Addressing infrastructure failure data gaps: A governance challenge
Addressing the infrastructure failure data gap: A governance challenge

The United Nations Office for Disaster Risk Reduction works towards the substantial reduction of disaster risk and losses to ensure a sustainable future. UNDRR supports the implementation of the Sendai Framework for Disaster Risk Reduction 2015-2030, which sets out a people-centred approach towards achieving a substantial reduction in disaster losses from man-made and natural hazards and a shift in emphasis from disaster management to disaster risk management.

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Highlights

In the 2015-2019 period, Target D (infrastructure loss and service disruption) was the second least reported after Target F (international cooperation).

Number of destroyed or damaged educational facilities attributed to disasters are notably high for all years between 2015 and 2018, with highest numbers in the Americas and the Caribbean.

Between 2015 and 2019, the majority of damages to critical infrastructure have occurred in the Americas and the Caribbean region. On the other hand, the majority of service disruption has been reported in the Arab States region, followed by Europe and Central Asia.

The lack of national, regional and global definitions on what constitutes critical infrastructure and services, the lack of data quality and data collection standards, the lack of centralized national databases, and the fact that certain disaster loss data is in private sector hands are among the most common hindrances to the efficient collection of data on target D.
The private sector has an inherent interest in seeking infrastructure-related disaster loss data and has the capacity to assist in collecting such data.

Robust national regulations, backed by continuous political commitment, would send a strong message to responsible public institutions, investors, infrastructure developers and other stakeholders, of the importance and the need for the collection of better quality and disaggregated data.

Understanding by all stakeholders of the purpose of collecting infrastructure loss data and how it translates into concrete risk reduction activities is crucial.

The role of disaster loss data, the methods for its collection and reporting, as well as the practical utility of the data, alongside high-level requirements, should be defined in discussion with all involved public agencies and across private sectors.
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Sendai Framework

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 2030.¹

¹ For all Sendai Framework targets and their indicators see: https://www.preventionweb.net/sendai-framework/sendai-framework-monitor/indicators (15.01.2021)
D1
Damage to critical infrastructure attributed to disasters.

D2
Number of destroyed or damaged health facilities attributed to disasters.

D3
Number of destroyed or damaged educational facilities attributed to disasters.

D4
Number of other destroyed or damaged critical infrastructure units and facilities attributed to disasters*.

D5
Number of disruptions to basic services attributed to disasters.

D6
Number of disruptions to educational services attributed to disasters.

D7
Number of disruptions to health services attributed to disasters.

D8
Number of disruptions to other basic services attributed to disasters*.

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

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

The 2020 Report of the Secretary-General on the Implementation of the Sendai Framework for Disaster Risk Reduction (SFDRR) 2015-2030 praised the efforts of nations towards increasing their capacity to implement disaster risk reduction programmes but noted that actions to prevent the creation of new and reduce existing risk are still lagging behind. The report found that DRR is still not sufficiently integrated in policies and investments in a multitude of sectors. Economic losses related to disasters continue to soar and the number of damaged or destroyed infrastructure facilities has increased from 0.587 in the 2005-2015 period to 0.844 per 100,000 people in the 2009-2019 period, as reported in the Sendai Framework Monitor (SFM) tool for global Target D and in the DesInventar disaster loss database (UNGA, 2020). This is only a fraction of the actual instances of damages and disruptions, as reporting loss data related to Target D has been relatively scarce. This report reiterates on the need to build resilience into infrastructure and health systems in the face of the COVID-19 outbreak, but also to address underlying risks and to build back better through increased political and financial commitments (UNGA, 2020).

Infrastructure investment is an important part of economic-crisis recovery as it creates jobs and revitalizes communities. It is already part of national and regional post COVID-19 stimulus packages. At the same time, the COVID-19 pandemic has shown the breadth of the consequences of systematically underinvesting in resilience. With investments going towards putting new infrastructure in place and given that the bulk of funding allocated for recovery will be used to support public investment and key structural reforms, it is critical that considerations of risk reduction (natural and human induced) and resilience shape how and where these resources are spent.

