services, transport sector, ICT, water supply, sewerage systems, solid waste management, power and energy supply, and emergency response (binary variables of Yes/No)</p> <p>Health facilities: health centres, clinics, local and regional hospitals, outpatient centres and in general facilities used by primary health providers</p> <p>Educational facilities: play schools, kindergartens, primary, secondary or middle schools, technical-vocational schools, colleges, universities, training centres, adult education, military schools and prison schools</p> <p>Transport system: road networks, railways (including stations), airports and ports</p> <p>ICT system: plants and telephone networks (telecommunication network), radio and television stations, post offices and public information offices, internet services, radio telephones and mobile phones</p> <p>Water supply: drinking water supply system (water outlets, water treatment plants, aqueducts and canals which carry drinking water, storage tanks.)</p> <p>Sewerage system: sanitation and sanitary sewage systems and collection and treatment of solid waste.</p> <p>Solid waste management: collection and treatment of solid waste.</p> <p>Power/energy system: generation facilities, transmission and distribution system and dispatch centres and other works</p> <p>Emergency Response: disaster management office, fire management service, police, army and emergency operation centres</p> <p>Hazardous event: The occurrence of a natural or human-induced phenomenon in a particular place during a particular period of time due to the existence of a hazard. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Hazard: A potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p>
<p>Method of computation</p>	<p>Summation of data from national disaster loss databases. Divide the total number of “Yes” by the total number of event.</p>
<p>Rationale and interpretation</p>	<p>This indicator monitors an element of “disruption of basic services” in the Target D and indirectly monitors an element of the affected people (Target B).</p> <p>The indicator is relatively subjective based on the observation of data recorder.</p>

Source and data collection	National disaster loss database, reported to UNISDR
Disaggregation	By country, by event, by hazard type (e.g. disaggregation by climatological, hydrological, meteorological, geophysical, biological and extra-terrestrial for natural hazards is possible following IRDR classification) By sector Ideally, in addition, by sub-national administrative unit
Comments and limitations	<u>Expert Group recommends replacing “times” with “days” and adding “how many people have not received basic services (figure to be normalized over population)”. UNISDR adds reservation for the proposal by Expert Group because it is extremely difficult to define and record the duration of service disruption and number of people who did not receive basic services. Introducing certain scales (duration: short, medium and long, affected scale in terms of household numbers) might be a practical solution but need to consider thresholds.</u> Not every country has comparable national disaster loss database consistent with the UNISDR guidelines (current coverage is 85 countries. Additional 32 countries are expected to be covered in 2015-16). By 2020, all countries will be expected to build/adjust the database according to the standard guideline.
Main linkage with SDG targets	Not proposed for the SDGs but related with the following targets. Target 9.1: Develop quality, reliable, sustainable and resilient infrastructure , including regional and trans border infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all Target 1.5: By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters Target 11.5: By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters , including water-related disasters, with a focus on protecting the poor and people in vulnerable situations Target 13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries Target 1.4: By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services , ownership and control over land and other

	<p>forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance</p> <p>Target 11.1: By 2030, ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums</p> <p>Target 4.a: Build and upgrade education facilities that are child, disability and gender sensitive and provide safe, non-violent, inclusive and effective learning environments for all</p> <p>Target 3.6: By 2020, halve the number of global deaths and injuries from road traffic accidents</p> <p>Target 11.2: By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons</p> <p>Target 3.c: Substantially increase health financing and the recruitment, development, training and retention of the health workforce in developing countries, especially in least developed countries and small island developing States</p> <p>Target 3.d: Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks</p>
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Target E: Substantially increase the number of countries with *national and local disaster risk reduction strategies* by 2020.

Possible indicators suggested:

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

(SDG proposal: Consistency with SDG proposal needed.)

E2 – Percentage of local governments that adopt and implement local DRR strategies in line with the [Sendai Framework for Disaster Risk Reduction 2015-2030 /national disaster risk reduction strategy – **Nepal**]

(SDG proposal: Consistency with SDG proposal needed.)

E3 – Number of countries that [integrate/integrated- **Morocco**] [climate and disaster risk/climate change-**Morocco**] into [development planning/development plan-**Morocco**]

(Also functions as indicator contributing to the outcome of the Target C “economic loss”)

[E4 – Number of countries that adopt and implement critical infrastructure protection plan – **Czech Republic, India, Egypt-delete**]

(SDG proposal: Consistency with SDG proposal needed.)

(Also functions as indicator contributing to the outcome of the Target D “damage to critical infrastructure”)

Additional indicators discussed and recommended by the Expert Groups:

[E5 Number of countries with cross-sectoral bodies/forums, with clear roles and responsibilities identified across state institutions, civil society, private sector and international actors, in the implementation and review of DRR measures- **Cuba, Czech Republic-delete; Japan-retain**]

[E-6 Number of countries accounting for future risk in public and private balance sheets, setting financial targets to inform investment strategies for reducing risk and enhancing future prosperity- **Cuba, Czech Republic-delete**]

[E-7 Number of countries and local governments conducting (independent) periodic outcome reviews of the implementation of national and local DRR strategies - **Cuba, Czech Republic-delete**]

Other indicators proposed in the 1st OEIWG

[E8 Number of countries that adopt and implement sector specific DRR strategies in line with the Sendai Framework for Disaster Risk Reduction – Tanzania]

[E9 – Number of countries that have national financing mechanisms for DRR –Madagascar, India]

[E10 – Number of countries that have spatial and land use planning mechanisms for DRR – Madagascar]

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

Definitions	<p>National DRR strategies in line with the Sendai Framework for Disaster Risk Reduction 2015-2030: national disaster risk reduction strategies and plans, across different timescales with targets, indicators and time frames, aimed at preventing the creation of risk, the reduction of existing risk and the strengthening of economic, social, health and environmental resilience (Sendai Framework, para 27(b)). In the Sendai Framework, link with DRR and climate change adaptation is strongly advocated.</p> <p><u>Note: the DRR strategies need to be based on risk information and assessments.</u></p> <p>Disaster risk reduction plan: A document prepared by an authority, sector, organisation or enterprise that sets out goals and specific objectives for reducing disaster risks together with related actions to accomplish these objectives. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Country: A nation with its own government, occupying a particular territory (Oxford Dictionary)</p>
Method of computation	Summation of data from National Progress Report of the Sendai Monitor
Rationale and interpretation	This indicator directly monitors the Target E.
Source and data collection	National Progress Report of the Sendai Monitor, reported to UNISDR
Disaggregation	By country
Comments and limitations	<p><u>Expert Group recommended adding “aligned with enabling legislation and regulation”. UNISDR has reservation because defining “enabling legislation and regulation” would bring new complexity and subjectivity.</u></p> <p>Expert Group also recommended for the Target G “<u>Number of countries that have national multi-hazard risk assessment providing the necessary information for National DRR strategies</u>”. This aspect can be integrated in the definition of DRR strategies in this indicator.</p> <p>Reporting of the HFA Monitor and the succeeding Sendai Monitor under development is not mandatory but it is only global database collecting DRR policy information. The HFA Monitor started in 2007 and over time, the number of countries reporting to UNISDR increased from 60 in 2007 to 133 in 2013. Because there is no specific data addressing this indicator at this moment, a baseline as of 2015 should be created through a questionnaire to all countries in order to monitor both the Sendai Framework and the SDGs.</p>
Main linkage with SDG targets	Target 13.2: Integrate climate change measures into national policies, strategies and planning

	<p>Target 13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries</p> <p>Target 13.b: Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries, including focusing on women, youth, local and marginalized communities</p> <p>Target 9.1: Develop quality, reliable, sustainable and resilient infrastructure, including regional and trans border infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all</p> <p>Target 11.5: By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations</p> <p>Target 1.5: By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters</p> <p>Target 3.9: By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination</p> <p>Target 3.d: Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks</p>
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Indicator E-2 Percentage of local governments that adopt and implement local DRR strategies in line with the Sendai Framework for Disaster Risk Reduction 2015-2030

Definitions	<p>Local DRR Strategies in line with the Sendai Framework for Disaster Risk Reduction 2015-2030: local disaster risk reduction strategies and plans, across different timescales with targets, indicators and time frames, aimed at preventing the creation of risk, the reduction of existing risk and the strengthening of economic, social, health and environmental resilience (Sendai Framework, para27 (b))</p> <p><u>Note: the DRR strategies need to be based on risk information and assessments.</u></p> <p>Disaster risk reduction plan: A document prepared by an authority, sector, organisation or enterprise that sets out goals and specific objectives for reducing disaster risks together with related actions to accomplish these objectives. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Local Government: Form of public administration at the lowest tier of administration within a given state, which generally acts within powers delegated to them by legislation or directives of the higher level of government.</p>
Method of computation	Summation of data from National Progress Report of the Sendai Monitor
Rationale and interpretation	This indicator directly monitors the Target E.
Source and data collection	National Progress Report of the Sendai Monitor, reported to UNISDR
Disaggregation	By country, By city
Comments and limitations	<p>Expert Group also recommended for the Target G “<u>Percentage of local governments that have national multi-hazard risk assessment providing the necessary information for local DRR strategies</u>”. This aspect can be integrated in the definition of DRR strategies in this indicator.</p> <p>Reporting of the HFA Monitor and the succeeding Sendai Monitor under development is not mandatory but it is only global database collecting DRR policy information. The HFA Monitor started in 2007 and over time, the number of countries reporting to UNISDR increased from 60 in 2007 to 133 in 2013. Because there is no specific data addressing this indicator at this moment, a baseline as of 2015 should be created through a questionnaire to all countries in order to monitor both the Sendai Framework and the SDGs.</p>
Main linkage with SDG targets	Target 11.b: By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, holistic disaster risk management at all levels

	<p>Target 13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries</p> <p>Target 13.b: Promote mechanisms for raising capacities for effective climate change-related planning and management, in least developed countries, including focusing on women, youth, local and marginalized communities</p> <p>Target 9.1: Develop quality, reliable, sustainable and resilient infrastructure, including regional and trans border infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all</p> <p>Target 11.5: By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations</p> <p>Target 1.5: By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters</p> <p>Target 3.9: By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination</p> <p>Target 14.2: By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans</p> <p>Target 3.d: Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks</p>
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Indicator E-3 Number of countries that integrate climate and disaster risk into development planning

Definitions	<p>Development Planning: Planning for “a multi-dimensional process involving changes in social structures, popular attitudes, and national institutions, as well as the acceleration of economic growth, the reduction of inequality, and the eradication of poverty” (Todaro and Smith, 2011)</p> <p>Climate and disaster risk integration into development planning: Satisfies the following three conditions: i) development plan(s) that recognizes disaster and climate risk as a challenge; ii) development plan (s) that identifies activities to address challenges from disaster and climate risk; iii) development plan (s) where addressing disaster and climate risk is metric of success.</p> <p>Country: A nation with its own government, occupying a particular territory (Oxford Dictionary)</p>
Method of computation	Summation of data from National Progress Reports of the Sendai Monitor
Rationale and interpretation	This indicator is highly related with the Target E and also monitors global policy progress to support the outcome of the Target C.
Source and data collection	National Progress Reports of the Sendai Monitor, reported to UNISDR
Disaggregation	By country
Comments and limitations	<p>Reporting of the HFA Monitor and the succeeding Sendai Monitor under development is not mandatory but it is only global database collecting DRR policy information. The HFA Monitor started in 2007 and over time, the number of countries reporting to UNISDR increased from 60 in 2007 to 133 in 2013. Because there is no specific data addressing this indicator at this moment, a baseline as of 2015 should be created through a questionnaire to all countries in order to monitor both Sendai Framework and the SDGs.</p> <p>Expert Group proposed alternative indicator of E3: Number of countries with implementation plans for DRR strategies informed by periodic and quantitative assessment of current and future multi-hazard risk, integrated into in national and sectoral development planning and investment”. UNISDR has reservation because this alternative would bring new complexity and subjectivity at global level and might be better monitored at national level.</p>
Main linkage with SDG targets	<p>Not proposed for the SDGs but related with the following targets.</p> <p>Target 11.5: By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations</p> <p>Target 13.2: Integrate climate change measures into national policies, strategies</p>

	<p>and planning</p> <p>Target 13.b: Promote mechanisms for raising capacities for effective climate change-related planning and management, in least developed countries, including focusing on women, youth, local and marginalized communities</p> <p>Target 13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries</p> <p>Target 1.5: By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters</p> <p>Target 9.1: Develop quality, reliable, sustainable and resilient infrastructure, including regional and trans border infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all</p> <p>Target 2.4: By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality</p> <p>Target 14.2: By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans</p> <p>Target 15.3: By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land-degradation-neutral world</p> <p>Target 3.6: By 2020, halve the number of global deaths and injuries from road traffic accidents</p> <p>Target 3.d: Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks</p>
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Indicator E-4 Number of countries that adopt and implement critical infrastructure protection plan

Definitions	<p>Critical infrastructure protection plan: Plan or programme to enhance the resilience of new and existing critical infrastructure systems, including water, transportation and telecommunications infrastructure, educational facilities, hospitals and other health facilities, to ensure that they remain safe, effective and operational during and after disasters and other contingencies in order to provide life-saving and essential services (SDG Proposal, Developed based on the Sendai Framework)</p> <p>Critical infrastructure: The physical structures, facilities, networks and other assets that support services that are socially, economically or operationally essential to the functioning of a society or community. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Country: A nation with its own government, occupying a particular territory (Oxford Dictionary)</p>
Method of computation	Summation of data from National Progress Reports of the Sendai Monitor
Rationale and interpretation	<p>This indicator is highly related with the Target E.</p> <p>This indicator also directly supports progress of the critical infrastructure in the Target (d) and indirectly contributes to reduction of the Target (b) affected people and the Target (c) economic loss</p>
Source and data collection	National Progress Reports of the Sendai Monitor, reported to UNISDR
Disaggregation	By country
Comments and limitations	Reporting of the HFA Monitor and the succeeding Sendai Monitor under development is not mandatory but it is only global database collecting DRR policy information. The HFA Monitor started in 2007 and over time, the number of countries reporting to UNISDR increased from 60 in 2007 to 133 in 2013. Because there is no specific data addressing this indicator at this moment, a baseline as of 2015 should be created through a questionnaire to all countries in order to monitor both the Sendai Framework and the SDGs.
Main linkage with SDG targets	<p>Target 9.1: Develop quality, reliable, sustainable and resilient infrastructure, including regional and trans border infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all</p> <p>Target 13.2: Integrate climate change measures into national policies, strategies and planning</p> <p>Target 1.5: By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-</p>

	<p>related extreme events and other economic, social and environmental shocks and disasters</p> <p>Target 11.5: By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations</p> <p>Target 13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries</p> <p>Target 11.1: By 2030, ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums</p> <p>Target 1.4: By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance</p> <p>Target 4.a: Build and upgrade education facilities that are child, disability and gender sensitive and provide safe, non-violent, inclusive and effective learning environments for all</p> <p>Target 14.2: By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans</p> <p>Target 15.3: By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land-degradation-neutral world</p> <p>Target 3.9: By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination</p> <p>Target 3.d: Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks</p>
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	<p>Target3.c: Substantially increase health financing and the recruitment, development, training and retention of the health workforce in developing countries, especially in least developed countries and small island developing States</p> <p>Target 3.6: By 2020, halve the number of global deaths and injuries from road traffic accidents</p> <p>Target 11.2: By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons</p>
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Indicator E-5 Number of countries with cross-sectoral bodies/forums, with clear roles and responsibilities identified across state institutions, civil society, private sector and international actors, in the implementation and review of DRR measures

Definitions	<p>Cross-sectoral bodies/forum: Coordinating mechanisms that operate within and across sectors and with relevant stakeholders across public and private stakeholders and at all levels, with the full engagement of all State institutions at national and local levels (based on the Principles of the Sendai Framework, Para 19 (e))</p> <p>Sector: A distinct part or branch of a nation’s economy or society or of a sphere of activity (Oxford Dictionary). This may describe for example the education or agricultural sectors. A sector may also be a subgroup of an economic activity - as in “coal mining sector” - or a group of economic activities - as in “service sector” - or a cross-section of a group of economic activities - as in “informal sector” (OECD Glossary of Statistical Terms), public, private, or civil society sectors (non-exhaustive).</p> <p>Note: The typology of cross-sectoral bodies/forums includes but not limited to National DRR platform. Related: Paragraph 27 (g) of the Sendai Framework.</p> <p>National platform for disaster risk reduction: A generic term for national mechanisms for coordination and policy guidance on disaster risk reduction that are multi-sectoral and inter-disciplinary in nature, with public, private and civil society participation involving all concerned entities within a country. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Country: A nation with its own government, occupying a particular territory (Oxford Dictionary)</p>
Method of computation	Summation of data from National Progress Report of the Sendai Monitor
Rationale and interpretation	This indicator indirectly monitors the Target E.
Source and data collection	National Progress Report of the Sendai Monitor, reported to UNISDR
Disaggregation	By country
Comments and limitations	<p>This indicator seeks confirmation of the assignation of roles and responsibilities in implementing DRR measures. If the coordinating mechanisms established are to positively affect decision-making and investment behaviour, it is important that this is verified in the review.</p> <p>This indicator was proposed by the Expert Group but UNISDR has reservation because this can be part of DRR strategies. This should be included in national level indicator system.</p> <p>Reporting of the HFA Monitor and the succeeding Sendai Monitor under development is not mandatory but it is only global database collecting DRR policy information. The HFA Monitor started in 2007 and over time, the number of countries reporting to UNISDR increased from 60 in 2007 to 133 in 2013. Because there is no specific data addressing this indicator at this moment, a baseline as of 2015 should be created through a questionnaire to</p>

	all countries in order to monitor both the Sendai Framework and the SDGs.
Main linkage with SDG targets	<p>Target 13.2: Integrate climate change measures into national policies, strategies and planning</p> <p>Target 13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries</p> <p>Target 13.b: Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries, including focusing on women, youth, local and marginalized communities</p> <p>Target 9.1: Develop quality, reliable, sustainable and resilient infrastructure, including regional and trans border infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all</p> <p>Target 11.5: By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations</p> <p>Target 1.5: By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters</p> <p>Target 3.9: By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination</p> <p>Target 3.d: Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks</p>

