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Cultural Organization



Sustainable
Development
Goals

UNESCO Guidelines for Assessing Learning Facilities in the Context of Disaster Risk Reduction and Climate Change Adaptation

VOLUME 1 - *Introduction to learning facilities
assessment and to the VISUS methodology*



UNIVERSITY
OF UDINE



SAFETY AND PROTECTION
INTERSECTORAL
LABORATORY



UNESCO Guidelines for Assessing Learning Facilities in the Context of Disaster Risk Reduction and Climate Change Adaptation

VOLUME 1

Introduction to
learning facilities assessment
and to the VISUS methodology

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VISUS methodology has been conceived and developed by the SPRINT-Lab of University of Udine, Italy

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PREFACE

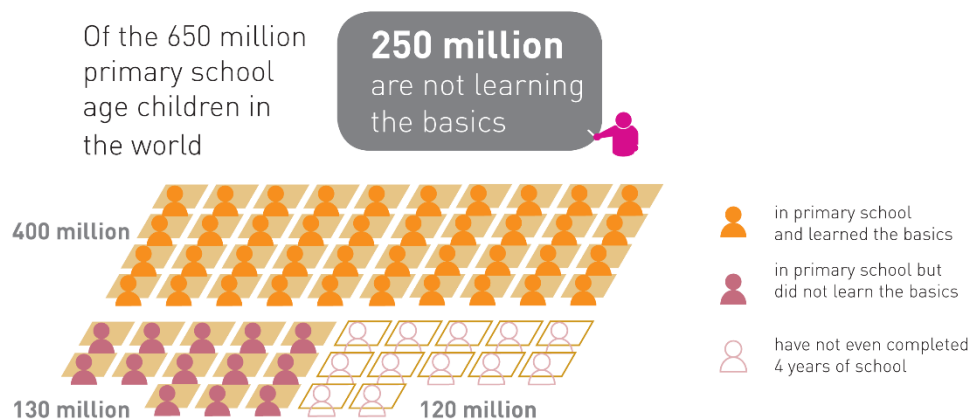
Governments have always placed a premium on education, which has been acknowledged in international conventions and declarations (e.g. Convention against Discrimination in Education [1960], International Covenant on Economic, Social and Cultural Rights [1966]). Major efforts have been made towards enhancing educational opportunities, quality and relevance. The Universal Declaration of Human Rights affirms that everyone has the right to education. The right to education is indispensable for the exercise of most other human rights.

Disparities in education along gender, urban–rural and other lines still run deep, however, and more investments in education infrastructure are required, particularly in the least developed countries. The provision of universal

education at the primary and secondary level by both the public and the private sectors is a remarkable undertaking. Nevertheless, there are still 262 million children and youth of primary and secondary school age who do not attend school – global learning crisis (Fig. 1) –, and a considerable number of those who do have access to an education receive it in buildings that do not offer a safe and effective learning environment (which relates to Sustainable Development Goal target 4.a, Education facilities and learning environments). In 2016, only 34 per cent of primary schools in the least developed countries had electricity and less than 40 per cent were equipped with basic handwashing facilities (United Nations, 2018).

Fig. 1 *The Global Learning Crisis*

THE GLOBAL LEARNING CRISIS



Infographic for the EFA Global Monitoring Report 2013/4 - Teaching and learning: Achieving quality for all



Source: UNESCO (2014).

Disasters have a major impact on children and youth, as well as education systems. Each year, school buildings collapse or incur significant damage from natural hazards, resulting in deaths and/or injuries to students, teachers and administrative staff. Disasters also disrupt education, which prevents rapid recovery from a disaster and can translate into long-term socioeconomic consequences. There has been a global recognition of the need for repairs and retrofitting to make existing schools safer, as well as to ensure that the large numbers of schools planned or under construction, particularly in developing countries, are inherently safe (Arup, 2013).

A safe learning facility is one that can withstand extreme events without collapsing; one that, while it may incur some damage, presents a low risk of the loss of life. Ensuring that schools are safe is also essential from the perspective that school buildings play a role in creating resilient communities, and that schools have the potential to be used as a community shelter (even if this is not recommended) and as a distribution or resource centre in the immediate aftermath of a disaster.