Resilient infrastructure projects need to be backed by sufficient resources and based on risk-informed policies, supported by credible data. At the same time, since the launch of the Sendai Framework and the Sendai Framework Monitor reporting tool,
**Target D** (Infrastructure losses and service disruption) has been the second most under-reported target after Target F (International cooperation). The lack of not only regional and global but also national definitions on what constitutes critical infrastructure and services, the lack of data quality and data collection standards and methodologies, the lack of centralized national databases, and the fact that certain disaster loss data is in private sector hands are among the most common hindrances to the efficient collection of data on target D.

That said, there are a number of opportunities and possible steps which governments, private companies, investors and other involved actors could take to support the collection of disaster loss data, so as to support decision-making and planning for the development of new and the upgrade of existing infrastructure projects and towards improved resilience. This report explores the state of reporting against Target D of the Sendai Framework, some of the identified obstacles that have created gaps in reporting and possible ways forward.
State of reporting towards target D

Data for this analysis has been taken from the Sendai Framework Monitor (SFM) and contains both data that has been validated by the countries and data that is yet to be validated. Almost all of the data for each annual reporting period is received in the following year and hence for the 2020 period, the reporting is still ongoing. The data presented in this report is a snapshot as of October 2020 and as countries are within their rights to retroactively change the data entered by them, this analysis could be subject to change in the future.

By year

Within the 2015-2019 period, reporting on Target D was overall low and there were no significant changes in the numbers and percentage of countries reporting for each year. In 2015, 45 (23%) of all 195 countries listed in the SFM reported some data on Target D. In 2016 this number was 52 (27%), followed by 61 (31%) in 2017, 59 (30%) in 2018 and 31 (16%) in 2019.

Percentage of total number of countries reporting on Target D by year
Across regions\(^2\)

The percentage of reporting countries across all regions for the same period (i.e. 2015-2019) is equally low. In the Africa region between 16% and 23% of countries have reported some data on Target D between 2015 and 2018. In the Americas and the Caribbean region between 26% and 31% have reported some data on Target D between 2015 and 2018. Asia-Pacific region varies between 23% and 31%; in the Europe and Central Asia region this range is between 22% and 40%, and in the Arab States region - between 27% and 45%. In 2019 the numbers decrease to between 9% and 24% for the different regions, as national data is still to be received in the next reporting periods.

Based on the data reported, between 2015-2019, the majority of damages to critical infrastructure have occurred in the Americas and the Caribbean region\(^3\). On the other hand, the majority of service disruptions has been reported in the Arab States region, followed by Europe and Central Asia\(^4\).

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2. Based on UNDRR’s regional division: Africa region – 44 countries; Americas & Caribbean region – 35 countries; Arab States – 22 countries; Asia-Pacific region – 39 countries; Europe & Central Asia – 55 countries.

3. Based on the data reported under indicator D-1, which is a compound indicator of D-2, 3 and 4 for the 2015-2019 period by each region.

4. Based on the data reported under indicator D-5, which is a compound indicator of D-6, 7 and 8 for the 2015-2019 period by each region.
Within various indicators of the target

The analysis of data entries for the five-year period (i.e. 2015-2019) by specific indicators (D-1 to D-8) does not reveal any significant discrepancies, meaning no specific indicator is distinctly more reported or under-reported on by countries. That said, reporting against all indicators of Target D is low.

Indicator D-1 is a compound indicator of D-2, D-3 and D-4 on damages to critical infrastructure and D-5 represents a compound indicator of D-6, D-7 and D-8 on disruptions to basic services. D-1 and D-5 are proposed to be calculated as an Index of Critical Infrastructure Damage and an Index of Service Disruption respectively (UNISDR, December 2017), where the number of damaged or disrupted facilities or services is counted and is taken relative to the countries’ population, expressing the indicator as the ratio per 100,000 population. 5.

While the Sendai Framework principally focuses on ‘critical infrastructure,’ it refrains from establishing a definition and has left it for national governments to decide which elements they include when reporting on progress. However, the framework does mention some infrastructure types that it considers critical, namely: water, transportation and telecommunications infrastructure, educational facilities, hospitals and other health facilities. More detailed information on what is understood by ‘critical infrastructure’ can also be found in the Technical Guidance for Monitoring and Reporting on Progress on the Sendai Framework Targets.