Indicator E-6 Number of countries accounting for future risk in public and private balance sheets, setting financial targets to inform investment strategies for reducing risk and enhancing future prosperity

Definitions	<p>Accounting for future risk: The incorporation of the risk that is estimated to impact societies, economies and activities in the short, medium and long term as the exposure of persons and assets increases - in addition to the existing stock of risk - in public and private financial records and statements.</p> <p>Public and private balance sheets: A statement of the assets, liabilities, and capital of a public entity, organisation or business at a particular point in time, detailing the balance of income and expenditure over the preceding period (Oxford Dictionary).</p> <p>Financial targets to inform investment strategies: The determination and incorporation of disaster risk reducing approaches within public and private investment that are established on the basis of a target or targets, established for instance by a ministry of finance or a central bank, that mitigates anticipated losses incurred by current and future risk. (proposed by Experts Group and based on the Sendai Framework Para 18 (c)).</p> <p>Country: A nation with its own government, occupying a particular territory (Oxford Dictionary)</p>
Method of computation	Summation of data from National Progress Reports of the Sendai Monitor
Rationale and interpretation	This indicator is highly related with the Target E and also monitors global policy progress to support the outcome of the Target C.
Source and data collection	National Progress Reports of the Sendai Monitor, reported to UNISDR
Disaggregation	By country
Comments and limitations	<p>Current and future disaster risk rarely features as a liability in public or private financial statements. If these liabilities are not recorded, the incentive to assume the costs of investment required to mitigate the costs incurred by these losses is much diminished. This indicator seeks to measure the degree to which such liabilities are estimated and incorporated in financial planning and investment so as to overcome impediments to future prosperity.</p> <p>This indicator was proposed by the Expert Group but UNISDR has reservation because the time frame of Target E is 2020 and the monitoring global progress of this indicator might be too ambitious. This should be included in national level indicator system.</p> <p>Reporting of the HFA Monitor and the succeeding Sendai Monitor under development is not mandatory but it is only global database collecting DRR policy information. The HFA Monitor started in 2007 and over time, the number of countries reporting to UNISDR increased from 60 in 2007 to 133 in 2013. Because there is no specific data addressing this indicator at this moment, a baseline as of 2015 should be created through a questionnaire to all countries in order to monitor both the Sendai Framework and the SDGs.</p>

<p>Main linkage with SDG targets</p>	<p>Not proposed for the SDGs but related with the following targets.</p> <p>Target 11.5: By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations</p> <p>Target 13.2: Integrate climate change measures into national policies, strategies and planning</p> <p>Target 13.b: Promote mechanisms for raising capacities for effective climate change-related planning and management, in least developed countries, including focusing on women, youth, local and marginalized communities</p> <p>Target 13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries</p> <p>Target 1.5: By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters</p> <p>Target 9.1: Develop quality, reliable, sustainable and resilient infrastructure, including regional and trans border infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all</p> <p>Target 2.4: By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality</p> <p>Target 14.2: By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans</p> <p>Target 15.3: By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and</p>
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	<p>strive to achieve a land-degradation-neutral world</p> <p>Target 3.6: By 2020, halve the number of global deaths and injuries from road traffic accidents</p> <p>Target 3.d: Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks</p>
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Indicator E-7 Number of countries and local governments conducting (independent) periodic outcome reviews of the implementation of national and local DRR strategies

Definitions	<p>Independent periodic outcome reviews: A cyclical and impartial appraisal of the impact of the implementation of national and local DRR strategies in achieving the outcome and goal of the Sendai Framework (Paras 16 and 17). Independent implies free from the influence of those stakeholders being evaluated. Periodic describes the definition of a predictable frequency of review (to be determined by the appropriate authority).</p> <p>National DRR strategies in line with the Sendai Framework for Disaster Risk Reduction 2015-2030: national disaster risk reduction strategies and plans, across different timescales with targets, indicators and time frames, aimed at preventing the creation of risk, the reduction of existing risk and the strengthening of economic, social, health and environmental resilience (Sendai Framework, para 27(b)). In the Sendai Framework, link with DRR and climate change adaptation is strongly advocated.</p> <p>Local DRR Strategies in line with the Sendai Framework for Disaster Risk Reduction 2015-2030: local disaster risk reduction strategies and plans, across different timescales with targets, indicators and time frames, aimed at preventing the creation of risk, the reduction of existing risk and the strengthening of economic, social, health and environmental resilience (Sendai Framework, para27 (b))</p> <p>Disaster risk reduction plan: A document prepared by an authority, sector, organisation or enterprise that sets out goals and specific objectives for reducing disaster risks together with related actions to accomplish these objectives. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Country: A nation with its own government, occupying a particular territory (Oxford Dictionary)</p> <p>Local Government: Form of public administration at the lowest tier of administration within a given state, which generally acts within powers delegated to them by legislation or directives of the higher level of government.</p>
Method of computation	Summation of data from National Progress Report of the Sendai Monitor
Rationale and interpretation	This indicator indirectly monitors the Target E.
Source and data collection	National Progress Report of the Sendai Monitor, reported to UNISDR
Disaggregation	By country
Comments and limitations	In calling for the predictable assessment of the impact that the implementation of such strategies has on trends in disaster risk and the corollary losses incurred, this indicator places the emphasis on both the implementation of national and local DRR strategies (and not simply their formulation), as well as their relevance.

	<p>This indicator was proposed by the Expert Group but UNISDR has reservation because the scope of this indicator (review) seems to be beyond the Target (e). This should be included in national level indicator system.</p> <p>Reporting of the HFA Monitor and the succeeding Sendai Monitor under development is not mandatory but it is only global database collecting DRR policy information. The HFA Monitor started in 2007 and over time, the number of countries reporting to UNISDR increased from 60 in 2007 to 133 in 2013. Because there is no specific data addressing this indicator at this moment, a baseline as of 2015 should be created through a questionnaire to all countries in order to monitor both the Sendai Framework and the SDGs.</p>
Main linkage with SDG targets	<p>Target 13.2: Integrate climate change measures into national policies, strategies and planning</p> <p>Target 13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries</p> <p>Target 13.b: Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries, including focusing on women, youth, local and marginalized communities</p> <p>Target 9.1: Develop quality, reliable, sustainable and resilient infrastructure, including regional and trans border infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all</p> <p>Target 11.5: By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations</p> <p>Target 1.5: By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters</p> <p>Target 3.9: By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination</p> <p>Target 3.d: Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks</p>

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.

Indicators proposed in the 1st OEIWG

[Chapeau:

This indicator directly supports the developing countries' implementation of the Sendai Framework and the fulfilment of the global goals. (Bangladesh, Egypt)

F1 - Level of non-earmarked support provided by developed countries and reported by developing countries. (Bangladesh, Egypt)

F2 - Number of developed countries having a policy marker as part of the legislation on provisions for support to developing countries to enhance the implementation of the Sendai Framework and the fulfilment of the global goals. (Bangladesh, Egypt)

F3- Progress on the implementation of paragraph 47 of the Sendai Framework, in particular subparagraphs 47(a) and 47 (b). (Bangladesh, Egypt, Ecuador, Brazil)

F4 - Progress in using the regional platforms for exchanging experiences and enhancing South-South cooperation for the implementation of the Sendai Framework. (Bangladesh, Egypt)

F5 - Level of support provided by international organizations in line with paragraph 48 of the Sendai Framework. (Bangladesh, Egypt)]

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.

Possible indicators suggested:

G-1 Number of countries that have multi-hazard early warning system (This index should be computed based on indicators G-2 through G-4 and G-6)

(SDG proposal: Consistency with SDG proposal needed.)

[G2 – Number of countries that have multi-hazard monitoring and forecasting system – **Ethiopia, Czech Republic-delete**]

G-3 – Number of people who are covered by multi-hazard early warning system [per 100,000-**Bhutan**]

G-4 – [Percentage / Number – **Cuba; El Salvador, Morocco** retain]] of local [and national – **Bhutan**] governments having preparedness plan (including EWS response and evacuation components) or evacuation plan [and standard operating procedures – **Tanzania**]

G-5 Number of countries that have [multi-hazard national risk assessment/risk information-**Bhutan**] with results in an accessible, understandable and usable format for stakeholders and people

(SDG proposal: Consistency with SDG proposal needed. Index represents additional elements for Sendai Framework indicator proposal)

G6 – [Percentage / Number – **Cuba; El Salvador, Morocco-** retain]] of local governments that have [multi-hazard risk assessment/risk information – **Bhutan**], with results in an accessible, understandable and usable format for stakeholders and people

Additional indicators discussed and recommended by the Expert Groups:

[G7 - Percentage of population with understanding of the risk they are exposed to- **Philippines, Czech Republic-delete**]

[G8 - Number of countries that have national plans with budget and timeline for development of multi-hazard EWS- **Philippines, Czech Republic-delete**]

[G9 - Number of countries that have disaster loss databases publicly accessible- **Philippines-delete**]

[G10 - Number of countries that have open data policies and mechanisms to make hazard and risk data accessible and available to all users-**Philippines-delete**]

Indicator G-1 Number of countries that have multi-hazard early warning system (This indicator should be computed based on indicators G-2 through G-4 and G-6).

Definitions	<p>Early warning system (EWS): An integrated set of hazard warning, risk assessment, communication and preparedness activities that enable individuals, communities, businesses and others to take timely action to reduce their risks. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Multi-hazard: addressing (1) selection of multiple major hazards that the country faces, and (2) specific contexts where hazardous events may occur simultaneously or cumulatively over time, and taking into account the potential interrelated effects.</p> <p>Multi-hazard early warning system: An early warning system designed to be used in multi-hazard contexts where hazardous events may occur simultaneously or cumulatively over time, and taking into account the potential interrelated effects. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Hazard: A potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Country: A nation with its own government, occupying a particular territory (Oxford Dictionary)</p>
Method of computation	<p>This indicator should be measured for each hazard separately to be meaningful.</p> <p>Compounding methodology should be developed at later stage.</p>
Rationale and interpretation	<p>This indicator directly monitors the Target G.</p>
Source and data collection	<p>National Progress Reports of the Sendai Monitor, reported to UNISDR</p>
Disaggregation	<p>By country</p>
Comments and limitations	<p>The indicator was originally proposed by UNISDR and also with other 16 agencies proposed for the SDG indicators. But Expert Group judged it would be almost impossible to measure the target according to this indicator because EWS is a localized phenomenon. The Group proposes G-8 to ratify the problem.</p> <p>Reporting of the HFA Monitor and the succeeding Sendai Monitor under development is not mandatory but it is only global database collecting DRR policy information. The HFA Monitor started in 2007 and over time, the number of countries reporting to UNISDR increased from 60 in 2007 to 133 in 2013. Because there is no specific data addressing this indicator at this moment, a baseline as of 2015 should be created through a questionnaire to all countries in order to monitor both the Sendai Framework and the SDGs.</p>

<p>Main linkage with SDG targets</p>	<p>Target 13.3: Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning</p> <p>Target 15:3: By 2020, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land-degradation-neutral world</p> <p>Target 2.4: By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality</p> <p>Target 11.5 By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations</p> <p>Target 13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries</p> <p>Target 3.d Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks</p>
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Indicator G-2 Number of countries that have multi-hazard monitoring and forecasting system

Definitions	<p>Early warning system (EWS): An integrated set of hazard warning, risk assessment, communication and preparedness activities that enable individuals, communities, businesses and others to take timely action to reduce their risks. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Multi-hazard: addressing (1) selection of multiple major hazards that the country faces, and (2) specific contexts where hazardous events may occur simultaneously or cumulatively over time, and taking into account the potential interrelated effects.</p> <p>Multi-hazard early warning system: An early warning system designed to be used in multi-hazard contexts where hazardous events may occur simultaneously or cumulatively over time, and taking into account the potential interrelated effects. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Hazard: A potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Monitoring and forecasting system: System consisting of device, people and institutional arrangement to observe, check or keep a continuous record of hazard or natural phenomena (such as precipitation) as well as define statement or statistical estimate of the likely occurrence of a future hazardous event or conditions for a specific area.</p> <p>Monitor: A device used for observing, checking, or keeping a continuous record of something (Oxford Dictionary)</p> <p>Forecast: Definite statement or statistical estimate of the likely occurrence of a future hazardous event or conditions for a specific area. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Country: A nation with its own government, occupying a particular territory (Oxford Dictionary)</p>
Method of computation	This indicator should be measured for each hazard separately to be meaningful.
Rationale and interpretation	This indicator monitors a component of EWS four components.
Source and data collection	National Progress Reports of the Sendai Monitor, reported to UNISDR
Disaggregation	By country
Comments and limitations	Reporting of the HFA Monitor and the succeeding Sendai Monitor under development is not mandatory but it is only global database collecting DRR policy information. The HFA Monitor started in 2007 and over time, the number of countries reporting to UNISDR increased from 60 in 2007 to 133

	<p>in 2013. Because there is no specific data addressing this indicator at this moment, a baseline as of 2015 should be created through a questionnaire to all countries in order to monitor both the Sendai Framework and the SDGs.</p>
<p>Main linkage with SDG targets</p>	<p>Not proposed for the SDGs but related with the following targets.</p> <p>Target 13.3: Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning</p> <p>Target 15.3: By 2020, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land-degradation-neutral world</p> <p>Target 2.4: By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality</p> <p>Target 11.5 By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations</p> <p>Target 13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries</p> <p>Target 3.d Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks</p>

Indicator G-3 Number of people who are covered by multi-hazard early warning system

Definitions	<p>Early warning system (EWS): An integrated set of hazard warning, risk assessment, communication and preparedness activities that enable individuals, communities, businesses and others to take timely action to reduce their risks. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Multi-hazard: addressing (1) selection of multiple major hazards that the country faces, and (2) specific contexts where hazardous events may occur simultaneously or cumulatively over time, and taking into account the potential interrelated effects.</p> <p>Multi-hazard early warning system: An early warning system designed to be used in multi-hazard contexts where hazardous events may occur simultaneously or cumulatively over time, and taking into account the potential interrelated effects. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Hazard: A potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>People covered : People who are supposed to receive the early warning because they are considered in the geospatial and social coverage of the warning</p>
Method of computation	This indicator should be measured for each hazard separately to be meaningful.
Rationale and interpretation	This indicator monitors a component of EWS four components.
Source and data collection	National Progress Reports of the Sendai Monitor, reported to UNISDR
Disaggregation	By country
Comments and limitations	Reporting of the HFA Monitor and the succeeding Sendai Monitor under development is not mandatory but it is only global database collecting DRR policy information. The HFA Monitor started in 2007 and over time, the number of countries reporting to UNISDR increased from 60 in 2007 to 133 in 2013. Because there is no specific data addressing this indicator at this moment, a baseline as of 2015 should be created through a questionnaire to all countries in order to monitor both the Sendai Framework and the SDGs.
Main linkage with SDG targets	<p>Not proposed for the SDGs but related with the following targets.</p> <p>Target 13.3: Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning</p>

	<p>Target 15:3: By 2020, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land-degradation-neutral world</p> <p>Target 2.4: By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality</p> <p>Target 11.5 By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations</p> <p>Target 13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries</p> <p>Target 3.d Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks</p>
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Indicator G-4 Percentage of local governments having preparedness plan (including EWS response and evacuation components) or evacuation plan.

Definitions	<p>Preparedness plan: Plan that establishes arrangements in advance to enable timely, effective and appropriate responses to specific potential events or emerging situations that might threaten society or the environment.</p> <p>Contingency planning: A management process that analyses emerging disaster risks and establishes arrangements in advance to enable timely, effective and appropriate responses. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Preparedness: The knowledge and capacities developed by governments, professional response and recovery organizations, communities and individuals to effectively anticipate, respond to, and recover from, the impacts of likely, imminent or current disasters. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Evacuation plan: Plan that establishes arrangements in advance to enable people and if possible assets to move temporarily to safer places before, during or after the occurrence of a hazardous event.</p> <p>Evacuated: People who, for different reasons or circumstances because of risk conditions or disaster, move temporarily to safer places before, during or after the occurrence of a hazardous event. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Local Government: Form of public administration at the lowest tier of administration within a given state, which generally acts within powers delegated to them by legislation or directives of the higher level of government.</p>
Method of computation	This indicator should be measured for each hazard separately to be meaningful.
Rationale and interpretation	This indicator monitors a component of EWS four components.
Source and data collection	National Progress Reports of the Sendai Monitor, reported to UNISDR
Disaggregation	By country, By city
Comments and limitations	Reporting of the HFA Monitor and the succeeding Sendai Monitor under development is not mandatory but it is only global database collecting DRR policy information. The HFA Monitor started in 2007 and over time, the number of countries reporting to UNISDR increased from 60 in 2007 to 133 in 2013. Because there is no specific data addressing this indicator at this moment, a baseline as of 2015 should be created through a questionnaire to all countries in order to monitor both the Sendai Framework and the SDGs.
Main linkage with SDG targets	<p>Not proposed for the SDGs but related with the following targets.</p> <p>Target 13.3: Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact</p>

	<p>reduction and early warning.</p> <p>Target 15:3: By 2020, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land-degradation-neutral world</p> <p>Target 2.4: By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality</p> <p>Target 11.5 By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations</p> <p>Target 13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries</p> <p>Target 3.d Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks</p> <p>Target 11.b: By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, holistic disaster risk management at all levels</p>
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Indicator G-5 Number of countries that have multi-hazard national risk assessment with results in an accessible, understandable and usable format for stakeholders and people

Definitions	<p>Risk assessment: An approach to determine the nature and extent of risk by analysing potential hazards and evaluating existing conditions of vulnerability that together could potentially harm exposed people, property, services, livelihoods and the environment on which they depend. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Multi-hazard: addressing (1) selection of multiple major hazards that the country faces, and (2) specific contexts where hazardous events may occur simultaneously or cumulatively over time, and taking into account the potential interrelated effects.</p> <p>Multi-hazard early warning system: An early warning system designed to be used in multi-hazard contexts where hazardous events may occur simultaneously or cumulatively over time, and taking into account the potential interrelated effects. (“Proposed updated Terminology on Disaster Risk Reduction (August 2015)”))</p> <p>Hazard: A potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Accessible, understandable and usable format: The targeted stakeholders can access the outputs with ease, understand it and use it for their respective needs.</p> <p>Stakeholders and People: Stakeholder is a person or an entity with a specific interest or concern in having access to use risk assessment results and people refer to the citizens of a country or a city.</p> <p>Country: A nation with its own government, occupying a particular territory (Oxford Dictionary)</p>
Method of computation	This indicator should be measured for each hazard separately to be meaningful.
Rationale and interpretation	This indicator directly monitors the element of “disaster risk information and assessments” of the Target G and a component of EWS four components.
Source and data collection	National Progress Reports of the Sendai Monitor, reported to UNISDR
Disaggregation	By country
Comments and limitations	<p>The indicator was originally proposed by UNISDR and also with other 16 agencies proposed for SDG indicators.</p> <p>Reporting of the HFA Monitor and the succeeding Sendai Monitor under development is not mandatory but it is only global database collecting DRR policy information. The HFA Monitor started in 2007 and over time, the number of countries reporting to UNISDR increased from 60 in 2007 to 133 in</p>

	<p>2013. Because there is no specific data addressing this indicator at this moment, a baseline as of 2015 should be created through a questionnaire to all countries in order to monitor both the Sendai Framework and the SDGs.</p>
<p>Main linkage with SDG targets</p>	<p>Target 13.3: Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning</p> <p>Target 15.3: By 2020, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land-degradation-neutral world</p> <p>Target 2.4: By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality</p> <p>Target 11.5 By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations</p> <p>Target 13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries</p> <p>Target 1.5: By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters</p> <p>Target 3.9: By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination</p> <p>Target 3.6: By 2020, halve the number of global deaths and injuries from road traffic accidents</p> <p>Target 3.d Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks</p>

Indicator G-6 Percentage of local governments that have multi-hazard risk assessment with results in an accessible, understandable and usable format for stakeholders and people.