There is an implicit assumption in much of the existing guidance on learning facilities that schools are being constructed within a regulatory framework or that technical expertise is always available. The reality is that even where building codes and standards exist, they are often out of date, and the institutional architecture facilitating their enforcement is in many cases weak or non-existent. This reality, combined with illicit practices implemented by unscrupulous contractors is, without a doubt, a significant challenge to overcome to secure structurally safe schools. In addition, many school buildings are built by local contractors or communities that are neither aware of nor trained in the minimum standards and/or site requirements for safe school construction. Sometimes, learning facilities use or adapt existing buildings that were not conceived to support the resistance demand required to host educational activities. Moreover, many countries do not have strong policies or regulations that clearly identify responsibilities and resources (human and financial) for maintenance or repair of learning facilities.

All of these factors increase the physical vulnerability of learning facilities worldwide. There are two further issues to consider in this regard: (i) the lack of data and information on educational infrastructure and facilities, and (ii) the lack of a management system to support the data and information. This lack of data and support systems has become a real topic of concern owing to the increase in the number of catastrophic events that have caused the death and/or injury of learners and education personnel.

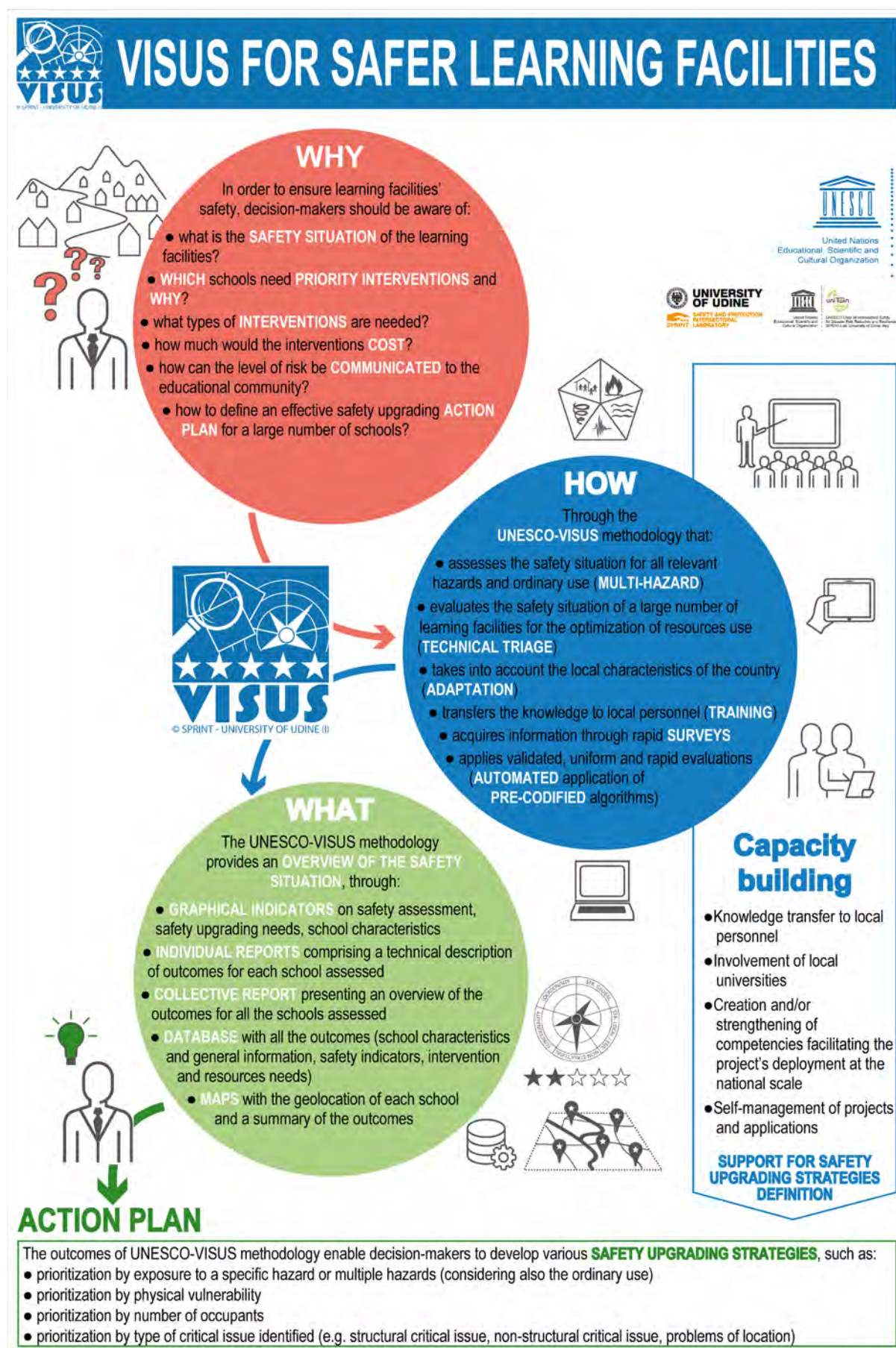
Guidelines for the technical assessment of school safety are also lacking. In order to accomplish the