The Technical Guidance indicates that D-2, 3 and 4 need to measure the number of facilities and infrastructure units which are damaged or destroyed, while D-6, 7 and 8 are measured by counting the number of times the provision of basic services are disrupted as a consequence of a disaster. If several interruptions occur in a given service during a disaster event this would count as one disruption, but if several services are interrupted during a disaster event they need to be accounted as separate records (UNISDR, December 2017).

Even though the SFM urges nations to report in a more segregated manner on “other” damaged and destroyed infrastructure and disruption of services through including the option to report data related to specific sub-sectors, such as energy, transportation, telecommunications, water and waste, and others, not many countries complete all or any of the sub-sector information. Data is mostly available on number of damaged and destroyed transportation infrastructure and disruption of related services.

5. D-1 = Index of Critical Infrastructure Damage = number of infrastructure units and facilities damaged/population * 100,000; D-5 = Index of Service Disruptions = number of disruptions occurred/ population * 100,000
Number of destroyed or damaged health facilities attributed to disasters: In the Arab States region, the reported values are very low for 2018 and not reported on for the rest of the period (value=0). In the 2015-2019 period, the reported values for Africa, the Asia-Pacific, and the Americas and the Caribbean are comparatively low. The major outlier in this group was reported in the Europe and Central Asia region, where 87,831 destroyed or damaged health facilities were reported in 2017 alone (21 out of 55 countries, or 38%, reported in that year).

Number of destroyed or damaged educational facilities attributed to disasters: Values for this indicator are notably high for all years between 2015 and 2018 for three of the regions, with highest numbers in the Americas and the Caribbean. In 2018, 119,992 educational facilities were reported as damaged or destroyed in that region (reported by 8 out of 35 countries). The previous three years the values were all over 55,000 facilities (reported by an average of approximately 8 countries). In 2015, the Asia-Pacific indicated a number of 51,738 facilities (reported by 10 out of 39 countries). In 2017, Europe and Central Asia reported a number of 106,888 facilities (reported by 21 out of 55 countries). Values for this indicator are lowest in the Arab States region, followed by Africa.

Number of other destroyed or damaged critical infrastructure units and facilities attributed to disasters: Americas and the Caribbean reported the highest numbers of damages and disruptions in 2015, 2017 and 2018 (53,904,170 in 2018, reported by 7 out of 35 countries). Asia-Pacific also registered high values in all years, the highest being 145,688 in 2019. Europe and Central Asia registered values above 1,500 for all years of this period (the highest was 2,832 in 2016).

Number of disruptions to educational services attributed to disasters: Reported numbers for this indicator are relatively low for all regions with the exception of Asia-Pacific, where 22,011 instances were reported for 2015 (reported by 9 countries) and 20,767 instances for 2018 (reported by 7 countries).

Number of disruptions to health services attributed to disasters: Values across all regions for the period are comparatively low. The highest reported value for this indicator is 476 disruptions in 2016 in the Arab States region and 178 disruptions in 2017 in the Asia-Pacific region.

Number of disruptions to basic services attributed to disasters: In this indicator, there are a few high outliers (e.g. in Arab States region in 2015 and Europe and Central Asia in 2017). It should be noted that countries have very divergent national methodologies for the calculations of this indicator, which makes comparisons difficult.
Comparison against reporting on other SFDRR targets

A 2017 review of the readiness of nations to report on the Sendai Framework targets and indicators revealed that from the 87 countries, which responded to the conducted survey, 83% had available data related to Target A and 66% to Target B, while data on Targets C and D was available in 50-60% of the countries (UNISDR, 2017). The analysis of the actual submitted data (validated and non-validated), however, reveals lower ambition to report data on the targets.

In the 2015-2019 period, Target D was second least reported on after Target F. In comparison, targets A and B were the most reported on targets for each year in the same period followed by Target C (with the exception of 2019, when Target C was more reported on compared to Target B). To put this into perspective, targets A and B were reported on by between 28% (lowest for Target B for 2019) and 54% (highest for Target A for 2017) of all 195 countries listed in the SFM tool; while Target D was reported on by between 16% (lowest for 2019) and 31% (highest for 2017) of all 195 countries listed in the SFM tool.