Definitions	<p>Risk assessment: An approach to determine the nature and extent of risk by analysing potential hazards and evaluating existing conditions of vulnerability that together could potentially harm exposed people, property, services, livelihoods and the environment on which they depend. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Multi-hazard: addressing (1) selection of multiple major hazards that the country faces, and (2) specific contexts where hazardous events may occur simultaneously or cumulatively over time, and taking into account the potential interrelated effects.</p> <p>Multi-hazard early warning system: An early warning system designed to be used in multi-hazard contexts where hazardous events may occur simultaneously or cumulatively over time, and taking into account the potential interrelated effects. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Hazard: A potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Accessible, understandable and usable format: The targeted stakeholders can access the outputs with ease, understand it and use it for their respective needs.</p> <p>Stakeholders and People: Stakeholder is a person or an entity with a specific interest or concern in having access to use risk assessment results and people refer to the citizens of a country or a city.</p> <p>Local Government: Form of public administration at the lowest tier of administration within a given state, which generally acts within powers delegated to them by legislation or directives of the higher level of government.</p>
Method of computation	This indicator should be measured for each hazard separately to be meaningful.
Rationale and interpretation	This indicator directly monitors the element of “disaster risk information and assessments” of the Target G and a component of EWS four components.
Source and data collection	National Progress Reports of the Sendai Monitor, reported to UNISDR
Disaggregation	By country, By city
Comments and limitations	Reporting of the HFA Monitor and the succeeding Sendai Monitor under development is not mandatory but it is only global database collecting DRR policy information. The HFA Monitor started in 2007 and over time, the number of countries reporting to UNISDR increased from 60 in 2007 to 133 in

	<p>2013. Because there is no specific data addressing this indicator at this moment, a baseline as of 2015 should be created through a questionnaire to all countries in order to monitor both the Sendai Framework and the SDGs.</p>
<p>Main linkage with SDG targets</p>	<p>Not proposed for the SDGs but related with the following targets.</p> <p>Target 13.3: Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning</p> <p>Target 15:3: By 2020, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land-degradation-neutral world</p> <p>Target 2.4: By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality</p> <p>Target 11.5 By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations</p> <p>Target 13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries</p> <p>Target 3.d Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks</p> <p>Target 11.b: By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, holistic disaster risk management at all levels</p>

Indicator G-7 Percentage of population with understanding of the risk they are exposed to

Definition	<p>Risk: The combination of the probability of an event and its consequences which result from interaction (s) between natural or human induced hazard (s), vulnerability, exposure and capacity. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Exposed to: `Being in a state present in hazard zones that are thereby subject to potential losses.</p>
Method of computation	This indicator should be measured for each hazard separately to be meaningful.
Rationale and interpretation	This indicator indirectly relates with the Target G.
Source and data collection	<u>Method of objective data collection (how to measure people’s understanding) should be developed.</u>
Disaggregation	By country
Comments and limitations	<p>Method of objective data collection (how to measure people’s understanding) should be developed.</p> <p>Expert Group proposed this indicator. UNISDR has reservation because this indicator would be extremely difficult to measure objectively at global level.</p>
Main linkage with SDG targets	<p>Not proposed for the SDGs but related with the following targets.</p> <p>Target 13.3: Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning</p> <p>Target 15.3: By 2020, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land-degradation-neutral world</p> <p>Target 2.4: By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality</p> <p>Target 11.5 By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations</p>

	<p>Target 13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries</p> <p>Target 3.d Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks.</p>
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Indicator G-8 Number of countries that have national plans with budget and timeline for development of multi-hazard EWS

Definitions	<p>Early warning system (EWS): An integrated set of hazard warning, risk assessment, communication and preparedness activities that enable individuals, communities, businesses and others to take timely action to reduce their risks. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Multi-hazard: addressing (1) selection of multiple major hazards that the country faces, and (2) specific contexts where hazardous events may occur simultaneously or cumulatively over time, and taking into account the potential interrelated effects.</p> <p>Multi-hazard early warning system: An early warning system designed to be used in multi-hazard contexts where hazardous events may occur simultaneously or cumulatively over time, and taking into account the potential interrelated effects. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Hazard: A potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Country: A nation with its own government, occupying a particular territory (Oxford Dictionary)</p>
Method of computation	This indicator should be measured for each hazard separately to be meaningful.
Rationale and interpretation	G-8 is input indicators not directly monitoring “availability and accessibility”.
Source and data collection	National Progress Reports of the Sendai Monitor, reported to UNISDR
Disaggregation	By country
Comments and limitations	<p>Expert Group proposed this indicator. UNISDR has reservation because output of this policy can be measured by indicators G-1 (computed based on G-2 to G-4 and G—6).</p> <p>Reporting of the HFA Monitor and the succeeding Sendai Monitor under development is not mandatory but it is only global database collecting DRR policy information. The HFA Monitor started in 2007 and over time, the number of countries reporting to UNISDR increased from 60 in 2007 to 133 in 2013. Because there is no specific data addressing this indicator, a baseline as of 2015 should be created through a questionnaire to all countries in order to monitor both the Sendai Framework and the SDGs.</p>
Main linkage with SDG targets	Not proposed for the SDGs but related with the following targets.

	<p>Target 13.3: Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning</p> <p>Target 15:3: By 2020, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land-degradation-neutral world</p> <p>Target 2.4: By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality</p> <p>Target 11.5 By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations</p> <p>Target 13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries</p> <p>Target 3.d Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks</p>
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Indicator G-9 Number of countries that have disaster loss databases publicly accessible

Definition	<p>Disaster loss database: A collection of systematically collected records about disaster occurrence, damages, losses and impacts, ideally compliant with the Sendai Framework monitoring minimum requirements.</p> <p>Country: A nation with its own government, occupying a particular territory (Oxford Dictionary)</p>
Method of computation	Summation of data from National Progress Reports of the Sendai Monitor, reported to UNISDR
Rationale and interpretation	<p>This indicator indirectly relates with the Target G.</p> <p>Disaster loss information represents part of disaster risk information, especially useful for disaster risk reduction policies for frequent disasters.</p> <p>This indicator monitors loss data availability and accessibility.</p>
Source and data collection	National Progress Reports of the Sendai Monitor, reported to UNISDR
Disaggregation	By country
Comments and limitations	<p>This indicator can be implicitly measured by country reporting to the Targets A through D.</p> <p>Reporting of the HFA Monitor and the succeeding Sendai Monitor under development is not mandatory but it is only global database collecting DRR policy information. The HFA Monitor started in 2007 and over time, the number of countries reporting to UNISDR increased from 60 in 2007 to 133 in 2013. Because there is no specific data addressing this indicator at this moment, a baseline as of 2015 should be created through a questionnaire to all countries in order to monitor both the Sendai Framework and the SDGs.</p>
Main linkage with SDG targets	<p>Not proposed for the SDGs but related with the following targets.</p> <p>Target 13.3: Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning</p> <p>Target 15.3: By 2020, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land-degradation-neutral world</p> <p>Target 2.4: By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality</p> <p>Target 11.5 By 2030, significantly reduce the number of deaths and the number</p>

	<p>of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations</p> <p>Target 13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries</p> <p>Target 3.d Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks</p>
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Indicator G-10 Number of countries that have open data policies and mechanisms to make hazard and risk data accessible and available to all users

Definition	<p>Open Data: “Anyone is free to use, reuse, and distribute if subject only, at most, to requirement to attribute and/or share-alike” (source: Open Data Commons Attribution License).</p> <p>Hazard: A potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. (“Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Risk: The combination of the probability of an event and its consequences which result from interaction (s) between natural or human induced hazard (s), vulnerability, exposure and capacity. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)</p> <p>Country: A nation with its own government, occupying a particular territory (Oxford Dictionary)</p>
Method of computation	Summation of data from National Progress Reports of the Sendai Monitor, reported to UNISDR
Rationale and interpretation	This indicator indirectly relates with the Target G.
Source and data collection	National Progress Reports of the Sendai Monitor, reported to UNISDR
Disaggregation	By country
Comments and limitations	<p>Expert Group proposed this indicator. UNISDR has reservation because output of this policy can be measured by indicators G-1 (computed based on G-2 to G-4 and G—6) and G-5.</p> <p>Reporting of the HFA Monitor and the succeeding Sendai Monitor under development is not mandatory but it is only global database collecting DRR policy information. The HFA Monitor started in 2007 and over time, the number of countries reporting to UNISDR increased from 60 in 2007 to 133 in 2013. Because there is no specific data addressing this indicator at this moment, a baseline as of 2015 should be created through a questionnaire to all countries in order to monitor both the Sendai Framework and the SDGs.</p>
Main linkage with SDG targets	<p>Not proposed for the SDGs but related with the following targets.</p> <p>Target 13.3: Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning</p> <p>Target 15.3: By 2020, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land-degradation-neutral world</p>

	<p>Target 2.4: By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality</p> <p>Target 11.5 By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations</p> <p>Target 13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries</p> <p>Target 3.d Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks.</p>
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Appendix A:

Concept note on Methodology to Estimate Direct Economic Losses from Hazardous Events to Measure the Achievement of Target C of the Sendai Framework for Disaster Risk Reduction: A Technical Review

(Originally released in 11 November 2015)

Overview

This document outlines a methodology to estimate the value of direct economic losses caused by hazardous events. The Open-ended Intergovernmental Expert Working Group on Indicators and Terminology Related to Disaster Risk Reduction requested the UNISDR to propose a methodology at the first session, held in Geneva on 29-30 September 2015, as informed by the “Indicators to monitor global targets of the Sendai Framework for Disaster Risk Reduction 2015-2030 - a technical review”. (UNISDR, 2015a).

The purpose of this document is to support discussion by Member States on the selection and design of indicators to monitor progress and achievement of the global target C of the Sendai Framework for Disaster Risk Reduction 2015-2030.

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

The methodology described here is based on the work published in the Global Assessment Report on Disaster Risk Reduction (GAR) editions of 2013 and 2015 (UNISDR, 2013b and 2015c; Velazquez, et.al 2014), which is a simplified and adapted version of the ECLAC methodology (UN-ECLAC, 2014) and built on continuing work with scientific partners including the team of scientists that developed UNISDR Probabilistic Global Risk Model. The methodology has been tested with datasets of 56 and 82 countries, respectively. In the latest round of tests, UNISDR produced the economic assessment of 350,000 reports of small, medium and large scale disasters.

Disaster loss economic assessments have been conducted and reported by different actors using different approaches, with the notable exception of UN-ECLAC and World Bank post-disaster damage and loss assessments (DaLA's and PDNA's), which proposes a uniform, rigorous and consistent methodology, however conducted only for large scale disasters.

This lack of uniform approach is reflected in inconsistencies in economic losses currently reported by both national and international data sources. In the cases these estimates are present it is most often difficult to know which elements of loss were taken into consideration and the methodology, criteria and parameters used for estimation.

The methodology proposed here will allow assigning a **consistent, conservative and homogeneously** estimated economic value to physical losses in hundreds of thousands of disasters at all scales expected to be reported as part of the Sendai Framework Targets monitoring process.

This methodology proposes the collection and use of **simple and uniform physical indicators of damage (counts of assets affected)** as starting point of the calculations, instead of requesting countries to directly evaluate the economic value of direct losses. A centralized and common approach to estimate direct economic losses will result in homogeneous and consistent indicator.

National Disaster loss databases, the source of data used in this methodology to estimate direct economic loss, usually contain a large number of hazardous events records at all scale including quantitative and qualitative indicators of physical damage. The experience working with disaster loss databases covering around 85 countries indicate that simple physical damage indicators are in general robust.

The economic evaluation methodology is presented for each of the Indicators proposed. Each section generally contains a brief explanation of the three steps (data collection, conversion of physical value into economic value and conversion from national currency into US dollars) while identifying challenges and suggesting options for countries to consider how to address them.

The following are the indicators for which an economic valuation is proposed in this guideline:

- C1:** Direct Economic loss due to hazardous events in relation to global gross domestic product
- C2:** Direct agricultural loss due to hazardous events
- C3:** Direct economic loss due to industrial facilities damaged or destroyed by hazardous events
- C4:** Direct economic loss due to commercial facilities damaged or destroyed by hazardous events
- C5:** Direct economic loss due to houses damaged by hazardous events
- C6:** Direct economic loss due to houses destroyed by hazardous events
- C7:** Direct economic loss due to damage to critical infrastructure/public infrastructure caused by hazardous events, to be calculated based on the following indicators D2 to D4.
 - D2:** Number of health facilities destroyed or damaged by hazardous events
 - D3:** Number of educational facilities destroyed or damaged by hazardous events
 - D4:** Number of transportation infrastructures destroyed or damaged by hazardous events

Newly proposed indicators in the 1st meeting of open-ended intergovernmental working group are as follows. UNISDR is examining measurability and economic evaluation methodology and therefore the methodology are not included in this guideline.

- C8** –Direct economic loss due to cultural heritage damaged or destroyed by hazardous events
- C9** – Direct economic loss due to environment degraded by hazardous events

What is a “direct economic loss indicator”?

An indicator, as the word itself suggests, is a number that gives an **indication** of the size of certain phenomena¹, in this case it **estimates the value** of direct economic losses that occur in each disaster.

It is important to emphasize that **no indicator will provide an absolutely precise, accurate and exhaustive measure of losses**. It would be impossible to get rid of certain level of inaccuracy from direct economic loss estimations, depending on the methodology and criteria used to assign monetary value to the assets damaged or destroyed and the exhaustiveness of the data collection. In this sense, the loss estimated is always an approximate value (a “proxy”).

The indicators to measure direct economic losses for the Sendai Framework aim to meet following important criteria:

Consistent over time: The target requires the comparison of losses of two different decades. Losses over a period of 25 years have to be calculated in a consistent way in the entire span of the measurements so that no biases are introduced.

Consistent across countries: It must be applicable to any country in the world, allowing as much as possible comparisons among countries or regions, and feasible to calculate independently of the level of development or income of each country.

SMART: Specific, Measurable, Achievable, Relevant, Time Bound.

Reliable: Results can be trusted and a measure of dispersion, and for which a certain uncertainty measure can be determined.

Transparent: The methodology used is well known, with caveats weaknesses and limitations along with strengths, and the economic assessment biases can be determined.

Verifiable: The estimated economic value can be traced back to the original indicators of damage.

Feasible: Easy to collect data in a practical and realistic way, without imposing an extraordinary or even impossible burden to countries.

Taking advantage of existing data: Many countries have already collected standardized data. Taking advantage of this fact is more practical than having everyone start from zero.

Can be refined/improved over time: when better information is made available, or improved methodologies are developed the economic estimation can be revised to reflect the improvement.

Useful: Results can be used not only for measuring the achievement of targets but also for DRR strategy planning, awareness raising, risk assessments and other DRR policies.

¹ <http://www.oxforddictionaries.com/es/definicion/learner/indicador>

Common methodology proposed: Direct economic losses using replacement cost approach

The methodology proposed is the conversion of physical damage value into economic value using replacement cost to monitor direct economic losses. The methodology is consistent with DALA and PDNA methodology.

Sendai Framework Target C specifically requires “**direct economic loss**” to be estimated. For the purposes of this methodology, the term “*Direct economic loss*” and related key terms are defined as proposed by the “ Proposed Updated Terminology on Disaster Risk Reduction: A Technical Review” background paper submitted to the Open-ended Intergovernmental Working Group of the Sendai Framework (UNISDR, 2015d).

Economic loss: *Total economic impact that consists of direct economic loss and indirect economic loss.*

Comments: Direct and indirect economic loss are two complementary parts of the total economic loss.

Direct economic loss: *The monetary value of total or partial destruction of physical assets existing in the affected area.*

Comments: Examples of physical assets include homes, schools, hospitals, commercial and governmental buildings, transport, energy, telecommunications infrastructures and other infrastructure; business assets and industrial plants; production such as standing crops, agricultural infrastructure and livestock. They may also encompass environment and cultural heritage.

Indirect economic loss: *Declines in value added as a consequence of direct economic loss and/or human and environmental impacts. Indirect economic loss is part of disaster impact.*

Comments: Indirect economic loss includes micro-economic impacts (e.g. revenue declines owing to business interruption), meso-economic impacts (e.g. revenue declines owing to impacts on a supply chain or temporary unemployment) and macro-economic 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.

Note from UNISDR: In DALA and PDNA methodologies, direct economic loss is called “damage” while indirect economic loss is called “loss”.