targets and objectives of the 2030 Agenda for Sustainable Development, policy-makers are calling for standardized guidelines that will allow them to technically implement physical vulnerability assessments of learning facilities, that includes non-structural, site context and functionality issues. These needs have been expressed in the relevant development frameworks: the Sendai Framework for Disaster Risk Reduction 2015–2030, the Paris Agreement and the New Urban Agenda.

The development of learning facility assessment will enable policy- and decision-makers to determine the severity of the problems, the magnitude and extent of infrastructure issues, the interventions required, and the financial resources needed to implement those interventions in an efficient, effective manner. To this end, policy- and decision-makers must have accurate, reliable and timely information on the state of the education infrastructure in a country. The dearth of empirical data and the mechanisms to collect them has resulted in the need for a standardized methodology allowing comparable data to be collected and integrated into an education management information system. This system can then provide the necessary information to allow policy- and decision-makers to design intervention strategies that include prioritization.

As part of its mandate, the United Nations Educational, Scientific and Cultural Organization (UNESCO) is actively engaged in empowering schools and their communities to identify the risks they are exposed to, map their vulnerabilities and capacities, and enhance school safety. In this framework, UNESCO, with the scientific support of the UNESCO Chair on Intersectoral Safety for Disaster Risk Reduction and Resilience at the Safety and Protection Intersectoral Laboratory of the University of Udine, Italy, developed a methodology – Visual Inspection for defining Safety Upgrading Strategies (VISUS) (Fig. 2).

Fig. 2 VISUS for safer learning facilities



VISUS provides an integrated framework to support the planning and decision-making process of future safety actions. The methodology facilitates a technical triage based on visual inspection, the results of which can be directly used for defining comprehensive safety upgrading strategies for school facilities. VISUS supports the identification of safety upgrading strategies considering across a wide spectrum of learning facilities. The methodology assesses multiple hazards – earth, water, wind and fire hazards – as well as safety during ordinary (day-to-day) use of a facility. The VISUS methodology pre-codifies the expert reasoning process and reproduces it in an automated manner. The implementation of VISUS for assessing the safety of schools follows four phases: preparation and organization, survey organization and implementation, automated elaboration and automated reporting.

Part of the first phase of VISUS implementation, preparation and organization, is adaptation, which aims to adjust the methodology to the circumstances of the geographical area where the assessment will be performed in terms of the typologies of buildings, hazard profile, and costs of construction and refurbishment. The survey phase is carried out by locally trained VISUS surveyors who collect information for each school using pre-codified VISUS survey forms. The collected information is then used in the automated elaboration phase to create the VISUS final outputs – a set of indicators used to support decision-makers in defining safety upgrading strategies. The automated reporting phase presents the outputs in a collective report containing an analysis of the results for the entire geographical area, along with individual reports on the situation of each of the inspected schools.