From the analysis above it is clear that there are significant gaps in reporting data on Target D, even though parts of the required data are also required for Target B and Target C.
Need of infrastructure damage and service disruption data in other international processes

Infrastructure loss and disruption of basic service data also has potential use in multiple 2030 development agendas.

Sustainable Development Goals (SDGs)

The Sendai Framework indicators were designed in coherence with relevant targets of the SDGs⁷. Ten out of the 17 SDGs contain 25 targets which are related to disaster risk reduction, ultimately linking the effective implementation of the Sendai Framework with the achievement of the SDGs and vice versa (LRI, 2020).

Target D is directly linked to SDG 11 on making cities and human settlements inclusive, resilient and sustainable. Indicator 11.5.2 requires the collection of data on “damage to critical infrastructure and number of disruptions to basic services, attributed to disasters”⁸ and nations have indicated that they use data on the two indicators interchangeably, alongside data from DesInventar. As such, data on this indicator is also insufficient but working towards achieving the SDGs would require both collection of data for Indicator 11.5.2 and Target D.

Apart from SDG 11, Target D is also of relevance to achieving the goals of SDG 9 – Industry, Innovation and Infrastructure, SDG 7 – Affordable and Clean Energy and SDG 13 – Climate Action.

SDG 9 requires that by 2030 infrastructure is developed and upgraded to make it reliable, sustainable and resilient. Even though the indicators of SDG 9 do not directly contribute to data reporting requirements of Target D,

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⁸ See: https://unstats.un.org/sdgs/metadata/
commitment to its implementation would have an impact on fulfilling the aims of Target D as well. SDG 9 calls for measuring the proportion of the rural population who live within two kilometres of an all-season road and for measuring the passenger and freight volumes, by mode of transport, which helps identify transport sector needs and potential spots that would require most attention. Target D asks for the number of disruptions to transportation services and damages on transport infrastructure. Linking SDG 9 with Target D could improve risk and impact assessments through informing development activities under the SDG agenda on risk areas. Indicator 9.4 also calls for measuring the CO2 emission per unit of value added, which links the resilience of infrastructure with the climate adaptation agenda. The link between SDG 9 and Target D underlines the importance of resilient infrastructure for providing safe and sustainable environments for communities.

SDG 7 promotes the development and upgrade of technology for the provision of sustainable energy services and includes indicators for measuring the proportion of population with access to electricity and the proportion of installed renewable energy sources. The majority of countries consider power and energy infrastructure, essential for the daily functioning of societies and communities, as critical infrastructure. The number of destroyed and damaged energy-related infrastructure and interruptions to services are included as a sub-sector to report on in the SFM. Increasing the awareness of the inter-dependencies between the two frameworks could support the inclusion of climate change impacts and disaster risk resilience into upcoming projects under the SDG agenda and also prompt governments to report on infrastructure (including green infrastructure) damages in relation to Sendai Framework commitments.

SDG 13 prompts integration of climate change measures in national policies, strategies and planning and for strengthening resilience and adaptive capacity to climate-related hazards and natural disasters, measured, among other indicators, by the number of countries that adopt and implement national disaster risk reduction strategies in line with the Sendai Framework. Resilience of infrastructure should be taken into account in local and national policies and strategies, in line with both Sendai Framework and the 2030 Agenda commitments (e.g. construction and repair of road infrastructure considering disaster risk and climate change impacts) (LRI, 2020).

SDG 13 also aims to encourage nations to limit their total greenhouse gas emissions per year as part of their national strategies. As the built environment is responsible for between 30 to 40% of all global carbon emissions (Parnell & Glowacz, 2020) it is crucial that infrastructure is considered in relevant policies and planning under this SDG.
Analysis of Sendai Framework Target D
Paris Agreement

Even though Article 8 of the Paris Agreement on the importance of “averting, minimizing and addressing loss and damage”⁹ could be directly related to Target D of the Sendai Framework, there is still the need to more clearly underline the inter-linkages between commitments under the two initiatives. For instance, reporting on Target D could include clearer climate markers to indicate which damages and destructions of infrastructure and disruptions of services are related to disaster events induced by climate change. This would support knowledge on the impacts of climate change on infrastructure for developing evidence-based climate resilience policies.