Replacement Cost: *The cost of replacing damaged assets with materials of like kind and quality.*

Comments: This includes both private and public assets. Replacement is not necessarily an exact duplicate of the subject but serves the same purpose or function as the original (not taking into account build back better).

The methodology basically consists in the following three steps. We identify challenges in each step.

Step 1: Collect good quality of data, ideally disaggregated, on physical damage per hazardous event.

Step 2: Apply replacement cost per unit to estimate economic value

Step 3: Convert the economic value from the one expressed in national currency into the one expressed into US dollars

With difference in details, the basic formula common to all indicators is as follows:

Direct economic loss =

(a) Number of physical assets affected (e.g. number of facilities damaged)

*** (b) Size of the physical assets**

*** (c) Unit Cost** (e.g. per square meters, per kilometres, per hectare)

As the formula shows, it is required to collect three critical data for estimation. In Step 1, the data (a) is collected from national disaster loss databases. In step 2, the data (b) and (c) are collected mainly from disaster loss databases or national socio-economic statistics. In case the data does not exist, it is suggested to be estimated using global methodology.

(a) Number of physical assets damage: The data is collected and reported from national disaster loss database. The level of disaggregation will enhance the accuracy of economic loss estimation while increasing the data collection burden. Several options are suggested in the section of each indicator.

(b) Size of physical assets: The most accurate estimate is possible if countries collect and report data on individual size of physical assets affected on each hazardous event. However, this involves a huge effort on data collection which is believed not feasible nor practical.

Countries are recommended to provide as proxy average size of physical assets (e.g. average size of housing, average size of commercial facility, average weight of livestock, average). Usually such data are found in official statistics or other statistics compiled by sectoral ministries. For example, average size of housing data can be often found in housing statistics.

In some cases, instead of average, using the median (middle value in the data set) or mode (the value most often observed in the data set) might be appropriate. If countries additionally report “distribution of assets by certain category” (e.g. type of crops, size category), weighted averages can be also proposed.

When countries cannot provide data from their related socio-economic statistics, as the last resort, UNISDR proposes the use of global data, or application of methodology based on the work from Global Assessment Report.

(c) **Unit cost:** As the majority of countries will collect only the number of facilities affected, countries are recommended to provide a proxy construction cost per unit (e.g. housing construction cost per square meter, school construction cost per square meter). If the asset is public assets, usually ministries in charge of the public asset have the data. For example, Ministry of Public Work would have standard road construction cost per kilometre. In case of private assets such as industrial facility, it is more difficult to find such data. However, related ministries or association of construction business are likely to have the data.

It is of note that construction cost per unit is usually different across sectors (e.g. industrial vs housing) and within sectors (urban vs rural, industrial sector, building structure). While enhancing reporting these details will significantly improve accuracy of loss estimate, it may raise the costs required to obtain this information.

When countries cannot report data from their related socio-economic statistics, as the last resort, UNISDR proposes the use of global data, or application of methodology based on the long lasting work for Global Assessment Report (See Annex I).

For element (c), ideally, a matrix *similar* to the one below should be filled up.

Table: Suggested MINIMUM REQUIREMENT: proxies to be provided by countries for Step 2 of C3 to C7 indicators

(The number and data source filled in is a sample value to show the image of reporting.)

Type of buildings	average size of facilities (m2) (a)	construction cost per m2 (b)	Data source
Industrial (for C3)	2,000	1,200	(a) Ministry of Economy (b) Application of national proxy formula
Commercial (for C4)	700	800	(a) Ministry of Commerce (b) National Construction Association
Housing (for C5 and C6)	55	500	(a) Ministry of Housing (b) Global Compass Data
Health (for C7)	60	800	(a) Application of recommended fixed value (b) Ministry of Health
Education (for C7)	200	300	(a)(b) Ministry of Education
National Proxy (When data is not provided by countries nor global database)	-	Estimate based on COMPASS data	UNISDR

Depending on data availability on each country, and on the level of detail of the actual physical damage data collection, these proxies could be disaggregated to enhance the quality of the estimates.

For example, if a country collects disaggregated data on physical damage for housing sector in rural and urban categories, then countries are recommended to provide both sizes and prices corresponding to each category.

Evolution of price over time

How to assure proper comparison across time? It is important to distinguish what part of the change in economic loss data stems from a change in the quantities affected and what part is accrued to a change in prices. Let's suppose the case that the housing loss is worth USD 10,000 in the first year and USD 12,000 in the second. It is important to know if this 20% loss increase is due to an increase in the number of housing affected or to an increase in its price.

The price factor, in this case, the construction cost per unit, change across time due to technical development and other market related factors (e.g. price increase of construction material in relation to other goods and services). General Price level change such as inflation will also influence unit price.

When the main objective of monitoring direct economic loss is observing the trend of physical damage, whether it is increased or not, it is recommend to use constant price in all the periods, with inflation adjusted.

If the main objective is monitoring the impact of disaster loss on overall economy, nominal price should be used and compared with nominal GDP. The percentage of loss to GDP matters and be compared across time.

However, these two directions might not be an issue of selecting either one or the other. As long as the original data is collected, it is easy to estimate both.

C-1 indicator is expressed in relation to GDP while others are not. It might need alignment between these two types of indicators.

Lastly, the loss expressed in national currency needs to be converted into US dollars. As the main objective is not cross-country comparison but global summation, it is suggested to simply use official exchange rate without taking into consideration of Purchasing Power Parities.

C1 –Direct Economic loss due to hazardous events in relation to global gross domestic product

Indicator C1 will be calculated as follows.

$$C1 = (C2 + C3 + C4 + C5 + C6 + C7) / \text{global GDP}$$

Challenge 1:

Should price adjustment be added?

Options suggested to be considered and discussed:

Option 1: The proportion of loss to GDP matters to estimate the possible impact of disaster loss on the global economy. Therefore, the nominal loss and GDP value is suggested to be taken to monitor progress.

Option 2: In addition to the proportion of loss to GDP to assume the possible impact of disaster loss on the global economy, the countries might be interested in monitoring trend of direct economic loss. In that case, UNISDR suggests to compare inflation-adjusted loss and GDP values by dividing nominal value by GDP deflator.

Challenge 2:

Review of summation. It is already expected that building baseline for indicators C3 and C4 would be extremely difficult. Because it is important to monitor industrial and commercial loss, it would be meaningful and important to have these indicators. However, in the headline indicator C1, should we add C3 and C4?

Options suggested to be considered and discussed:

Option 1: Retain the current formula. Develop methodology to estimate baseline for C3 and C4.

Option 2: Drop C3 and C4 from the current formula. In this case, it is of note that the resulting value would significantly underestimate the loss to industrialized developed countries.

C2 – Direct agricultural loss due to hazardous events

From 347,000 records in the 85 national databases analysed in GAR 2015, 26% (91,686) register quantitative indicators (expressed as number of hectares of crops affected and livestock lost) or qualitative (yes/no indicator) about the existence of direct damages to the agricultural sector. Most of agricultural damage (98.5%) is associated to weather-related hazards. Three disaster types, namely flood, drought and forest fire, represent 82 % of the damages with a total of more than 209 million of hectares affected. The importance of agricultural loss due to disasters is undeniable, especially when looking at accumulated impact of small scale but frequent events.

This indicator can be calculated based on two indicators, one for crop loss and the second for livestock losses (c2b):

C2 = Direct agricultural loss due to crops affected

+ Direct agricultural loss due to livestock lost

The physical damage data that countries will be requested to collect are:

C2a=the number of hectares of crops affected

C2b=the number of livestock lost

These are usually reported by emergency management authorities or ministries of agriculture and are the most available data in disaster reports, especially in small and medium scale disasters.

C2-1 Direct agricultural loss due to crops affected (damaged or destroyed)

The general formula proposed is:

$$\text{Loss on crops} = \text{number of hectares affected (C2a)} * \text{direct cost per hectare} * 0.25$$

It is proposed that direct costs per hectare (which are very difficult to obtain) would be estimated using crop output. Output is, simply said, price per unit times quantity (yield). Price consists of three elements: variable cost, fixed cost and profit.

Cost of crops (direct losses) should include variable cost such as labour and machinery operating costs, costs of raw ingredients, including seeds, fertilizer and pesticides and fixed costs such as damage to productive soil, irrigation infrastructure, machinery and equipment, storage infrastructure, and damages to stored fertilizers and seed. As it can be seen, the methodology simplifies the calculation of all these elements as they are all included in the output.

Thus, a more specific formula proposed is:

$$\text{Loss on crops} = \text{number of hectares affected (C2a)} * \text{average crop output per hectare} * 0.25$$

where

Average crop output per hectare = average yield per hectare * price per ton

Step 1: Collect good quality of data, ideally disaggregated, on physical damage

The minimum requirement data proposed to estimate direct loss in crops is:

C2a=Number of hectares of crops affected (damaged or destroyed)

Challenges:

- a) Agricultural losses are not recorded as thoroughly as other losses such as human related loss or housing damage and destruction. Further involvement of authorized data sources for all hazardous events will increase the coverage, and thus the reliability of the indicator.
- b) Disaster loss databases don't record, with a few exceptions, the type of crops damaged. Additional efforts to capture for each hazardous event the number of hectares affected per type of crop will be beneficial, but will introduce additional workload and complexity for data collection.
- c) Disaster loss databases don't record the level of affectation. Additional efforts to capture for each hazardous event the level of damage as a percentage (or simply dividing into partially damaged and totally destroyed crops) would be beneficial.
- d) Collecting separately other physical damages, such as those to irrigation and equipment could result in better measurements. However, introducing more sub-indicators may pose additional challenges of comparability and the possibility of consolidation.
- e) Damage to crops is also very dependent of the growth cycle of the crop. Damage varies depending on the intensity of the hazard but also on how early or late in this cycle the disaster hits the crops. For example, FAO (2012) introduces *"At various stages of growth, the estimated reduction in harvest per hectare of a specific crop caused by, say, floods can be varied. For instance, a flood that will submerge newly planted taro for 2 to 3 days may cause a 100% reduction in harvest while the same flood may cause only a 50% reduction in harvest of taro at maturing stage."*
- f) Currently the national disaster loss database compiles forest area damage caused by forest fire. In GAR 2015, losses associated to forests damaged were priced same as farmland. However, forest area losses may be very different from crop losses, therefore it is suggested that losses of forest fires pricing be reviewed, and/or kept separated from agricultural losses. The GAR consolidated database for 82 countries has 253,035,883 hectares lost, about 10% of which (23,003,834 hectares) were forests/grasslands.

Options suggested to be considered and discussed:

Given the benefit and cost of collecting further data, the scope of loss data collection should be decided by countries.

Step 2: Apply average output per hectare to estimate direct crop losses

As mentioned earlier, with few exceptions, the type of crop damaged is not recorded. The price “producer price per ton” is of course not equal for all crops in a country, and can be very different by country. For example, in El Salvador, the producer price per ton is 30 times higher for green coffee than oranges (USD 4,160 per ton for green coffee, USD 132 per ton for oranges).

For GAR 2015 UNISDR devised a methodology to value farmland damage that aims at designing a proxy value for crop losses using publicly available datasets from FAO Statistics, which may also be obtained nationally in ministries of Agriculture.

At first, a **weighted average agricultural output per hectare (Aoha)** of all types of crops is recommended to be calculated per country based on the three variables. Only crops for which all variables are available are taken into account (in most cases, all three are available).

$$Aoha = \sum \left(\frac{Area_i * Yield_i * Price_i}{Total Area} \right)$$

Where:

$Area_i$ is the total area planted of each crop type i

$Yield_i$ is the yield per hectare for crop type i (expressed in ton)

$Price_i$ is the producer price per ton for crop type i

Annual Producer Prices or prices received by farmers for primary crops as collected at the farm-gate or at the first point of sale (based on FAO definition)

Then, this approach suggests **to multiply a conservative percentage (25%)** to the output under normal conditions to derive direct loss per damaged hectare (UNISDR, 2015c).

The first reason to apply 25% is that the affected farmland does not necessarily imply total crop destruction. The second, much minor reason compared to the first reasons is that cost (variable cost + fixed cost) can be estimated as the total price minus profit. Profit is regarded as indirect loss, it should be excluded. However, profit margin of agriculture is not very high in many countries. Even in the US, 70% of farmers have less than 10% profit margin².

Lastly, $Aoha \times 25\%$ is multiplied by C2a to derive total agriculture crop direct loss.

² http://www.ers.usda.gov/amber-waves/2015-januaryfebruary/profit-margin-increases-with-farm-size.aspx#.Vjb6y_kvflU, accessed as of 3 November 2015.

Challenge 1:

- a) Determining the direct cost per type of crop and per hectare is extremely difficult given the lack of sources of information and the diversity of crops and agricultural technologies, from pure manual to highly mechanized.

Options suggested to be considered and discussed:

Option 1: Countries report three variables (the total area planted for each crop type, the average yield per hectare for each crop type and the producer price per ton for each crop type). It is expected that ministries of Agriculture will be able to supply the required statistical data for the Sendai Framework targets and indicators to enhance the quality and accuracy of the estimate.

Option 2: Utilize global data from **FAO statistics** (<http://faostat.fao.org/>). It is suggested to utilize data only when three variables are available (usually the most common). The caveat is missing statistical data: Unfortunately the FAO statistics coverage is not global, and in several countries is not complete, i.e. not exhaustive in terms of types of crops.

Complementary method for both options 1 and 2: For those countries for which these statistics are not available, UNISDR designed a method which extrapolates a good proxy indicator for the producer price by using a set of regressions of known prices against GDP per capita.

To further improve the methodology, UNISDR grouped countries by income groups using World Bank's income group classification (high income (OECD), high income (non-OECD), upper middle income, lower middle income and low income).

The calibration via GDP per capita plus income groups leads to results that go from USD 6,875/ha ($y = 0.0344x + 3051.3$) for high income (OECD) countries to USD 720 /ha ($y = 0.6891x + 565.8$) for low income countries. This method gives a proxy price for all countries with missing FAO data.

Challenge 2:

Direct losses as a percentage of output: The percentage chosen (25%) is an expert criteria based on different factors. If more information on damage level and general profit margin is available, the ratio can be refined to enhance the quality of estimate.

Challenge 3:

How to assure proper comparison across time? The agriculture output will change in terms of volume and price due to different reasons from disasters. Technical development will increase the yield per hectare. Price level changes such as inflation will influence unit price. Technical development or other factors in agriculture product market will influence relative price of agriculture product higher or lower compared to other goods and services. Should the methodology apply nominal price per unit or the same unit price for all period?

Options suggested to be considered and discussed:

Option 1: The relative unit price increase of agricultural goods in relation to other goods and services indicates the increased influence of agriculture loss on overall economy. Impact of general inflation will be considered in C1 if agreed so. Suggested to use nominal per unit price in each moment of time.

Option 2: Simply to observe affected volume trend, use the same unit price for all the moments from baseline period until 2030.

Step3: Convert the value expressed in national currency into the one in USD and derive global loss value

It is recommended to convert the value expressed in national currency into USD by using the official exchange rate at the year of event (Data source: Official exchange rate of the World Bank Development indicator).

Official exchange rate refers to the exchange rate determined by national authorities or to the rate determined in the legally sanctioned exchange market. It is calculated as an annual average based on monthly averages (local currency units relative to the U.S. dollar).

C2-2 Direct agricultural loss due to livestock lost

It is proposed that total price to producer of livestock lost would indicate the direct agricultural loss due to livestock.

The price³ per livestock is, simply said, price per kilo times weight of livestock. The general formula proposed is:

Loss on livestock = number of livestock lost * average weight per animal * average price per kilogram

For the purposes of assessing the direct losses in livestock, it is necessary to convert headcount of livestock to total weight of meat taken from livestock and multiply it by average price per kilo.

Step 1: Collect good quality of data, ideally disaggregated, on physical damage

National disaster loss databases typically record losses of 4-legged animals such as goats, sheep, cows, buffalos and horse. The minimum requirement data proposed to estimate direct loss to livestock is

C2b=Number of livestock lost

Challenges:

a) Livestock losses are not recorded as thoroughly as other losses such as human related loss or housing damage and destruction. Further involvement of authorized data

³ the concept of price here is equivalent to the concept of “output” in economic theory.

sources for all hazardous events will increase the coverage and thus the reliability of the indicator.

b) Disaster loss databases don't record, with a few exceptions, the type of livestock damaged. Additional efforts to capture the number of livestock lost per type of livestock will be beneficial, but will introduce additional workload and complexity for data collection.

c) Collecting separately other physical damages, such as those to farm equipment could result in better measurements. However, introducing more sub-indicators may pose additional challenges of comparability and the possibility of consolidation.

d) Damage to livestock is also very dependent of the growth cycle of the livestock. Damage varies depending on how early or late in this cycle the disaster hits the livestock.

Options suggested to be considered and discussed:

Given the benefit and cost of collecting further data, the scope of livestock loss data collection should be decided by countries.

Step 2: Apply average price per kilo and average weight per livestock to estimate economic value

As in the case of agricultural crops the economic value of these animals has high variance in terms of price per kilo and number of kilos per animal, which in general determines its value.

In order to obtain an average price per kilo, if data is available, a weighted average could be used. Average price of livestock (i.e. price of one animal) to producer per kilo (Apkg) is

$$Apkg = \sum \left(\frac{Stock_i * Weight_i * Price_i}{Total Stock * Weight} \right)$$

Where:

$Stock_i$ is the headcount number of livestock type i (ex. 1 million cows)

$Weight_i$ is the average weight of livestock type i (ex. 350 kg per cow)

$Price_i$ is the producer price per kilo for meat of livestock type i (ex. 10 USD per kilo of beef)

If data is not available, it is suggested a simple average of producer price per kilogram (Apkg) be calculated.

The simple average can be calculated as

$$Apkg = (\sum Price_i) / n \quad i=1...n$$

Where $Price_i$ is the producer price per kilo for meat live weight of livestock type i

n is the number of livestock type in a country

Accuracy of the estimation can be greatly improved using an average weight, but it requires the existence of livestock data in the country. The average weight can also be calculated as a weighted average:

$$Awkg = \sum \left(\frac{Stock_i * Weight_i}{Total Stock} \right)$$

Where:

$Stock_i$ is the headcount number of livestock type i in the country

$Weight_i$ is the average weight of livestock type i

$Total Stock$ is the total headcount number of all types of livestock in the country

Price and weight can also be potentially determined as the simple average, median or the mode of the prices and weights.