In this way, VISUS tackles lack of data and information, supports a management system and provides a standardized method to assess a large number of schools. The methodology allows the most critical learning facilities to be identified and further investigated, and suggests actions to improve the safety of the other facilities through restoration, refurbishment, retrofitting or, if necessary, reconstruction or relocation.

UNESCO has tested the VISUS methodology in seven countries (El Salvador, Haiti, Indonesia, Italy, Lao People's Democratic Republic, Mozambique and Peru) with positive results. More than 11,000 buildings in about 1,700 school complexes, and most importantly, the safety of more than 500,000 students and education personnel, have been assessed in the pilot projects. Furthermore, through this widespread application, knowledge has been gained on the accuracy of the methodology and the indicators. The data and information gathered during the seven pilot projects have been used to update and improve the VISUS methodology. The positive feedback from the pilot projects led UNESCO to prepare

these guidelines for assessing learning facilities in the context of disaster risk reduction and climate change adaptation. The methodology has been peer reviewed by more than twenty recognized scientific institutions worldwide, and their recommendations have been integrated into this publication. The intended audience for the guidelines comprises decision-makers and practitioners in education infrastructure.

The UNESCO Guidelines for Assessing Learning Facilities in the Context of Disaster Risk Reduction and Climate Change Adaptation, composed of three volumes, provide detailed information on the VISUS methodology and on how to adapt it to a particular context. They aim to group the necessary elements of information for an assessment of the physical vulnerabilities of learning facilities from a multi-hazard perspective. The results of the assessment can be used, among other ways, to populate national Education Management Information Systems (EMIS). The results inform the initial planning for and design of restoration, refurbishment, retrofitting, reconstruction or relocation programmes, whether local or national.

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INTRODUCTION

The safety of people when natural hazards occur is one of the main concerns of public administrators in hazard-prone territories, ensuring in particular the safety of people using public buildings such as schools. This requires a rational and effective strategy for risk reduction based on knowledge of the level of risk, the type and severity of the critical issues to be addressed, and the possible countermeasures including the related costs for their implementation.

These Guidelines for Assessing Learning Facilities in the Context of Disaster Risk Reduction and Climate Change Adaptation introduce the VISUS methodology, with the goal that policy- and decision-makers, as well as practitioners, implement school safety assessments using the proposed methodology. The guidelines aim to facilitate this process. The VISUS methodology will provide decision-makers and practitioners in the education sector with practical information on the physical vulnerabilities of individual schools that can potentially affect the delivery of their education services, and practical information that allows decisions to be made on the investment needs and areas where investments should be prioritized.

The VISUS methodology can be applied nationwide relatively quickly and inexpensively. It identifies potentially unsafe buildings in learning facilities and provides information that can be used by decision-makers to implement strategies aimed at improving the safety of those buildings.

The target audience for these guidelines includes agencies or organizations that are considering conducting a rapid assessment of learning facilities (rapid visual screening programme) such as: ministries of education and ministries of public works; civil engineers, structural engineers, architects and design professionals; and the surveyors who will conduct the assessments. The surveyors might be civil engineers, structural engineers, architects, design professionals, building officials, construction contractors, firefighters, architecture or engineering students, or other individuals with familiarity with or a background in building design or construction.

The guidelines were conceived to minimize ambiguity and limit the need for characterization and judgement, making the methodology accessible to a larger group of potential surveyors; and also making the assessment of a large number of learning facilities possible.

The guidelines are structured in three volumes, as follows.

Volume 1 (Introduction to learning facilities assessment and to the VISUS methodology) contextualizes the concept of school safety and showcases its relevance in the various frameworks contributing to the Global 2030 Agenda including the Sendai Framework for Disaster Risk Reduction, the 2030 Agenda for Sustainable Development, the Paris Agreement and the New Urban Agenda. This volume also highlights the importance of continuous assessment, categorizes the different types of assessments that are possible, and identifies the VISUS methodology in the different levels of assessment. Volume 1 provides decision-makers with a clear understanding of the outcomes of the implementation of the VISUS methodology, and presents examples of the strategies that could be developed to upgrade the level of safety of learning facilities.