On the other hand, assessing climate and disaster risks when managing infrastructure projects (e.g. green energy) should be an important part of developing low-carbon strategies for fulfilling Nationally Determined Contributions (NDCs) under the Paris Agreement, which also links with the commitments toward the 2030 Agenda (e.g. SDG 13 as stated above) (IISD, 2018).

New Urban Agenda

The New Urban Agenda commits to implementing disaster risk reduction and climate change mitigation measures for ensuring safe, resilient and sustainable cities and housing, looking at improving and transforming urban mobility, water and waste management, energy and green infrastructure¹⁰. Improved and increased reporting on Target D and high-quality disaggregated data could support the aims of the New Urban Agenda in designing the required policies and strategies, through revealing gaps and identifying hotspots of infrastructure and services at risk. At the same time, it would be worth exploring ways to streamline Target D objectives into activities under the New Urban Agenda (e.g. engaging with the Global Taskforce of Local and Regional Governments), even more so given that major infrastructure and services are most commonly built and operated in or around cities.

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Known barriers

UNDRR’s 2017 Sendai Framework Data Readiness Review, the consecutive monitoring report Snapshot of Reporting for 2018 on the status of implementation of the Sendai Framework, and a recent report of the ETH Zurich Center for Security Studies have pointed out several challenges in collection of and reporting on Target D:

a. There is **no commonly agreed definition** or understanding of what constitutes critical infrastructure, and especially critical services, resulting in unclarity and lack of harmonisation of what critical infrastructure includes that needs to be recorded and reported¹¹;

b. Data quality and data collection **standards and methodologies vary among reporting countries** and at times within the different administrative regions within a country. Data is often inconsistent when collected from several sources. **Nations face difficulties in identifying all national and local data sources** and compiling data in a single format with common definitions;

c. Certain data may be available but is owned by the private sector and the insurance sector, who may not want to disclose it (e.g. data protection legislation and policies; competition-sensitive information) or do **not disclose data free of charge**;

d. **Lack of sufficiently disaggregated data.** The SFM requires that nations report data disaggregated along the lines of type of hazard, geography, and socio-economic status of affected people. It also requires data on D-4 and D-8 to be provided for each infrastructure and services sub-sector (e.g. water, transport, etc.) but a significant number of countries do not have and/or do not provide disaggregated data.

¹¹. It should be noted that the Technical Guidelines on Monitoring and Reporting Progress of the Sendai Framework targets does provide working definitions. Nonetheless, national definitions may differ from the ones included in the Technical Guidelines.
The 2017 Sendai Framework Data Readiness Review collected responses from participating countries on the challenges they face in collecting disaster loss data. Thus, for instance, for:

- **Indicator D-2**: Out of the 24% of countries that responded to the question on challenges and resources needed (out of 87 responding countries), 86% cited the need for financial resources, 71% for increased capacities and 67% for technology transfer.

- **Indicator D-3**: Out of the 23% of countries that responded to the question on challenges and resources needed, 90% indicated lack of financial resources, 70% needed more capacities and 65% mentioned technology transfer as a requirement.

Member states provided similar responses when referring to indicators D-4, 6, 7 and 8, identifying the lack of or sufficient financial resources as the major challenge in collecting disaster loss data, followed by the need to improve national and local capacities and the need to develop new or upgrade existing technologies (UNISDR, 2017).
Disaster risk reduction requires both awareness of historical events and understanding of potential future risks and the damages they can cause. Both public institutions and the private sector have a high level of responsibility in building the resilience of infrastructure. They also have the prerogative and the capacity to put in place a broad range of resilience strategies that address the reduction of exposure to shocks and improve financial and functional capacities.