Therefore the final formula would look like:

$$\text{Loss on livestock} = \text{number of livestock lost} * Awkg * Apkg$$

Challenge 1:

- a) Determining the price per kilo of meat of livestock is difficult given the lack of sources of information.

Options suggested to be considered and discussed:

Option 1: Countries report the number of livestock per type, average meat prices per kilogram and average livestock weight. It is expected that ministries of Agriculture will be able to supply the required statistical data for the Sendai Framework targets and indicators to enhance the quality and accuracy of the estimate.

Option 2: Utilize global data from **FAO statistics** (<http://faostat.fao.org/>). It is suggested to utilize this data only when data for most meat types are available. To calculate average price of meat using the 2011 FAO datasets, the following variable is used:

Producer price per ton in USD per type of livestock, which is defined as “Annual Producer Prices or prices received by farmers for live animals and livestock primary products as collected at the farm-gate or at the first point of sale.” (FAO).

For GAR 2015, in order to obtain one unique value per country, the average producer price per ton has been calculated. For Bulgaria, the average price per ton is USD 2,215.35 with a maximum of USD 3,464.7/ton for sheep and USD 1,572.3/ton for Buffalo (FAO, 2011). An average price per ton in USD (at 2011 price) is obtained for 82 countries, ranging from USD 746/ton for Slovak Republic to USD 8,735.85/ton for Japan.

The caveat is missing statistical data. Unfortunately, the FAO statistics coverage is not global, and in several countries is not complete, i.e. not exhaustive in terms of types of livestock.

Option 3: Complementary methods for options 1 and 2: There are, however, several countries for which these statistics are not available in national sources, nor in FAO. To extrapolate a proxy for the price of meat for such countries, UNISDR conducted a set of FAO data regressions against GDP per capita and produced proxy values which allow estimation of livestock loss.

Countries can be grouped by income groups from the World Bank income group classification (high income (OECD), high income (non-OECD), upper middle income, lower middle income and low income). The calculation for missing FAO data using calibration via GDP per capita plus income groups leads to results that go from USD 424/100 kg ($y = 0.0022x + 179.78$) for high income (OECD) countries to USD 73/100kg for low income countries ($y = 0.3439x - 4.5952$). The regression using the equations per income groups calibrated with GDP per capita gives an artificial price for all countries with missing FAO data.

Challenge 2:

The average weight per livestock is an extremely important element in the estimation of direct loss of livestock. However, the global data by country does not exist. There are several alternatives as follows:

Options suggested to be considered and discussed:

Option 1: Countries report the average weight per livestock. It is expected that ministries of Agriculture will be able to supply the required statistical data for the Sendai Framework targets and indicators.

Option 2: Utilize FAO data in countries where it is provided, and in those countries not covered by FAO statistics, use a world weighted average of weight based on other countries for which data is available.

Option 3: Use the GAR 2015 average size of **75 Kg per animal**. The weight is an expert criteria based on different factors.

Challenge 3:

How to assure proper comparison across time? The agriculture output will change in terms of volume and price due to different reason from disasters. Technical development will increase the output per unit. Price level change such as inflation will influence unit price. Technical development or other factors in agriculture product market will also influence relative price of agriculture product higher or lower compared to other goods and services.

Options suggested to be considered and discussed:

Option 1: The relative unit price increase of agricultural goods in relation to other goods and services indicates the increased influence of agricultural loss on overall economy. Impact of general inflation will be considered in C1 if agreed so. Suggested to use nominal per unit price in each moment of time.

Option 2: Simply to observe affected volume trend, use the same unit price for all the moments from baseline period until 2030.

Step3: Convert the value expressed in national currency into the one in USD and derive global loss value

It is recommended to convert the value expressed in national currency into USD by using the official exchange rate at the year of event (Data source: Official exchange rate of the World Bank Development indicator).

Official exchange rate refers to the exchange rate determined by national authorities or to the rate determined in the legally sanctioned exchange market. It is calculated as an annual average based on monthly averages (local currency units relative to the U.S. dollar).

C3 - Direct economic loss due to industrial facilities damaged or destroyed by hazardous events

The methodology proposed here to evaluate damage to industrial facilities is also a broad simplification of the DALA/PDNA methodology which suggests that basic estimation would take into account the area of the affected premises, the construction cost per square meter and the estimated value of equipment and products (raw materials and finished product) stored in these premises. The data are usually reported by emergency management authorities and/or ministries of economy.

The general formula proposed is:

Loss = Number of affected facilities * average size of the facilities * construction cost per square meter * affected ratio

Step 1: Collect good quality of data, ideally disaggregated, on physical damage

The size of industrial and manufacturing facilities can have large variations in terms of construction cost. The ECLAC handbook suggests three typologies based on number of employees: large establishments employing 200 workers or more; medium-sized establishment employing between 199 and 40 workers; and small establishments employing 39 or fewer workers

Depending on availability of data countries can collect information on physical damage with increasing levels of detail. The minimum requirement would be to collect data on total number of affected industrial facilities (Option 1 below) and the maximum level of detail would be to collect separately the damage level and size category of facility (Option 4). There could be intermediate levels of data collection (Table):

Option 1: Total number of facilities damaged or destroyed is collected and reported. **(Minimum Requirement)**

Option 2: The number of facilities damaged and destroyed are collected and reported separately.

Option 3: The number of facilities damaged or destroyed is collected and reported by each category of size (i.e. number of large industrial facilities damaged/destroyed, number of medium facilities damaged/destroyed, number of small facilities damaged/destroyed).

Option 4: The number of facilities affected is collected reported separately by damaged or destroyed and by each category of size.

Table: Damage data collection and reporting options

Size	Damaged	Destroyed	Affected (damaged or destroyed)
Small facilities	Option 4	Option 4	Option 3
Medium facilities	Option 4	Option 4	Option 3
Large facilities	Option 4	Option 4	Option 3
Total number	Option 2 strongly recommended	Option 2 strongly recommended	Option 1 MINIMUM REQUIREMENT

Step 2: Apply replacement cost per unit to estimate economic value

Challenge 1

UNISDR could not find the global data on the average size of industrial facility and construction cost per square meter. The country is recommended to report information on the average size of facility and construction cost per square meter, if possible, for each size category.

If the reporting of size and price information is not possible, several alternatives are suggested below. Each subsequent alternative involves more work and challenges in the data collection but provides a more accurate estimation of the losses.

Options suggested to be considered and discussed

Option 1: (MINIMUM REQUIREMENT) Total number of facilities damaged or destroyed is reported.

C3a: number of industrial facilities damaged or destroyed

$$\text{Loss} = \text{C3a} * \text{average size of the facilities} * \text{construction cost per square meter} * \text{affected ratio}$$

Where:

average size of the facilities can be

- The average size of facilities in the country **(if reported by the country)**.
- The **median** or **mode** of the sizes of facilities in the country. **(if reported by the country)**
- A fixed value defined on the design of a very small and conservative Industrial facility, for example 100 square meters

construction cost per square meter can be :

- The average value of construction cost per square meter nationally (**if reported by the country**)
- Application of the formula for housing construction cost per square meters.

affected ratio: calculated from the estimated percentage of damaged facilities out of total damaged/destroyed facilities. Assuming 20% of the industries reported are totally destroyed and the rest (80%) suffered some degree of damage (suggested to be estimated the same as in the housing sector, 25%), then the overall affected ratio would be the composite of 100% damage for 20% of premises plus 25% damage to 80% of premises, **40%**:

Option 2: The number of facilities damaged and destroyed are reported separately

C3b: number of industrial facilities damaged

C3c: number of industrial facilities destroyed

$$\begin{aligned} \text{Loss} = & \text{C3b} * \text{average size of damaged facilities} * \text{construction cost per square} \\ & \text{meter} * \text{damage ratio} \\ & + \text{C3c} * \text{average size of destroyed facilities} * \text{construction cost per square} \\ & \text{meters} \end{aligned}$$

where

damage ratio: The percentage of the total value of the premise that would represent the damage, suggested to be the same as in the housing sector, **25%**

Average size of damaged facilities, construction cost per square meter: Same method used as the option1.

Note for damage ratio: Ideally, damage ratio (0-100%) and size (m²) of each facility affected is collected and reported separately.

In this case total damage would be estimated as:

$$C3 = \sum (Size_i * Damage\ ratio_i * \text{construction cost per square meters})$$

for Industries facilities affected i=1...n

Option 3: The total number of facilities damaged or destroyed is reported by each category of size (i.e. number of large industrial facilities damaged/destroyed, number of medium facilities damaged/destroyed, number of small facilities damaged/destroyed).

C3d: number of **Large** industrial facilities damaged or destroyed

C3e: number of **Medium** industrial facilities damaged or destroyed

C3f: number of **Small** industrial facilities damaged or destroyed

$$\begin{aligned}
\text{Loss} = & \text{C3d} * \text{average size of large facilities} * \text{construction cost per square} \\
& \text{meters} * \text{affected ratio} \\
& + \text{C3e} * \text{average size of medium facilities} * \text{construction cost per square} \\
& \text{meters} * \text{affected ratio} \\
& + \text{C3f} * \text{average size of small facilities} * \text{construction cost per square} \\
& \text{meters} * \text{affected ratio}
\end{aligned}$$

where

Average size is specified for each size range.

Construction cost per each size category (if reported by country). If not reported, apply the same value to all, based on the option 1 method.

Affected ratio would be same as in Option 1.

Option 4: The total number of facilities damaged or destroyed is reported separately by each category of size:

C3g: number of **Large** industrial facilities damaged

C3h: number of **Medium** industrial facilities damaged

C3i: number of **Small** industrial facilities damaged

C3j: number of **large** industrial facilities *destroyed*

C3k: number of **Medium** industrial facilities *destroyed*

C3l: number of **Small** industrial facilities *destroyed*

$$\begin{aligned}
\text{Loss} = & \text{C3g} * \text{average size of large facilities} * \text{construction cost per square meter} * \\
& \text{damage ratio} \\
& + \text{C3h} * \text{average size of medium facilities} * \text{construction cost per square} \\
& \text{meter} * \text{damage ratio} \\
& + \text{C3i} * \text{average size of small facilities} * \text{construction cost per square} \\
& \text{meter} * \text{damage ratio} \\
& + \text{C3j} * \text{average size of large facilities} * \text{construction cost per square} \\
& \text{meter} \\
& + \text{C3k} * \text{average size of medium facilities} * \text{construction cost per square} \\
& \text{meter} \\
& + \text{C3l} * \text{average size of small facilities} * \text{construction cost per square} \\
& \text{meter}
\end{aligned}$$

where

Average size is specified for each size range.

Construction cost per each size category (if reported by country). If not reported, apply the same value to all, based on the option 1 method.

Damage ratio would be same as in Option 2.

More sophisticated approaches can be devised (for example using types of industries) that could make the estimation more accurate, **but would exponentially increase the burden of data collection in countries.** Methodologies that could be feasible only in developed, information-rich countries would not be recommended.

Challenge 2:

How to estimate the overhead of equipment and stored assets?

Option suggested to be considered and discussed:

As in the case of the Housing Sector (see Indicators C5 and C6) an additional loss has to be assigned corresponding to the value of equipment, associated urban infrastructure and products stored in premises. An **overhead of 25% is proposed to be used in the case of industrial facilities.**

Challenge 3:

How to assure proper comparison across time? The construction cost per square meter will change across time due to technical development and other market related factors (e.g. price increase of construction material in relation to other goods and services). Price level change such as inflation will also influence unit price.

Options suggested to be considered and discussed:

Option 1: The relative unit price increase of construction cost in relation to other goods and services indicates the increased influence of industrial facility loss on overall economy. Impact of general inflation will be considered in C1 if agreed so. Suggested to use nominal per unit price in each moment of time.

Option 2: Simply to observe affected volume trend, use the same unit price for all the moments from baseline period until 2030.

Step3: Convert the value expressed in national currency into the one in USD and derive global loss value

It is recommended to convert the value expressed in national currency into USD by using the official exchange rate at the year of event (Data source: Official exchange rate of the World Bank Development indicator).

Official exchange rate refers to the exchange rate determined by national authorities or to the rate determined in the legally sanctioned exchange market. It is calculated as an annual average based on monthly averages (local currency units relative to the U.S. dollar).

C4 - Direct economic loss due to commercial facilities damaged or destroyed by hazardous events

As with previous indicators, the methodology proposed for commercial facilities is also a broad simplification of the DALA/PDNA methodology, which suggests that basic estimation would take into account the area of the affected premises, the construction cost per square meter and the estimated value of equipment and products (raw materials and finished product) stored in these premises. The data are usually reported by emergency management authorities and/or ministries of economy or commerce.

The general formula proposed is:

$$\text{Loss} = \text{Number of affected facilities} * \text{average size of the facilities} * \text{construction cost per square meter} * \text{affected ratio}$$

Step 1: Collect good quality of data, ideally disaggregated, on physical damage

In this methodology the term “Commercial Facility” is defined as any building or real estate property that is used for business activities classified in ISIC Code G (wholesale and retail trade) (Rev.4). Commercial properties fall into many categories and include including department store, big shopping centres and malls, super market and individual small shops. It is suggested that when a shopping centre is affected it is reported as the sum of individual shops affected within a shopping centre.

While the size of *individual shops* has a relevant variation, the variance is not as high as the industrial facilities. Except for small number of department store and large supermarkets, the great majority of commercial establishments will fit a more or less uniform pattern in most countries. Therefore, compared to industrial facilities, there is less benefit to collect and report affected facilities by size category at global level.

Depending on the desired accuracy of the evaluations countries should collect and report the following possible data:

Option 1: (MINIMUM REQUIREMENT) Total number of facilities damaged or destroyed is reported.

Option 2: The number of facilities damaged and destroyed are reported separately

Option 3: Damage level and size of each facility affected is collected separately.

Step 2: Apply replacement cost per unit to estimate economic value

Challenge 1: Construction cost estimate

To estimate the economic value, it is necessary to have information on the average size of facilities and construction cost per square meter. UNISDR could not find the global data on the average size of facility and construction cost per square meters. The country needs to collect and report the

information on the size of commercial facilities (average or ideally, affected) and construction cost per square meter (average). It is expected that ministries of Economy will be able to supply the required statistical data for the Sendai Framework targets and indicators.

If this is not possible the option is to simply apply construction cost per square meter for housing using formula explained in Annex for each of the options below. There are several alternatives which require different levels of work. The more detailed assessment is possible, however, it means more workload for data collection in Step1.

It is estimated that average size of commercial facilities would be 25 square meters (the design of a very small and conservative commercial facility, comprising as one sales area of 4x4 m2 plus storage and miscellaneous usage (washroom, administrative) area of 3x3 m2).

To account for the associated urban infrastructure, equipment and product stored in the commercial facility it is proposed to add the same overhead as applied for industrial facilities to this basic cost of 25%. Adding this element raises average size of establishment to 35 square meters.

Options suggested to be considered and discussed

Option 1: Total number of commercial facilities damaged or destroyed is reported. (MINIMUM REQUIREMENT)

C4a - Number of commercial facilities damaged or destroyed by hazardous events

$Loss = C4a * average\ size\ of\ facilities * construction\ cost\ per\ square\ meter * affected_ratio$

Where:

Average size of the facilities can be

- The average size of facilities in the country (**if reported by the country**).
- The **median** (middle value in the data set) or **mode** (the value most often observed in the data set) of the sizes of facilities in the country. (**if reported by the country**)
- A fixed value defined on the design of a very small and conservative commercial facility, for example 35 square meters, see above.

Construction cost per square meter can be :

- The average value of construction cost per square meter nationally (**if reported by the country**)
- Application of the formula for housing construction cost per square meter.

Affected ratio: calculated from the estimated percentage of damaged facilities out of total damaged/destroyed facilities. Assuming 20% of the industries reported are totally destroyed and the rest (80%) suffered some degree of damage (suggested to be estimated the same as in the housing sector, 25%), then the overall affected ratio would be the composite of 100% damage for 20% of premises plus 25% damage to 80% of premises, **40%**:

Option 2: The number of facilities damaged and destroyed are reported separately

C4b - Number of commercial facilities damaged by hazardous events

C4c - Number of commercial facilities destroyed by hazardous events

The economic loss would be calculated as:

$$\begin{aligned} \text{Loss} = & \mathbf{C4b} * \text{average size of damaged facilities} * \text{construction cost per square metre} \\ & * \text{damage ratio} \\ & + \mathbf{C4c} * \text{average size of destroyed facilities} * \text{construction cost per square meter} \end{aligned}$$

where

Damage ratio: The percentage of the total value of the premise that would represent the damage, suggested to be the same as in the housing sector, **25%**

Average size of damaged facilities, construction cost per square meter: Same method used as the option1.

Note for damage ratio: Ideally, damage ratio (0-100%) and size (m²) of each facility affected is collected and reported separately.

In this case total damage would be estimated as:

$$C4 = \sum (Size_i * Damage\ ratio_i * \text{construction cost per square meters})$$

for commercial facilities affected $i=1\dots n$

Challenge 2:

How to estimate the overhead of equipment and stored assets?

Option suggested to be considered and discussed:

As in the case of the Housing Sector (see Indicators C5 and C6) an additional loss has to be assigned corresponding to the value of equipment, products stored in premises and associated urban infrastructure. An **overhead of 25% is proposed to be used for commercial facilities.**

Challenge 3:

How to assure proper comparison across time? The construction cost per square meter will change across time due to technical development and other market related factors (e.g. price increase of construction material in relation to other goods and services). Price level change such as inflation will also influence unit price.

Options suggested to be considered and discussed:

Option 1: The relative unit price increase of construction cost in relation to other goods and services indicates the increased influence of commercial facility loss on overall economy. Impact of general inflation will be considered in C1 if agreed so. Suggested to use nominal per unit price in each moment of time.

Option 2: Simply to observe affected volume trend, use the same unit price for all the moments from baseline period until 2030.

Step3: Convert the value expressed in national currency into the one in USD and derive global loss value

It is recommended to convert the value expressed in national currency into USD by using the official exchange rate at the year of event (Data source: Official exchange rate of the World Bank Development indicator).