Volume 2 (VISUS Methodology) explains the theoretical aspects of the VISUS methodology, and presents in its annexes the rules and criteria that are the basis for assessment and evaluation. Volume 2 aims to:

- Present the goals of the methodology
- Explain the motivation and criteria that led to specific assumptions in the design of the methodology
- Provide an overview of the methodology, highlighting the specificity and the logic structure
- Illustrate the pre-codified evaluation rules and criteria, which are implemented in the VISUS algorithms

Volume 3 (VISUS Implementation) explains the phases of VISUS implementation and presents in its annexes the tools developed for it. The phases are:

- Preparation and organization: the organizational and logistical aspects of implementation
- Survey organization and execution: preparation for and conduct of a survey
- Automated elaboration: elaboration of survey data using the algorithms, based on the VISUS logical trees
- Automated reporting: creation of the VISUS outputs (e.g. reports, maps, databases, inventories)

While Volume 1 of the guidelines is addressed to decision-makers at the ministries of education and ministries of public works in charge of school infrastructure, Volumes 2 and 3 are addressed to stakeholders who have a role in assessing the physical vulnerabilities of existing learning facilities either at the ministerial level (i.e. technicians) or in academia (notably in faculties of civil or structural engineering or of architecture).

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1. IMPACTS OF HAZARDS ON LEARNING FACILITIES

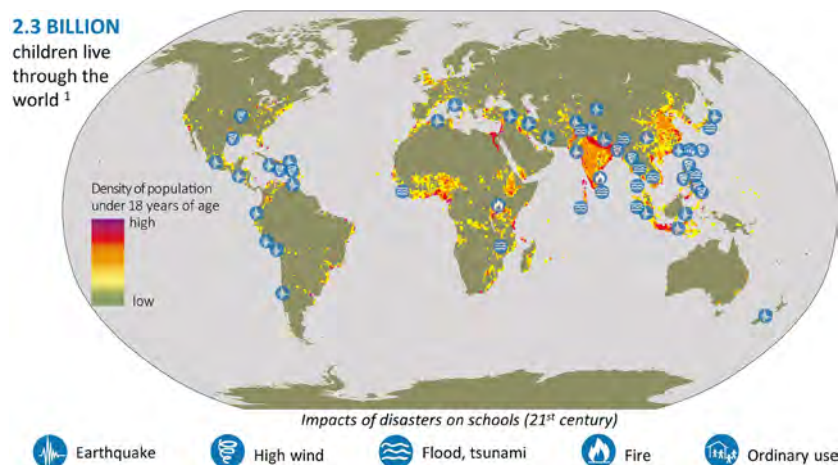
Communities are exposed to various natural hazards, such as hurricanes, floods, volcanic eruptions, earthquakes, tsunamis, landslides, droughts and fires. These hazards can compromise a country's poverty reduction strategies, hinder development gains and endanger education systems. The impacts of these hazards are likely to be exacerbated by changes in the global climate, which will potentially bring more frequent and severe extreme weather events.

Education is the right of every child, and that education should be of high quality and provided in a safe environment. Many children are nevertheless unable to realize this right owing to the impacts of disasters (Ireland, 2016). Disasters have a major impact on children and youth and on education systems. Studies of disaster trends and the consequences of climate change suggest

that each year, 175 million children are likely to be affected by natural hazard related disasters alone (McDiarmid, 2008). Damage to the infrastructure of learning facilities during hazardous events is one of the main reasons a child's education may be interrupted. This interruption is more pronounced in countries and communities in which access to education resources is already limited.

Figure 1.1 shows the location and causes of the most severe disasters with impacts on learning facilities recorded in the twenty-first century (to April 2019) (see also Table 1.1 for a description of their impacts). The type of hazardous event – earthquake, high wind, flood, tsunami or fire, as well as ordinary (day-to-day) use of the school – that caused each of the fifty-eight (58) disasters, is shown.