Strengthening regulatory mechanisms and establishing data collection standards

The 2017 Sendai Framework Data Readiness Review revealed that out of the 87 responding countries only 45% collected disaster loss data for both small and large-scale events, another 45% did not respond to this query and 10% indicated they do not collect data for events at any scale. Furthermore, only 22 countries answered that they collect data on damages or destruction of “other” critical infrastructure in relation to Indicator D-4 (this could include damage and destruction of water pipes, bridges, ports and airports, power supply systems, drainage, telecommunication infrastructure, etc.). Data on damaged and destroyed roads were available in 38 of the responding countries. Water supply disruption data (related to Indicator D-8) were available in 33 of the countries (UNISDR, 2017). At present reporting desegregated data on Target D in the SFM is more of an exception, rather than the rule. Back in 2014, only six EU member states had binding legislation on the establishment of national databases or the collection of damage and loss data. At the same time the availability of such legislation does not guarantee that comprehensive and/or sufficiently disaggregated data is being recorded (EC, 2018). In contrast, there are a number of countries where the establishment of disaster loss datasets is not required by law (e.g. France) but quality data is still being collected. That said, robust national regulations, backed by continuous political commitment, would send a strong message to responsible public institutions, investors, infrastructure developers and other stakeholders and would facilitate the collection of better quality and disaggregated information.
or not (EC, 2014). The Canadian Disaster Database (CDD), for instance, provides detailed disaster loss information on natural, man-made and conflict events, starting from 1900 onward. The database contains information on transportation accidents (including fire, spills and derailment), on infrastructure failures related to the communications, manufacturing, transportation and water sectors, and on explosions in the air, marine, rail and vehicle means of transport, thus facilitating infrastructure risk assessments12.

This process needs to be undertaken along with the establishment of a definition for resilient infrastructure. In defining sustainable and resilient infrastructure, it is suggested that this should be a broad definition that includes digital, distributed and natural forms of infrastructure, and making resilience to future

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physical climate change impacts and natural disaster risk a key criterion of classification as ‘sustainable infrastructure’ (UNDRR, November 2020).

The role of disaster loss data, the methods for its collection and reporting, as well as the practical utility of the data, alongside high-level requirements, should be defined in discussion with all involved public agencies and across private sectors. A good approach could be setting up minimum mandatory reporting requirements for investors, owners and operators of infrastructure and services that are supplanted by a balanced combination of obligations and incentives which do not threaten economic interests (OECD, 2017). It is important that infrastructure regulators lead this process.

Another issue is represented by the fact that in places the collection and sharing of data is not sufficiently coordinated among different national and regional agencies and bodies. Addressing intra-governmental data silos requires political will and clear delineation of roles and responsibilities of the different bodies, as well as clearly established definitions, methodologies, processes and procedures. At the same time, establishing coordination mechanisms for information flows should be conducted in such a way so that it would not present and would not be perceived as an attempt towards centralization of decision-making power. Understanding by all stakeholders of the purpose of collecting disaster loss data on Target D and how it translates into concrete risk reduction activities is also crucial, as not all bodies currently see the need to report and record detailed information on past events (Kohler et. al., 2020).
Some countries have taken steps to develop data-sharing protocols, procedures and online portals for members to facilitate data collection, sharing and access. The experience has showcased that quality data which can be used for reporting and decision-making can be obtained if preceded by extensive advocacy aimed at the relevant bodies and other stakeholders. This requires a coordinated effort to address the development or improvement of common standards among institutions (UNISDR, 2017). In Germany, the collection of data happens through a combination of methods, including bilateral exchanges, workshops, and research, which facilitate the achievement of common understanding and definitions (Kohler et. al., 2020).

Establishing nationally agreed minimum standards would set a basis for countries around which national databases can be built or updated. Such an effort would require the involvement of professionals who are skilled in auditing infrastructure and industrial plants on the basis of the understanding of cross-sector risks (UNISDR, 2015).
Engage the private sector including the insurance industry

The Sendai Framework defines the responsibility of governments for effective risk reduction, and calls on the private sector to engage in this effort. Governments depend on business investment to generate employment and the wealth required to provide public services. Likewise, businesses depend on reliable public infrastructure and utilities, on efficient urban systems, on an educated and healthy workforce and on a range of ecosystem services. Reducing disaster risks in business and in public investment presents a win-win situation for both.