Official exchange rate refers to the exchange rate determined by national authorities or to the rate determined in the legally sanctioned exchange market. It is calculated as an annual average based on monthly averages (local currency units relative to the U.S. dollar).

C5 - Direct economic loss due to houses damaged by hazardous events

C6 - Direct economic loss due to houses destroyed by hazardous events

The methodology proposed here to evaluate damage to the housing is a broad simplification of the DALA/PDNA methodology which suggests that basic economic loss estimation would take into account the sizes of houses, the value of construction cost per square meter and the estimated value of equipment and associated urban infrastructure.

It is proposed to estimate direct economic loss of housing damaged and destroyed using the following formula:

C5 = number of houses damaged * average size of damaged facilities * construction cost per square metre * damage ratio

where

damage ratio is 25%. Following suggestions in the DALA/PDNA methodologies the average losses of partially damaged houses is evaluated as 25% of the loss of a completely destroyed house.

C6 = number of houses destroyed * average size of destroyed facilities * construction cost per square meter

Step 1: Collect good quality of data, ideally disaggregated, on physical damage

Challenge

Given the benefit and cost of collecting further data, the scope of loss data collection should be decided by countries.

Options suggested to be considered and discussed:

Option 1: Total number of houses damaged and destroyed collected separately (**MINIMUM REQUIREMENT**). However, housing can have large variations in terms of the size and structure and therefore construction cost though not being as large as industrial and commercial facilities.

Option 2: Total number of houses damaged and destroyed collected separately and disaggregated by other criteria such as urban/rural, income level, type of construction structure or other characteristics, when this criteria is relevant for the estimation of the loss.

Disaggregated data, for example housing loss by structural type would provide basis for building vulnerability assessment and evidence for strengthening enforcement of building codes or retrofitting policy. Disaggregated data collection could make the estimation more accurate and more usable for policy making, but countries need to be aware it would exponentially increase the burden of data collection.

Step 2: Apply replacement cost per unit to estimate economic value

Challenge1

Determining the construction cost per square meter and size of housing affected is extremely difficult given the lack of sources of information and the diversity of housing structure from concrete to wooden barrack.

Options suggested to be considered and discussed:

Option 1 (highly recommended): Countries report the necessary two variables (i.e. construction cost per square meter, average size of housing in the country). If the disaggregated data is collected, a weighted average of house size in the country taking into account distribution of each size segment (income, structural type or range of size) and the average size of the houses on each segment would increase the reliability of the indicator and would solve to a large extent the issue of choosing a fixed house size. If it is difficult to obtain price information from private market, construction cost of social housing might provide a useful benchmark. It is expected that ministries of housing will be able to supply the required statistical data for the Sendai Framework targets and indicators to enhance accuracy of the estimate.

Option 2: When the housing construction cost per square meter is missing, it is suggested to utilize global data sources regarding unit cost information. After a review of different sources, we recommend to use “Global Construction Cost and Reference Yearbook 2012” from *Compass International* to determine the construction cost per square meter. However, unfortunately the COMPASS statistics coverage is not global, and in several countries is not complete, i.e. not exhaustive in terms of types of constructions.

To extrapolate a proxy for the unit cost for countries for which no information is available, the following formula is proposed, as explained in the Annex in more detail.

$$1m^2=304 + 0.0118*GDP \text{ per capita.}$$

Option3: When the average size is not reported, based on GAR methodology, it is suggested to apply a small ‘social housing solution’ and its associated equipment and urban infrastructure (furniture, water network, power, communications, etc.) as estimation methodology.

The concept of a “Social Interest Housing solution” has been used in many types of risk assessments (CIMNE, 2013). It is inspired by the fact that in many cases the state, acting as ultimate insurer of losses especially for the poorest segments of the population, tends to provide homogeneously small housing solutions and/or compensation packages.

The concept and size of social housing varies by country. But for the purpose of a homogeneous estimation across countries it is proposed the **size of a social housing to be set to 45 square meters** – i.e. a very small housing solution.

In order to assess the value of the equipment of the house and the additional urban infrastructure associated to loss of houses (such as connection to road networks, water, sewage, green areas, energy and communications infrastructure that usually results damaged in disasters), an additional

40% is proposed to be added to the 45 square meters (CIMNE, 2012), raising the estimated average size of housing to the equivalent of **63 square meters**.

Challenge 2:

How to assure proper comparison across time? The construction cost per square meter will change across time due to technical development and other market related factors (e.g. price increase of construction material in relation to other goods and services). Price level change such as inflation will also influence unit price.

Options suggested to be considered and discussed:

Option 1: The relative unit price increase of construction cost in relation to other goods and services indicates the increased influence of housing loss on overall economy. Impact of general inflation will be considered in C1 if agreed so. Suggested to use nominal per unit price in each moment of time.

Option2: Simply to observe affected volume trend, use the same unit price for all the moments from baseline period until 2030.

Step3: Convert the value expressed in national currency into the one in USD and derive global loss value

It is recommended to convert the value expressed in national currency into USD by using the official exchange rate at the year of event (Data source: Official exchange rate of the World Bank Development indicator).

Official exchange rate refers to the exchange rate determined by national authorities or to the rate determined in the legally sanctioned exchange market. It is calculated as an annual average based on monthly averages (local currency units relative to the U.S. dollar).

C7 – Direct economic loss due to damage to critical infrastructure/public infrastructure caused by hazardous events, to be calculated based on the following indicators D2 to D4.

Proposed indicator C7 is suggested to be calculated based on the indicators D2, D3 and D4 (road only).

C7 = the sum of the direct economic loss estimated for indicators D2 to D4 (road only)

D2 - Number of health facilities destroyed or damaged by hazardous events

The general formula proposed is:

$$\text{Loss} = \text{Number of affected facilities} * \text{average size of the facilities} * \text{construction cost per square meter} * \text{affected ratio}$$

Step 1: Collect good quality of data, ideally disaggregated, on physical damage

Challenge

Health facilities range from small clinics, rural health posts and doctor's offices to urgent care centres and large hospitals with advanced emergency rooms and trauma centres. The size of these facilities and replacement costs are varied more than housing sector.

Options suggested to be considered and discussed.

Additional effort can be invested in collecting disaggregated data per size/type of health facility damaged on each hazardous event. Several categories can be established (regional (large) hospital, local (medium) hospital, health centre, clinic, etc.), with typical sizes and economic replacement values. While disaggregated data collection could make the estimation more accurate, **countries need to be aware it would exponentially increase the burden of data collection, which may not justify the additional accuracy of the indicator.**

Depending on availability of data countries can collect information on physical damage with increasing levels of detail (See table below). The minimum requirement would be to collect data on total number of affected health facilities (Option 1 below) and the maximum level of detail would be to collect separately by damaged/destroyed and per size category (Option 4). There could be intermediate levels of data collection:

Option 1: Total number of health facilities damaged or destroyed is collected and reported.
(MINIMUM REQUIREMENT)

Option 2: The number of health facilities damaged and destroyed are collected and reported separately

Option 3: The total number of facilities affected (damaged or destroyed) is collected and reported by each category of size (i.e. number of large health facilities damaged/destroyed,

number of medium facilities damaged/destroyed, number of small facilities damaged/destroyed)

Option 4: The total number of facilities affected is reported separately by damaged or destroyed and by each category of size

Table: Physical damage data collection and reporting options

Size	Damaged	Destroyed	Affected (damaged or destroyed)
Small health facilities	Option 4	Option 4	Option 3
Medium health facilities	Option 4	Option 4	Option 3
Large health facilities	Option 4	Option 4	Option 3
Total number	Option 2 strongly recommended	Option 2 Strongly recommended	Option 1 MINIMUM REQUIREMENT

Step 2: Apply replacement cost per unit to estimate economic value

The DALA/PDNA methodology suggests that the value of the physical damage to the buildings of health facilities can be calculated based on the size of the premise (area), the construction cost per square meter and an overhead to estimate the value of losses in equipment in the premises.

Challenge1:

It is necessary to have information on the average size of facilities and construction cost per square meter. UNISDR could not find the global data on the average size of facility and construction cost per square meter. The country needs to report the information on the size of facilities and construction cost per square meter, if possible, for each size category. The easier option is to simply apply construction cost per square meter for housing using formula explained in Indicators C6 and Annex for each of the options below. There are several alternatives which requires different level of work. The more detailed assessment is possible however it means more workload for data collection.

Options suggested to be considered and discussed:

Option 1 (highly recommended): Countries collect and report the two variables (average size of facilities and construction cost per square meter). It is expected that ministries of Health will be able to supply the required statistical data for the Sendai Framework targets and indicators. If not possible, countries are recommended to consider the options below.

Option 2: When construction cost per square meter is missing, it is suggested to utilize housing formula as explained in the Annex in more detail.

$$1m^2=304 + 0.0118 * \text{GDP per capita.}$$

Option3: When the average size (existing or affected) is not reported, based on GAR methodology, it is suggested to apply a small conservative minimum unit scenario and its associated equipment and urban infrastructure (e.g. connection to water network, power, communications). The idea behind this is that in the developing world health facilities are often small and very inexpensive (GAR 2013). UNISDR recognizes values of minimal size used in the GAR will not likely to apply for developed countries where these facilities tend to be much larger.

Size of minimum unit is characterized as a small outpatient clinic consisting of a waiting room of 3x4 meters (12 m²), a consulting room of 3x4 meters (12 m²), an operating/first aid section of 5x4 meters (20 m²), with a medicine depot and maintenance area (4 m²), for a total of 48 m².

In order to assess the value of the equipment of the facility and the additional urban infrastructure associated to loss of facilities (e.g. connection to road networks, water, sewage, green areas, energy and communications infrastructure that usually results damaged in disasters), an additional 25% is proposed to be added to the 45 square meters (CIMNE, 2012), raising the estimated average size of facility to the equivalent of **60 square meters**.

Summary

Depending on the options taken in Step 1 and 2 above, the following options can be suggested:

Option 1: (MINIMUM REQUIREMENT) Total number of health facilities damaged or destroyed is reported.

D2a number of health facilities damaged or destroyed

$$\text{Loss} = \mathbf{D2a} * \text{average size} * \text{construction cost per square meter} * \text{affected ratio}$$

Where:

average size of the facilities can be

- The average size of facilities in the country **(if reported by the country)**.
- The **median** (middle value in the data set) or **mode** (the value most often observed in the data set) of the sizes of facilities in the country. **(if reported by the country)**
- A fixed value defined on the design of a very small and conservative Industrial facility, for example 60 square meters

construction cost per square meter can be:

- The average value of construction cost per square meter nationally **(if reported by the country)**
- Application of the formula for housing construction cost per square meters.

affected ratio: calculated from the estimated percentage of damaged facilities out of total damaged/destroyed facilities. Assuming 20% of the industries reported are totally destroyed and the rest (80%) suffered some degree of damage (suggested to be estimated the same as in the housing sector, 25%), then the overall affected ratio would be the composite of 100% damage for 20% of premises plus 25% damage to 80% of premises, **40%**:

Option 2: The number of health facilities damaged and destroyed is reported separately.

D2b number of health facilities damaged

D2c number of health facilities destroyed

$$\begin{aligned} \text{Loss} = & \mathbf{D2b} * \text{average size of damaged facilities} * \text{construction cost per} \\ & \text{square meter} * \text{damage ratio} \\ & + \mathbf{D2c} * \text{average size of destroyed facilities} * \text{construction cost per} \\ & \text{square meter} \end{aligned}$$

where

damage ratio: The percentage of the total value of the premise that would represent the damage, suggested to be the same as in the housing sector, **25%**

Average size of damaged facilities, construction cost per square meter: Same method used as the option1.

Note for damage ratio: Ideally, damage ratio (0...100%) and size (m²) of each facility affected is collected and reported separately.

In this case total damage would be estimated as:

$$D2 = \sum (Size_i * Damage\ ratio_i * Construction\ cost\ per\ square\ meters)$$

for health facilities affected $i=1...n$

Option 3: The total number of health facilities damaged or destroyed is reported by each category of size (i.e. number of large health facilities damaged/destroyed, number of medium facilities damaged/destroyed, number of small facilities damaged/destroyed).

D2d number of **Large** health facilities damaged or destroyed

D2e number of **Medium** health facilities damaged or destroyed

D2f number of **Small** health facilities damaged or destroyed

$$\begin{aligned} \text{Loss} = & \mathbf{D2d} * \text{average size of large facilities} * \text{construction cost per square meter} \\ & * \text{affected ratio} \\ & + \mathbf{D2e} * \text{average size of medium facilities} * \text{construction cost per square} \\ & \text{meter} * \text{affected ratio} \\ & + \mathbf{D2f} * \text{average size of small facilities} * \text{construction cost per square} \\ & \text{meter} * \text{affected ratio} \end{aligned}$$

where

Average size is specified for each size range.

Affected ratio would be same as in Option 1.

Construction cost per each size category (if reported by country). If not reported, apply the same value to all, based on the option 1 method.

Option 4: The total number of health facilities damaged or destroyed is reported separately by each category of size.

D2g number of **Large** health facilities damaged

D2h number of **Medium** health facilities damaged

D2i number of **Small** health facilities damaged

D2j number of **Large** health facilities *destroyed*

D2k number of **Medium** health facilities *destroyed*

D2l number of **Small** health facilities *destroyed*

$$\begin{aligned} \text{Loss} = & \mathbf{D2g} * \text{average size of large facilities damaged} * \text{construction cost per} \\ & \text{square meter} * \text{damage ratio} \\ & + \mathbf{D2h} * \text{average size of medium facilities damaged} * \text{construction cost} \\ & \text{per square meter} * \text{damage ratio} \\ & + \mathbf{D2i} * \text{average size of small facilities damaged} * \text{construction cost per} \\ & \text{square meter} * \text{damage ratio} \\ & + \mathbf{D2j} * \text{average size of large facilities destroyed} * \text{construction cost per} \\ & \text{square meter} \\ & + \mathbf{D2k} * \text{average size of medium facilities destroyed} * \text{construction cost} \\ & \text{per square meter} \\ & + \mathbf{D2l} * \text{average size of small facilities damaged} * \text{construction cost per} \\ & \text{square meter} \end{aligned}$$

where

Average size is specified for each size range.

Damage ratio would be same as in Option 2.

Construction cost per each size category (if reported by country). If not reported, apply the same value to all, based on the option 1 method.

It is clear that more sophisticated approaches can be devised (for example using types of health facility) that could make the estimation more accurate, **but would exponentially increase the burden of data collection in countries.** Methodologies that could be feasible only in developed, information-rich countries would not be recommended.

Challenge 2:

How to estimate the overhead of equipment and stored assets?

Option suggested to be considered and discussed:

As in the case of the Housing Sector (see Indicators C5 and C6) an additional loss has to be assigned corresponding to the value of equipment, stocks in premises and associated urban infrastructure. While the overhead of equipment and stock would be larger in health facilities than in housings, given the lack of information, **the same overhead of 25% is proposed to be used for health facilities.**

Challenge 3:

How to assure proper comparison across time? The construction cost per square meter will change across time due to technical development and other market related factors (e.g. price increase of construction material in relation to other goods and services). Price level change such as inflation will also influence unit price.

Options suggested to be considered and discussed:

Option 1: The relative unit price increase of construction cost in relation to other goods and services indicates the increased influence of industrial facility loss on overall economy. Impact of general inflation will be considered in C1 if agreed so. Suggested to use nominal per unit price in each moment of time.

Option 2: Simply to observe affected volume trend, use the same unit price for all the moments from baseline period until 2030.

Step3: Convert the value expressed in national currency into the one in USD and derive global loss value

It is recommended to convert the value expressed in national currency into USD by using the official exchange rate at the year of event (Data source: Official exchange rate of the World Bank Development indicator).

Official exchange rate refers to the exchange rate determined by national authorities or to the rate determined in the legally sanctioned exchange market. It is calculated as an annual average based on monthly averages (local currency units relative to the U.S. dollar).

D3 - Number of educational facilities destroyed or damaged by hazardous events

The general formula proposed is:

$$\text{Loss} = \text{Number of affected facilities} * \text{average size of the facilities} * \text{construction cost per square meter} * \text{affected ratio}$$

Step 1: Collect good quality of data, ideally disaggregated, on physical damage

Challenge:

Schools range from small rural schools to large universities with similar variances as seen in the health sector, therefore these facilities have a much higher variance than houses in size and therefore in economic value.

Depending on availability of data countries can collect information on physical damage with increasing levels of detail. The minimum requirement would be to collect data on total number of affected educational facilities (Option 1 below) and the maximum level of detail would be to collect separately the damage level and size category of facility affected (Option 4).

For the purposes of the data collection it is proposed to consider three categories of sizes:

- Small schools (up to 100 students), similar to rural schools and other small education and training facilities.
- Medium schools (100-700 students), similar to urban elementary or secondary schools
- Large educational compounds like university campuses.

Options suggested to be considered and discussed:

While disaggregated data collection could make the estimation more accurate, **countries need to be aware it would exponentially increase the burden of data collection.**

There could be several options for data collection (see table below):

Option 1: Total number of education facilities damaged or destroyed is reported. **(MINIMUM REQUIREMENT)**

Option 2: The number of education facilities damaged and destroyed are reported separately

Option 3: The total number of facilities affected (damaged or destroyed) is reported by each category of size (i.e. number of large education facilities damaged/destroyed, number of medium facilities damaged/destroyed, number of small facilities damaged/destroyed)

Option 4: The total number of facilities affected is reported separately by damaged or destroyed and by each category of size

Table: Damage data collection and reporting options

Size	Damaged	Destroyed	Affected (damaged or destroyed)
Small education facilities	Option 4	Option 4	Option 3
Medium education facilities	Option 4	Option 4	Option 3
Large education facilities	Option 4	Option 4	Option 3
Total number	Option 2 strongly recommended	Option 2 strongly recommended	Option 1 MINIMUM REQUIREMENT

Step 2: Apply replacement cost per unit to estimate economic value

The DALA/PDNA methodology suggests that the value of the physical damage to the buildings of education facilities can be calculated based on the size of the premise (area), the price per square meter of construction and an overhead to estimate the value of losses in equipment in the premises.