Fig. 1.1 Location of disasters affecting schools in the twenty-first century (to April 2019): the types of hazardous event are shown by symbols, and a qualitative indication of the density of the population under 18 years of age is also shown



Source: Modified from UNICEF (2015, fig. 2, p.15)

Table 1.1 presents a short description of the consequences of each event shown in Figure 1.1 on schools, and especially on children and education workers. The statistics cited show how severe the impacts of hazards on school safety are. Earthquakes pose risks to children's safety in schools in terms of threats to life, while floods and high wind (e.g. cyclones, hurricanes, typhoons and tornados) cause adverse impacts on education services. Sometimes, the adverse impacts are not triggered by natural phenomena, as was the case for one of the most recently recorded disasters, which occurred in Lagos, Nigeria. In March 2019, twenty (20) people died and more

than forty (40) were injured, mostly children, when a four-story building housing a school collapsed owing to inherent structural problems. Outside Johannesburg, South Africa, in February 2019, four students also died and twenty-three (23) were injured after a walkway collapsed at a school.

Table 1.1 *Impacts of disasters on schools in the twenty-first century (to April 2019)*

Year	Location	Event	Impacts on schools
2001	India	Earthquake	The Bhuj earthquake killed 971 students and 31 teachers; most children that were killed were outside school for Republic Day celebrations. In total, 1,884 schools collapsed, destroying 5,950 classrooms. Another 11,761 school buildings suffered major damage, with 36,584 classrooms rendered unusable.
2001	Taiwan Province of China	Ordinary use	A three-story school collapsed in the middle of the night.
2001	Peru	Earthquake	The Arequipa earthquake seriously damaged 98 school buildings.
2001	El Salvador	Earthquake	The earthquake damaged 85 schools beyond repair at the cost of US\$114 million. One month after the earthquake, during an aftershock, 22 pre-school children and their teacher were killed when a building collapsed.
2002	Italy	Earthquake	In the Molise region, 27 children and one teacher died when a school collapsed from the earthquake. Further investigation revealed that the area of San Giuliano was not classified as a seismic zone and thus the building was not constructed using seismic criteria. Use of poor quality masonry and a heavy reinforced-concrete roof also contributed to the collapse. The event alerted authorities to the vulnerability of critical structures.
2002	Iran (Islamic Republic of)	Earthquake	The education of more than 16,500 students was disrupted in Abgarm, where 8 schools collapsed and 137 were damaged.
2003	Algeria	Earthquake	In Boumerdes, 122 schools had to be rebuilt and 560 – out of 1,800 schools inspected – were seriously damaged. The cost of the earthquake in terms of school reconstruction and rehabilitation was estimated to be US\$70 million. The failure of school buildings during the disaster can be attributed to a growing urban population and subsequent demand for inexpensive and rapid school construction, poor quality construction, failure to adhere to construction regulations, lack of quality control in construction, absence of licensing for professionals and underestimated code hazard parameters. The earthquake occurred outside of school hours.
2003	Dominican Republic	Earthquake	The 2003 Dominican Republic earthquake occurred on September 22 with a magnitude of 6.4. Eighteen thousand students lost their classrooms.
2003	China	Earthquake	A middle school collapsed during the Xinjiang earthquake, killing at least 20 students. Nine hundred classrooms in dozens of other schools collapsed, only 27 minutes before thousands of children were due to return to the classrooms.
2003	Iran (Islamic Republic of)	Earthquake	In Bam, 10,000 schoolchildren and 1,200 teachers died as a result of the earthquake, and more than 32,000 students were adversely affected by it. Of the city's 131 schools, 67 collapsed and the remaining ones were heavily damaged.
2003	Turkey	Earthquake	In Bingöl, 84 children and teachers died when a school building collapsed following an earthquake of moderate magnitude. Four other schools also collapsed, and 90 per cent of schools were affected by the earthquake, disrupting the education of numerous children.
2004	India	Fire	In the state of Tamil Nadu, 93 children died in a fire after the explosion of a cooking gas cylinder in a school.
2004	Bangladesh	Flood	The 2004 floods lasted from July to September and covered 50% of the country at their peak. The flood destroyed 1,259 school buildings and damaged 24,236 more.
2004	Cambodia	Flood	Severe flooding damaged entirely or partially about 2,000 schools in eight provinces of the country disrupting the education of one million students in the impacted regions