The private sector has an inherent interest in seeking infrastructure-related disaster loss data and has the capacity to assist in collecting such data. Infrastructure developers, owners and investors need to be aware of potential disaster and climate-related risks for the construction of new or the upgrading of existing assets and services. The current COVID-19 pandemic has only made this ever more painfully obvious. Disaster loss data and risk assessments support ensuring the resilience of infrastructure projects and limiting the cost of recovery in the aftermath of disasters. There is also an opportunity for private companies working on big data, data analysis or GIS projects, for instance, to be engaged in developing comprehensive disaster loss databases as part of their business.

Governments, investors and asset owners all need to have a good understanding of risk and potential impacts and could actively contribute to the collection and assessment of disaster loss and disaster risk data.

Engaging the insurance sector would be particularly beneficial in collecting disaster loss data (UNDRR, May 2019). There are currently a number of good practices and efforts that highlight the partnership and role of insurance claim data. Insurance companies, for instance, save data on damage and destruction as a part of their business. In France, the insurance industry even takes part in a public-private partnership for providing disaster aid and compensation to victims. The public administration in the country works closely with the insurance sector on information sharing and recording of disaster losses (EC, 2014).

Insurance and claims data alone will not be sufficient to achieve a full picture of losses as it only includes assets and services that are insured. However this data could have an important complimentary role in the collection of detailed disaggregated data. Important data gaps on Target D could be filled if information collected by the private sector was shared.
Case study: Norwegian Insurance Loss Data Sharing Project for Climate-Resilient Municipalities

A public-private partnership between Finance Norway and ten Norwegian municipalities demonstrated a successful initiative to share claims data on an asset level from the insurance industry with local government. The collaboration involved Finance Norway, insurers, Western Norway Research Institute, the Department of Geography at the Norwegian University of Science and Technology (NTNU) and ten municipalities.

Through opening conversation between insurers and municipalities the project encouraged the building of trust. Ten years of claims data at near 100% of market share was shared with municipalities who then mapped the information. This helped to better inform municipality and county councils of their risk to both river and urban flooding, highlighting areas at risk that previous local government information did not capture.

Figure 1 shows the number of storm water insurance claims in Oslo, Norway, which were gathered as part of the project. Patterns of claims, showing areas at risk, helped inform flood risk mitigation investment decisions at a local level in terms of management, maintenance and land use planning. This is of importance given increasing flood risk from climate change combined with continued growth of cities, which increases vulnerability. The partnership in Norway is the first successful example of collaboration between the insurance industry and government. The project has led to a national collaboration between the public (The Norwegian Directorate of Civil Protection, the National flood agency and the State Road directorate) and Finance Norway to establish a national loss data platform with all loss data available, giving all the municipalities in Norway and the County Governor access to the loss data.

Figure 1: Map of Oslo, Norway – the location of stormwater damages and rivers (Source: Oslo Kommune)
Establishing relevant partnerships, leveraging existing data sets and investing in technology

Lack of or insufficient national and local data is a challenge for many countries. At the same time some non-governmental organizations, universities and centres collect disaster information, which could be of value. Governments need to identify and partner with such organizations to collect disaster information in general, and on Target D in particular, which would help in decision making, feed into national disaster loss databases and then be aggregated and reported. It would be beneficial for governments to collaborate with such initiatives and partners in tracking data on critical infrastructure and services in the future (Kohler et. al., 2020).

Working together with publicly available data-set initiatives to include comprehensive data on Target D and linking important stakeholders to achieve a common understanding of definitions and methodologies, could subsequently improve the quality of reported data and provide for the extraction of more meaningful in-country comparisons, regional and global trends (Kohler et. al., 2020).

An important source of data is the Sendai DesInventar platform that provides data on some of the indicators of Targets A to D, which also contribute to relevant SDG target and indicators from Goals 1, 11 and 13. The 2017 Sendai Framework Data Readiness Review looked at countries’ readiness to report on the Sendai Framework targets. Out of the 87 respondent countries, 26 mentioned that they use Sendai DesInventar as a source for disaster loss data (UNISDR, 2017). Currently, there are a total of 52 countries and territories that have reported on some indicator of Target D for the period 2015 onwards (DesInventar Sendai, 2020). It is worth mentioning that the DesInventar Sendai platform allows for data entry on complex disasters and it is possible to track interlinkages between two
or more disaster events (UNDRR, June 2019).