Challenge1:

It is necessary to have information on the average size of facilities and construction cost per square meter. UNISDR could not find the global data on the average size of facility and construction cost per square meter. The country needs to report the information on the average size of facilities and construction cost per square meter, if possible, for each size category. The easier option is to simply apply construction cost per square meter for housing using formula explained in Annex for each of the options below. There are several alternatives which requires different level of work. The more detailed assessment is possible however it means more workload for data collection.

Options suggested to be considered and discussed:

Option 1 (highly recommended): Countries collect and report the two variables (average size of facilities and construction cost per square meters) from countries. It is expected that ministries of Education will be able to supply the required statistical data for the Sendai Framework targets and indicators. If not possible, countries are recommended to consider the options below.

Option 2: When the construction cost per square metre is missing, it is suggested to utilize housing formula as explained in the Annex in more detail.

$$1m^2=304 + 0.0118*GDP \text{ per capita.}$$

Option3: When the average size (existing or affected) is not reported, based on GAR methodology, it is suggested to apply a small conservative minimum unit scenario and its associated equipment and urban infrastructure (furniture, water network, power, communications, etc.). The idea behind this is that in the developing world school facilities tend to be small and inexpensive (GAR 2013). UNISDR recognizes values of minimal size used in the GAR will not likely apply for developed countries where these facilities tend to be much larger.

In order to assess the value of the equipment of the facility and the additional urban infrastructure associated to loss of facilities (e.g. connection to road networks, water, sewage, green areas, energy and communications infrastructure that usually results damaged in disasters), an additional 25% is proposed to be added to the 60 square meters (CIMNE, 2012), raising the estimated average size of facility to the equivalent of **75 square meters**.

Summary

Depending on the options taken in Step 1 and 2 above, the following options can be suggested:

Option 1: (MINIMUM REQUIREMENT) Total number of educational facilities damaged or destroyed is reported.

D3a number of educational facilities damaged or destroyed

$$\text{Loss} = \mathbf{D3a} * \text{average size} * \text{construction cost per square meter} * \text{affected ratio}$$

Where:

average size of the facilities can be

- The average size of facilities in the country (**if reported by the country**).
- The **median** (middle value in the data set) or **mode** (the value most often observed in the data set) of the sizes of facilities in the country. (**if reported by the country**)
- A fixed value defined on the design of a very small and conservative educational facility, for example 75 square meters

construction cost per square meter can be:

- The average value of construction cost per square meter nationally (**if reported by the country**)
- Application of the formula for housing construction cost per square meters.

affected ratio: calculated from the estimated percentage of damaged facilities out of total damaged/destroyed facilities. Assuming 20% of the industries reported are totally destroyed and the rest (80%) suffered some degree of damage (suggested to be estimated the same as in the housing sector, 25%), then the overall affected ratio would be the composite of 100% damage for 20% of premises plus 25% damage to 80% of premises, **40%**:

Option 2: The number of educational facilities damaged and destroyed are reported separately.

D3b number of educational facilities damaged

D3c number of educational facilities destroyed

$$\begin{aligned} \text{Loss} = & \mathbf{D3b} * \text{average size of damaged facilities} * \text{construction cost per} \\ & \text{square meter} * \text{damage ratio} \\ & + \mathbf{D3c} * \text{average size of destroyed facilities} * \text{construction cost per} \\ & \text{square meter} \end{aligned}$$

where

damage ratio: is the percentage of the total value of the premise that would represent the damage, suggested to be the same as in the housing sector, **25%**

Average size of damaged facilities, construction cost per square meter: Same method used as the option1.

Note for damage ratio: Ideally, damage ratio (0...100%) and size (m²) of each facility affected is collected and reported separately.

In this case total damage would be estimated as:

$$D2 = \sum (\text{Size}_i * \text{Damage ratio}_i * \text{construction cost per square meters})$$

for educational facilities affected $i=1\dots n$

Option 3: The total number of educational facilities damaged or destroyed is reported by each category of size (i.e. number of large educational facilities damaged/destroyed, number of medium facilities, number of small facilities)

D3d number of **Large** educational facilities damaged or destroyed

D3e number of **Medium** educational facilities damaged or destroyed

D3f number of **Small** educational facilities damaged or destroyed

$$\begin{aligned} \text{Loss} = & \mathbf{D3d} * \text{average size of large facilities} * \text{construction cost per square meter} \\ & * \text{affected ratio} \\ & + \mathbf{D3e} * \text{average size of medium facilities} * \text{construction cost per square} \\ & \text{meter} * \text{affected ratio} \\ & + \mathbf{D3f} * \text{average size of small facilities} * \text{construction cost per square} \\ & \text{meter} * \text{affected ratio} \end{aligned}$$

where

Average size is specified for each size range.

Affected ratio would be same as in Option 1.

Construction cost per each size category (if reported by country). If not reported, apply the same value to all, based on the option 1 method.

Option 4: The total number of educational facilities damaged or destroyed is reported separately by each category of size:

D3g number of **Large** educational facilities damaged

D3h number of **Medium** educational facilities damaged

D3i number of **Small** educational facilities damaged

D3j number of **Large** educational facilities *destroyed*

D3k number of **Medium** educational facilities destroyed

D3l number of **Small** educational facilities *destroyed*

$$\begin{aligned} \text{Loss} = & \mathbf{D3g} * \text{average size of large facilities damaged} * \text{construction cost per} \\ & \text{square meter} * \text{damage ratio} \\ & + \mathbf{D3h} * \text{average size of medium facilities damaged} * \text{construction cost} \\ & \text{per square meter} * \text{damage ratio} \end{aligned}$$

- + *D3i* * average size of small facilities damaged * construction cost per square meter * damage ratio
- + *D3j* * average size of large facilities destroyed* construction cost per square meter
- + *D3k* * average size of medium facilities destroyed * construction cost per square meter
- + *D3l* * average size of small facilities damaged * construction cost per square meter

where

Average size is specified for each size range.

Damage ratio would be same as in Option 2.

Construction cost per each size category (if reported by country). If not reported, apply the same value to all, based on the option 1 method.

It is clear that more sophisticated approaches can be devised (for example using types of educational facility) that could make the estimation more accurate, **but would exponentially increase the burden of data collection in countries**. Methodologies that could be feasible only in developed, information-rich countries would not be recommended.

Challenge 2:

How to estimate the overhead of equipment and stored assets?

Option suggested to be considered and discussed:

As in the case of the Housing Sector (see Indicators C5 and C6) an additional loss has to be assigned corresponding to the value of equipment, stocks in premises and associated urban infrastructure. While the overhead of equipment and stock would be smaller in educational facilities than in housings, given the lack of information, **the same overhead of 25% is proposed to be used for educational facilities**.

Challenge 3:

How to assure proper comparison across time? The construction cost per square meter will change across time due to technical development and other market related factors (e.g. price increase of construction material in relation to other goods and services). Price level change such as inflation will also influence unit price.

Options suggested to be considered and discussed:

Option 1: The relative unit price increase of construction cost in relation to other goods and services indicates the increased influence of industrial facility loss on overall economy. Impact of general inflation will be considered in C1 if agreed so. Suggested to use nominal per unit price in each moment of time.

Option 2: Simply to observe affected volume trend, use the same unit price for all the moments from baseline period until 2030.

Step3: Convert the value expressed in national currency into the one in USD and derive global loss value

It is recommended to convert the value expressed in national currency into USD by using the official exchange rate at the year of event (Data source: Official exchange rate of the World Bank Development indicator).

Official exchange rate refers to the exchange rate determined by national authorities or to the rate determined in the legally sanctioned exchange market. It is calculated as an annual average based on monthly averages (local currency units relative to the U.S. dollar).

D4 - Number of transportation infrastructures (roads) destroyed or damaged by hazardous events

The general formula proposed for loss in roads is:

Loss on roads= Number of kilometres affected * average rehabilitation cost per kilometre

Step 1: Collect good quality of data, ideally disaggregated, on physical damage

For the economic cost estimation of transportation infrastructures damaged, the current UNISDR methodology has proposed to use the following sub-indicator only due to limited data availability for several other transport infrastructures:

D4a Number of kilometres of road destroyed or damaged per hazardous event. **(MINIMUM REQUIREMENT)**

It is recommended to collect only length of roads affected. Other road infrastructure such as bridges are not taken into account due to complexity of cost estimation. UNISDR recognizes roads are the most universal basic transportation infrastructure while railways, ports and airports might have global variance in terms of the importance and presence in different countries.

Additional effort can be invested in collecting disaggregated data per type of road affected on each hazardous event. Several categories can be established (Highway, main paved road, paved road, unpaved).

Step 2: Apply replacement cost per unit to estimate economic value

The DALA/PDNA methodology suggests that the value of the physical damage can be calculated based on the size of the damage and the construction cost per unit.

Challenge:

Determining the construction cost per kilometre is extremely difficult.

Options suggested to be considered and discussed:

Option 1: Countries report the average construction cost per kilometre for paved and unpaved roads, and if possible, other related information. It is expected that ministries of Infrastructure or Transport will be able to supply the data for the Sendai Framework targets and indicators.

Though UNISDR recognizes classifying roads in paved and unpaved may be too simplistic in countries where the road network is very developed, it is assumed to be the minimum cost information.

Option 2: It is suggested to utilize global data from the ROad Costs Knowledge System (ROCKS) developed by the Transport Unit (TUDTR) of the World Bank (accessible at <http://www.worldbank.org/transport/roads/tools.htm>). The ROCKS Worldwide Database compiles data collected primarily from World Bank financed projects and has more than 1,500 records from 65 developing countries. ROCKS compiles cost estimates for maintenance work (renovation, rehabilitation and improvement of existing roads) and for development work (construction of new roads). Roads are categorized as paved and unpaved.

The cost of road rehabilitation is proposed to be a proxy for replacement cost, as most of the work on roads after disasters must be considered as rehabilitation, despite in some cases a full reconstruction of the roads have to be undertaken. Rehabilitation cost is more conservative than development cost.

In order to reflect the significant cost difference in cost between paved and unpaved roads (Table below), UNISDR proposes to assume that distribution of road damage on each category would roughly follow the same pattern as the national distribution of roads. It is recommended to use the latest year data published by the World Bank for the percentage of the road network of the country that are paved (“paved ratio” in the formulas below), reported on annual basis (see <http://data.worldbank.org/indicator/IS.ROD.PAVE.ZS>). The distribution of paved and unpaved roads does not change significantly over the years, and does not justify the additional complexity in the calculation by updating the data annually.

Table Road related costs (global average costs per km, expressed in the USD of year 2002)

PAVED Roads	UNPAVED Roads
Seals USD 20,000 /km	Regravelling USD 11,000/km
Functional Overlays USD 56,000 /km	Improvement USD 72,000/km
Structural Overlays USD 146,000 /km	
Rehabilitation USD 214,000 /km	Rehabilitation USD 31,000 /km
Construction USD 866,000 /km	Paving USD 254,000/km

Source: World Bank, ROCKS database

The caveat of ROCKS is missing statistical data: Unfortunately the data coverage is not global. However, ROCKS summarizes the data by World Bank regions. While the averages per region are slightly different, the number of records per region per type of work is not statistically representative enough in certain regions with very few projects; therefore UNISDR proposes to use global averages instead of the regional averages instead of the regional average of rehabilitation costs.

The current formula to estimate direct cost of damage using replacement cost is:

$$\text{Loss on roads} = ((\text{rehabilitation cost paved per Km} * \text{paved ratio}) + (\text{rehabilitation cost unpaved per Km} * (1 - \text{paved ratio})) * \text{Kilometres affected}$$

Challenge 2:

How to assure proper comparison across time? The construction cost per kilometre will change across time due to technical development and other market related factors (e.g. price increase of construction material in relation to other goods and services). Price level change such as inflation will also influence unit price.

Options suggested to be considered and discussed:

Option 1: The relative unit price increase of construction cost in relation to other goods and services indicates the increased influence of road loss on overall economy. Impact of general inflation will be considered in C1 if agreed so. Suggested to use nominal per unit price in each moment of time.

To adjust inflation factor, the ROCKS are expressed in 2002 US dollars. UNISDR assumes that relative price of construction materials and other elements for road construction remains stable from the simplicity reason under the current data limitation.

Option 2: Simply to observe affected volume trend, use the same unit price for all the moments from baseline period until 2030.

Step3: Convert the value expressed in national currency into the one in USD and derive global loss value

It is recommended to convert the value expressed in national currency into USD by using the official exchange rate at the year of event (Data source: Official exchange rate of the World Bank Development indicator).

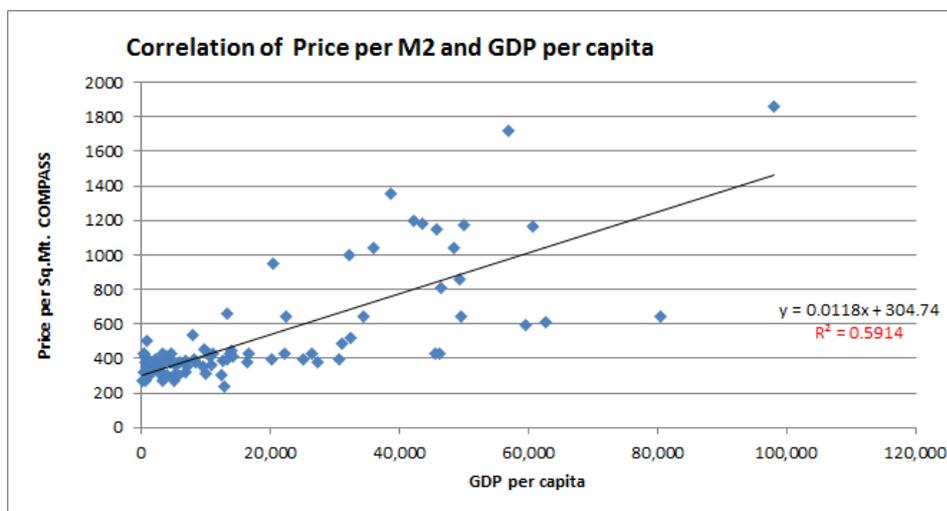
Official exchange rate refers to the exchange rate determined by national authorities or to the rate determined in the legally sanctioned exchange market. It is calculated as an annual average based on monthly averages (local currency units relative to the U.S. dollar).

ANNEX I: Method to derive a national proxy construction cost per square meter for all sectors in case no cost information is reported by countries

Especially for countries that are likely to face difficulty reporting construction cost for each type of sector, UNISDR and scientific partners devised a methodology aimed to obtain a **national proxy construction cost per square meter** that could be used *as approximation* to be applied for each of these sectors that the cost information is missing.

The method is based on data analysis of global housing construction cost database “Global Construction Cost and Reference Yearbook 2012” (Compass International, 2012).⁴ The housing construction cost per square meter for more than 90 countries in Compass and GDP per capita showed a moderate but sufficiently high correlation factor (about 60%). (See Figure below)

Figure: Correlation between housing construction cost per square meter and GDP per capita



The statistical regression produced the following formula to assess the construction cost per square meter in the 85 countries of the GAR sample:

$$\text{Construction cost per square meter} = 304 + 0.0118 * \text{GDP per capita.}$$

This formula is suggested to be applied to all facilities in case construction cost for each sector cannot be obtained.

⁴ This is the only source that contains multiple country information with a documented and consistent methodology. This publication is used worldwide by consulting engineering firms to estimate initial budgets of construction projects.

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Appendix B:

Suggested Critical Infrastructure Categorization Related with Target D

Given the measurability and data availability, it is recommended to monitor the damage to following critical infrastructures at either global or national levels.

	Recommended to be monitored at <u>global level</u>	Recommended to be monitored at <u>national level</u> depending on the needs and context of each country
Education	x	
Health	x	
Transport	Road	Other transportation modes (e.g. airport, seaport, public bus etc.)
Energy		X
ICT		X
Finance		X
Food		X
Water		X
Safety		X
Emergency services		x

Reference: The sectoral coverage of critical infrastructure protection plan in selected countries

Sector	Australia	Canada	Netherlands	UK	US	EU
Energy (including nuclear)	x	x	x	x	X	x
ICT	x	x	x	x	x	x
Finance	x	x	x	x	x	x
Health care	x	x	x	x	x	x
Food	x	x	x	x	x	x
Water	x	x	x	x	x	x
Transport	x	x	x	x	x	x
Safety	Emergency services	x	x	Emergency services	Emergency services	x
Government		x	x	x	x	x
Chemicals		x	x		x	x
Defence industrial base	x	x	x		x	
Other sectors or activities	Public gatherings, national icons		Legal/judicial		Dams, commercial facilities, national monuments	Space and research facilities

Source: OECD (2008), "Protection of Critical Infrastructure and the Role of Investment Policies Relating to National Security. It cites Australia: "What is critical infrastructure? Australian National Security (www.ag.gov.au/add), Canada: About Critical Infrastructure, Public Policy Canada (www.ps-sp.gc.ca) , Netherlands: Report on Critical Infrastructure Protection; Ministry of Interior 16/9/05; UK: Counter-terrorism strategy (www.security.homeoffice.gov.uk), USA: Department of Homeland "Security Sector Specific Plans" (www.dhs.gov); Commission of the European Communities Green Paper on a European Programmes for Critical Infrastructure Protection (COM 2005)576,

Appendix C:

Concept Note on Methodology to Estimate Progress of National and Local DRR Strategy to Measure the Achievement of Target E of the Sendai Framework for Disaster Risk Reduction: A Technical Review

(Originally released in 17 November 2015)

Background

This document outlines suggested options regarding computation methodology for two indicators to monitor the progress and achievement of Target E. It aims to prepare options that countries may wish to consider in preparation for further discussions on global indicators by complementing the background paper “The Indicators to Monitor Global Targets of the Sendai Framework for Disaster Risk Reduction 2015-2030: A Technical Review”, submitted to the Open-ended Intergovernmental Expert Working Group on Indicators and Terminology Related to Disaster Risk Reduction, held on 29-30 September 2015.

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 DRR strategies in line with the Sendai Framework for Disaster Risk Reduction 2015-2030

E-2: Percentage of local governments that adopt and implement local DRR strategies in line with the Sendai Framework for Disaster Risk Reduction 2015-2030

In the 1st session of the Open-ended Intergovernmental Expert Working Group, several countries called for clarification on the minimum standard of DRR strategy and computation method for these indicators. The issue was raised if it is possible to have quantitative indicators to measure the level of progress, rather than applying only Yes/No as regards plan availability. Several countries also addressed the need to make these indicators more related with the Goals and Priorities of action of the Sendai Framework for Disaster Risk Reduction.

These two indicators are also currently examined in the SDG indicator discussion in the Inter-Agency Expert Group and asked for the urgent development of methodology. Indicators - simply counting the number of countries - are not technically recommended in the SDG discussion. Instead, indicators to measure global and national progress have been promoted. This argument can also be applied to the local level and indicators monitoring gradual progress might be welcomed. There was also discussion on the population coverage of such plan would be important for people-centered approach.

Based on these consideration expressed by countries in the Sendai and SDG indicators discussion, UNISDR developed a discussion paper for computation methodology for these two indicators to contribute to further examination by countries.

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

Two options are suggested below. Option 1 is the minimum requirement to measure Target E. Option 2 can also measure the degree to which that the DRR Strategy is in alignment with the Sendai Framework for Disaster Risk Reduction. The process for setting targets and indicators is expected to take time. The introduction of a Progress Index will allow for the monitoring of such continuing and gradual improvement in strategy development.

In both cases, countries report status information and UNISDR calculates the global figure.

Option 1 (Minimum requirement): Simply count **the number of countries** which reported on the adoption and implementation of the national DRR strategy in line with the Sendai Framework for Disaster Risk Reduction 2015-2030.

Definition of the National DRR Strategy can be taken from the paragraph 27 (b) of the Sendai Framework.

National DRR strategies in line with the Sendai Framework for Disaster Risk Reduction 2015-2030: national disaster risk reduction strategies and plans, across different timescales with targets, indicators and time frames, aimed at preventing the creation of risk, the reduction of existing risk and the strengthening of economic, social, health and environmental resilience (Sendai Framework, para 27(b)).

Additional concern is that coherence among DRR, climate change adaptation and sustainable development is strongly advocated in the Sendai Framework. The DRR strategies should be based on risk information and assessments.

It is suggested that countries evaluate if their national DRR strategies satisfy the minimum requirement outlined in the Sendai Framework paragraph 27 (b).

Option 2: Create an index (temporarily called **National DRR Strategy Index**) to reflect progress in more details. National DRR strategy does not have a clear definition in itself, but the minimum criteria are defined as elements of the Progress Index below. The criteria include elements of Paragraph 27 (b) of the Sendai Framework.

National DRR Strategy Index =

Progress index₁ + Progress Index₂+...+ Progress Index_n

Where

n =number of countries reporting the progress on national DRR strategy

The score of non-reporting countries is assumed as zero (not having national DRR strategy) and therefore not included in the formula.

The Progress Index checks the degree to which the national DRR strategy satisfies 5 elements defined in the Sendai Framework paragraph 27 (b). The five elements are (a) setting time frames and targets, (b) setting indicators, (c) setting objectives and measures aiming at preventing the creation of risk, (d) setting objectives and measures aiming at the reduction of existing risk, and (e) setting objectives and measures aiming at the strengthening of economic, social, health and environmental resilience.

Each element is assigned 0.2 (20%). If a country has a DRR strategy satisfying the five elements, it is evaluated as 1. If a country reports the lack of DRR strategy, it is evaluated as 0. If a country has a contingency or preparedness plan which has objectives and measures aiming at the strengthening of economic, social, health and environmental resilience, but not addressing the prevention of risk creation and reduction of existing risk and also not having targets and indicators, then it is evaluated as 0.2.

The score of National DRR Strategy index will increase when the number of countries reporting on the adoption and implementation of national DRR strategy increases and/or the quality of national DRR strategy improves to satisfy the definition of the DRR strategy outlined in the Sendai Framework.

The five elements would have variation. An example is combining (a) and (b) to make new (a) setting timeframes, targets and indicators, and adding a new (b) being informed by risk assessment and information. However, it is not recommended to significantly change the five elements to be consistent with the Sendai Framework.

This option is more complicated than option 1. However, without putting significant additional burden, it is possible to monitor quality improvement of national DRR strategy. Given that target and indicator setting is usually a process taking time, instead of evaluating the plan which does not satisfy the Sendai Framework para 27 (b) definition as zero in Option 1, option 2 can evaluate the achieved element as 0.2, 0.4, 0.6 and 0.8.

Indicator E-2 Percentage of local governments that adopt and implement local DRR strategies in line with the Sendai Framework for Disaster Risk Reduction 2015-2030

Four options are suggested below. Option 1 is the minimum requirement to measure Target E. Option 2 can measure the degree to which the DRR Strategy is in alignment with the Sendai Framework for Disaster Risk Reduction. The process for setting targets and indicators is expected to take time. The introduction of the Progress Index will allow monitoring such continuing and gradual improvement of the strategy development.

The variations in size of local governments might need attention on population coverage of local strategies. In a country where the majority of small local governments adopt and implement local DRR strategies but one big local government does not have a local DRR strategy, a significant percentage of the national population will not be covered by local DRR strategies. From a human-centered perspective, option 3 is proposed to take population coverage into consideration. Option 4 is the combination of the Options 2 and 3 (Table 1).

Table 1 Four options suggested

	Progress (quality improvement)	Population coverage
Option 1	-	-
Option 2	x	-
Option 3	-	x
Option 4	x	x

The required information from countries for each option is as follows (Table 2). In all cases, countries report status information and UNISDR calculates the global average percentage.

Table 2 Required information from countries for each option

	Option1	Option2	Option 3	Option4
DRR strategy adoption and implementation (Required for all options)	X	x	x	X
Progress Index (explained below) (Required for options 2 and 4)	-	x	-	x
Population Share Index (explained below) (Required for options 3 and 4)	-	-	x	x

Definition:

It is currently proposed to define the **local government** as a “form of public administration at the lowest tier of administration within a given state, which generally acts within powers delegated to them by legislation or directives of the higher level of government”.

It is proposed as the lowest tier because between national level and municipality (lowest) level, there is much variance of sub-national governments across countries (e.g. state, prefecture, department, province, canton). Additionally, lowest tier governments are the closest to the citizens and serve as the base of resilience building.

This indicator needs caution because administrative reform in a country will influence the percentage in each option by changing the total number of local governments. However, no solution can be found on this issue.

In options 1 and 3, **Local DRR Strategy** is defined as local disaster risk reduction strategies and plans, across different timescales with targets, indicators and time frames, aimed at preventing the creation of risk, the reduction of existing risk and the strengthening of economic, social, health and environmental resilience (Sendai Framework, para 27(b)).

In Option 2 and 4, Local DRR strategy does not have clear definition in itself but the minimum criteria are defined as elements of the Progress Index. The criteria include the elements of Paragraph 27 (b) of the Sendai Framework.

Additional concern in both cases is that coherence among DRR and climate change adaptation and sustainable development is strongly advocated in the Sendai Framework. The DRR strategies should be based on risk information and assessments.

Option 1 (Minimum requirement): Calculate global average: Add each country's percentage of local government adopting and implementing local DRR strategy and divide the value by the number of countries reported.

$$\text{Global average} = \frac{(\text{Percentage of Country}_1 + \text{Percentage of Country}_2 + \dots + \text{Percentage of Country}_n)}{\text{Number of countries reported}}$$

n = number of countries reported

$$\text{National average} = \frac{\text{Number of local government adopting and implementing local DRR strategy}}{\text{total number of local government in a country}}$$

Definition of the Local DRR Strategy will be taken from paragraph 27 (b) of the Sendai Framework.

Countries are suggested to evaluate if their local DRR strategies satisfy the minimum requirement outlined in the Sendai Framework paragraph 27 (b).

Non-reporting local government is assumed as not having a local DRR strategy.

Option 2: Create an index (temporarily called **Local DRR Progress Index**) to reflect the national progress in local DRR Strategy quality, add each country's Index and divide the value by the number of countries reported to calculate the global average.

$$\text{Global Average} = \frac{(\text{Local DRR Progress Index}_1 + \text{Local DRR Progress Index}_2 + \dots + \text{Local DRR Progress Index}_n)}{\text{Number of countries reported}}$$

n = number of countries reported

Local DRR Progress Index in a country=

$$\text{Progress Index}_1 + \text{Progress Index}_2 + \dots + \text{Progress Index}_n / \text{Total number of local government in a country}$$

Where

n = total number of local governments in a country

The score of non-reporting local governments is assumed as zero in terms of the Progress Index (not having DRR strategy).

The Progress Index checks the degree to which the local DRR strategy satisfies the 5 elements defined in the Sendai Framework paragraph 27 (b). The Five elements are (a) setting time frames and targets, (b) setting indicators, (c) setting objectives and measures aiming at preventing the creation of risk, (d) setting objectives and measures aiming at the reduction of existing risk, and (e) setting objectives and measures aiming at the strengthening of economic, social, health and environmental resilience.

Each element is assigned 0.2 (20%). If a local government has a DRR strategy satisfying the five elements, it is evaluated as 1. If a local government reports the lack of DRR strategy, it is evaluated as 0. If a local government has a contingency or preparedness plan which has objectives and measures aiming at the strengthening of economic, social, health and environmental resilience but not addressing the prevention of risk creation and reduction of existing risk and also not having targets and indicators, then it is evaluated as 0.2 (20%).

The score of the Global Average will increase when more local governments report on the adoption and implementation of local DRR strategy and/or the quality of local DRR strategy improves to satisfy the definition of the DRR strategy outlined in the Sendai Framework.

The five elements can have variation. An example is combining (a) and (b) to make new (a) setting timeframes, targets and indicators, and adding a new (b) being informed by risk assessment and information. However, it is not recommended to significantly change the five elements to be consistent with the Sendai Framework.

This option is more complicated than option 1. However, without putting significant additional burden, it is possible to monitor quality improvement of the local DRR strategy. Given that target and indicator setting is usually a process taking time, instead of evaluating the local plan which does not satisfy the Sendai Framework para 27 (b) definition as zero in option 1, option 2 can evaluate the achieved element as 0.2, 0.4, 0.6 and 0.8.

Option 3: Create an index (temporarily called **Local DRR Population Share Index**) to reflect the population coverage of local DRR Strategies at national level, add each country's Index and divide the value by the number of countries reported to calculate global average.

Global average= (Local DRR Population Share Index₁+ Local DRR Population Share Index₂ +...+ Local DRR Population Share Index_n) / Number of countries reported

n = number of countries reported

Local DRR Population Share Index in a country=

$$\text{Local government (LG)}_1 * \text{Population Share Index}_1 + \text{LG}_2 * \text{Population Share Index}_2 + \dots + \text{LG}_n * \text{Population Share Index}_n / \text{Total number of local government in a country}$$

Where

Local Government (LG): Binary value 1 or 0 is given. Local governments reporting the adoption/implementation of local DRR strategy in line with the Sendai Framework is given 1 while local governments reporting the lack of such a plan is given 0. Non-reporting local government is assumed as zero (not having DRR strategy).

n = total number of local governments reported

Population Share Index: the local government's population share (%) in national population

The score of the Global Average will increase when the number of local governments reporting the adoption and implementation of a local DRR strategy in line with the Sendai Framework increases and/or the population share of local governments adopting/implementing DRR strategy increases.

This option is more complicated than option 1. However, without putting significant additional burden, it is possible to monitor the population coverage of local DRR strategy.

Option 4: Create an index (temporarily called **Local DRR Progress Population Index**) to reflect the quality improvement and population coverage of local DRR Strategies at national level, add each country's Indexes and divide the value by the number of countries reported to calculate global average.

$$\text{Global average} = (\text{Local DRR Progress Population Index}_1 + \text{Local DRR Progress Population Index}_2 + \dots + \text{Local DRR Progress Population Index}_n) / \text{Number of countries reported}$$

n = number of countries reported

Local DRR Progress Population Index in a country=

$$\text{Local government (LG)}_1 * \text{Progress Population Index}_1 + \text{LG}_2 * \text{Progress Population Index}_2 + \dots + \text{LG}_n * \text{Progress Population Index}_n / \text{Total number of local governments in a country}$$

Where

Local Government (LG): Binary value 1 or 0 is given. Local governments reporting the adoption/implementation is given 1 while local governments reporting lack of the adoption/implementation is given 0. Non-reporting local government is assumed as zero (not having DRR strategy).

n = total number of local governments in a country

Progress Population Index: the Progress Index * Population Share Index

The score of Global average will increase when (a) the number of local governments reporting the adoption and implementation of local DRR strategy increases, (b) the quality of local DRR strategy

improves to satisfy the definition of the DRR strategy outlined in the Sendai Framework, and/or (c) the population share of local governments adopting/implementing DRR strategy increases.

This option is the most complicated. Interpretation needs caution by introducing several elements.

Example:

National Level

Let us suppose an imaginary country having 4 local governments. The information reported from these 4 local governments for each option is as follows.

	Local 1	Local 2	Local 3	Local 4
DRR strategy adoption and implementation	Yes	Yes	Yes	No
Progress Index (a)	100%	80%	60%	0
Population Coverage Index (b)	40%	30%	15%	15%
Progress Population Index ((a)*(b))	40%	24%	9%	0

Note: The table shows only Local 1 satisfies definition of para 27 (b) of the Sendai Framework (Progress Index is 100%).

Option 1

Percentage is 25%

(1 out of 4 local governments having local DRR strategies satisfying 5 elements in paragraph 27 (b) of the Sendai Framework. Local governments 2 and 3 might have local DRR strategy but the strategies are not satisfying the 5 elements judging from the Progress Index. Therefore, they are evaluated as not satisfying the definition of local DRR strategy in alignment with the Sendai Framework and therefore are scored as zero.)

Option 2

$$(1*100\% + 1*80\% + 1*60\% + 0)/4=240\%/4 =60\%$$

Currently remaining 40% is attributed to no plan in local 4 and lacking elements in local 2 and 3. If the local 4 adopts and implements the plan satisfying all 5 elements, then

$(1*100\% + 1*80\% + 1*60\% + 1*100\%)/4=340\%/4 =85\%$. Remaining 15% can be remedied by quality improvement of plans in local 2 and 3.

Option 3

$$(1*40\% + 0\% + 0\% + 0\%)/4 = 40\%/4 = 10\%$$

(Only Local 1 satisfies the definition of local DRR strategy and is counted as 1.)

Option 4

$$(1*40\% + 1*24\% + 1*9\% + 0)* /4 = 73\%/4 =18\%$$

Global Level

Let us suppose an imaginary world consisting of 3 countries. The information reported from these 3 countries for each option is as follows.

	Country 1	Country 2	Country 3
Option 1: DRR strategy adoption and implementation	25%	50%	40%
Option 2: Local DRR Progress Index	60%	80%	50%
Option 3: Local DRR Population Share Index	10%	50%	75%
Option 4: Local DRR Progress Population Index	18%	48%	60%

Option 1: $(25\% + 50\% + 40\%) / 3 = 38\%$

Option2: $(60\% + 80\% + 50\%) / 3 = 63\%$

Option3: $(10\% + 50\% + 75\%) / 3 = 45\%$

Option4: $(18\% + 48\% + 60\%) / 3 = 42\%$

Appendix D:

**Suggested List of Hazard Measured for the Purpose of Measuring
Global Targets of the Sendai Framework**

FAMILIES	SUB-FAMILIES	HAZARDS
Natural hazards	Geophysical	Earthquake
		Mass movement
		Volcanic activity
	Hydrological	Flood
		Landslide
		Wave Action
	Meteorological	Convective Storm
		Extra-tropical storm
		Extreme temperature
		Fog
		Tropical cyclone
	Climatological	Drought
		Glacial lake outburst
		Wildfire
	Extra-terrestrial	Impact
		Space weather
Environmental Hazards	Environment degradation	Erosion
		Deforestation
		Salinization
		Desertification
		Asian Dust cloud
		Wetland loss/degradation
		Glacier retreat/melting
Biological hazards	Biological hazards	Epidemics
		Pandemics
		Epizootics
		Pest
		Insect infestation
		Animal Incidents
		Pollution
Man-made hazards (Anthropogenic hazards)	Technological hazards	Industrial disaster
		Structural collapse
		Power outage
		Fire
		Explosion
		Mine disaster
	Chemical and radiological hazards	Chemical Spill
		Oil Spill
		Radiation contamination
	Major Transportation Accidents	Aviation Accident
		Rail Accident
		Road Accident
		Navigation Accident
		Space Accident

Appendix E:

Suggested basic set of requirements for recording and reporting disaster loss from countries to UNISDR in order to monitor the Targets (a) through (d)

Data to monitor the Sendai Framework should be gathered, entered and validated by/with government. This set of requirements is established for countries to obtain the minimum data required for reporting to the Sendai Framework and at the same time leaves the countries with a data product that can be used for many purposes in DRR practice, based on their needs and contexts. Countries are asked to examine each requirement in recording and reporting disaster losses. The detailed guidelines are under development by UNISDR.

1. **All loss indicators** defined by the OEIWG decision should be recorded and reported.
2. National disaster loss data collection should have **no data entry threshold**.
3. Disaster loss data should be reported at the minimum scale of **national level**.
4. Disaster loss data should be recorded and reported by each **Hazardous event***.
***Hazardous event:** The occurrence of a natural or human-induced phenomenon in a particular place during a particular period of time due to the existence of a hazard. (Proposed updated Terminology on Disaster Risk Reduction, August 2015)
5. Disaster loss data should be recorded and reported by **hazard(s)** that triggered the event.
6. **UNISDR (including IRDR) Hazard classification** should be followed. (Note: need to examine man-made hazard classification).
7. Human related loss (mortality and affected) should be recorded and reported by **disaggregation** defined by the OEIWG. When possible data had better be also disaggregated by other characteristics as relevant as possible.
8. Disaster loss data ideally should be recorded on a scale of specific **geographic unit**, ideally units similar to a **municipality**.
9. Disaster loss data should specify the **temporal span (starting and ending dates)** of each event.

Table: Image of disaster loss recording

Event no.	Hazard	Province	Municipality	Starting Date (YMD)	Ending Date (YMD)	Deaths (Female)	Houses destroyed	Houses Damaged
71021	STORM	Western Region	Tanahu	1971/4/21	1971/4/25	1 (0)		
71025	EPIDEMIC	Central Region	Sindhupalchoke	1971/4/25	1971/5/2	1 (1)		