Important, detailed and also significantly more segregated disaster loss information with relevance to the indicators of Target D is available in the **Post Disaster Needs Assessments (PDNAs)**. PDNAs cover specific disaster events and are conducted under the leadership of the affected countries. They are increasingly being used as a basis on which to plan recovery and reconstruction plans and activities by governments and international organizations alike. Data on damages in the housing sector, transportation, protective infrastructure, health and education sectors, irrigation, water and sanitation, and the energy sector are all taken into consideration and made available according to the impacts of the specific disaster event. Comprehensive information on location, number of damaged facilities, description of service interruptions and economic losses is included. Viet Nam has conducted several post-disaster damage assessments in the past 30 years, to assess the level of damages to the physical and financial losses to properties, infrastructure, production and industry. The established Damage Assessment and Needs Assessment (DANA) system records direct costs of recovery and reconstruction of damaged property and infrastructure, but does not currently take account of impacts on services and on secondary or business interruption losses.

The **Our World in Data** initiative led by the University of Oxford, together with the non-profit organization Global Change Data Lab, is a good example of a useful source of data on disaster events. Currently, the initiative tracks information on disaster risk reduction progress, on disaster-related deaths, and on economic losses but it does not track data related to Target D.

Another comprehensive database that could be tailored to specific information needs is **Munich Re’s NatCatSERVICE** database. However it is a paid service. The company has been collecting data on disaster occurrences since 1980, which could be of great benefit to governments who are willing to pay for data.

Finally, governments could utilize crowdsourcing methods to engage directly with communities and encourage citizens to report on destructions and damages of infrastructure facilities and disruptions of services. A combined method of using digital technologies to collect and process data from administration systems, together with citizen-generated data and geospatial data is also more and more explored by nations. Here, validation of reported data will be one of the major issues to address, but local authorities could play an important role in the process of assessing and confirming the quality of the data.

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14. Our World in Data: [https://ourworldindata.org/](https://ourworldindata.org/)
Strengthen national and local capacities

Ensuring that data is collected, used and translated into actionable measures is essential for increasing resilience. **While there is a lag in data collection, there is also a data literacy challenge**, whereby end users may not have the skills to identify sources, analyse and work with various datasets to inform policymaking and actions.

Data collection based on standardized formats would require multiple stakeholders, all of whom play a critical role. These include the public sector, investors, lenders, contractors, service providers/operators, civil society organizations and end users. To fill the current gap, it is necessary to improve the knowledge and capacities of all stakeholders. This requires awareness raising, advocacy and training programmes targeting each category of stakeholder across a range of national or local contexts. This relies not only on training and specialized technical assistance, but also on strengthening the capacities of groups and individuals to recognize and reduce risks within their own communities. This includes sustainable technology transfers, information exchange, network development, management skills, professional linkages and other resources. Capacity development needs to be sustained through institutions that support capacity building and capacity maintenance as permanent ongoing objectives.

The Coalition for Disaster Resilient Infrastructure – established in 2019 under the leadership of the Government of India and with the support UNDRR is a recent initiative to promote cooperation and the exchange of best practices between countries. As such, its goals and activities relate directly to the objectives of Sendai Framework Target D. CDRI could both support and benefit from streamlining policies aimed at increasing the ambition of nations to report on Target D and improving their capacities for collecting data. Improved data on Target D would, assist in identifying specific infrastructure needs and vulnerabilities to be addressed.
Used acronyms

CDD - Canadian Disaster Database
CDRI - Coalition for Disaster Resilient Infrastructure
DANA - Damage Assessment and Needs Assessment
EM-DAT - Emergency Events Database
ETH Zurich - Swiss Federal Institute of Technology in Zurich
NDC - Nationally Determined Contribution
PDNA - Post Disaster Needs Assessments
SDG – Sustainable Development Goal
SFDRR – Sendai Framework for Disaster Risk Reduction
SFM - Sendai Framework Monitor
UNDRR – United Nations Office for Disaster Risk Reduction
UNISDR – United Nations International Strategy for Disaster Reduction (now UNDRR)
References


UNDRR DesInventar Sendai (2020) DesInventar as a Disaster Information Management System. Background. UNDRR. Available at: https://www.desinventar.net/whatisdesinventar.html (23.12.2020)