Year	Location	Event	Impacts on schools
2004	Indian Ocean (several countries)	Tsunami	The tsunami destroyed 750 schools in Indonesia and damaged 2,135 more, leaving 150,000 students without a school to attend. In Sri Lanka, 51 schools were destroyed; this number was 44 in Maldives and 30 in Thailand.
2005	United States of America	High wind (hurricane)	Hurricane Katrina and subsequent flooding destroyed 56 schools and damaged another 1,162 in the states of the Gulf Coast. Closures of 700 schools displaced 372,000 children, and 73,000 college students were also displaced. In the first year after the disaster, US\$2.8 billion was spent on educating displaced students.
2005	Pakistan	Earthquake	In schools in the affected areas, 17,000 students and 900 teachers died and 50,000 were seriously injured – many of them disabled. The earthquake destroyed 10,000 school buildings; in some districts of Kashmir, 80 per cent of schools were destroyed. In total, 300,000 children were affected by the disaster.
2006	Uganda	Fire	Thirteen children died in a fire in a school dormitory where children were using candles for lighting.
2006	Philippines	Flood (mudslide)	On Leyte Island, 245 children and teachers died in a mudslide that buried Guinsaugon Elementary School after five days of rain had ceased.
2006	Vietnam	Heavy rain (typhoon)	Typhoon Durian destroyed 22 schools and 1,120 houses in Binh Thuân Province.
2006	Philippines	High wind (typhoon)	Typhoon Durian caused US\$20 million in damage to thousands of primary and secondary school buildings and day-care centres. The schooling of hundreds of thousands of children was affected.
2007	India	Flood	In the state of Assam, flooding caused 150,000 people to be evacuated to public school buildings disrupting the education of children in the region.
2007	Bangladesh	High wind (cyclone)	Cyclone Sidr destroyed 496 school buildings and damaged 2,110 more.
2007	Indonesia	Earthquake	Earthquakes in Sumatra destroyed 260 educational facilities and severely damaged 450.
2007	Peru	Earthquake	The earthquake damaged several schools in Pisco. Those built in accordance with the most up-to-date building codes did not suffer damage.
2008	China	Earthquake	More than 10,000 children were estimated to have died in their schools in Sichuan Province. An estimated 7,000 classrooms were destroyed.
2008	Myanmar	High wind (cyclone)	Cyclone Nargis destroyed 2,460 schools (50 per cent of schools in the affected area), while 750 other schools were severely damaged.
2009	Taiwan Province of China	High wind (typhoon)	Typhoon Morakot destroyed 682 schools, with the damage estimated at US\$6 million.
2009	Philippines	High wind (tropical storm)	Typhoon Ketsana, (known as Tropical Storm Ondoy) damaged 78 schools (with damage estimated at US\$13 million), and 122 schools were used as evacuation centres.
2009	Indonesia	Earthquake	The earthquake struck after the end of the school day. It caused the collapse of many schools, and 1,100 schools (3,200 classrooms) were damaged.
2010	Haiti	Earthquake	An estimated 4,000 students and 700 teachers died in schools in the magnitude 7.0 earthquake. About 4,800 schools were damaged or destroyed, including 1,300 schools and all three universities in Port-au-Prince. About half of the nation's 15,000 primary and 1,500 secondary schools were affected. The school system could not cope with the impacts and even two years after the earthquake a considerable number of children remained out of school.

Year	Location	Event	Impacts on schools
2010	New Zealand	Earthquake	There were no deaths of or major injuries to schools students during the Canterbury earthquake owing to a 30-year effort to improve the safety of school buildings. Significant damage to more than 100 of 179 state schools did, however, occur. School continuity was a sensitive issue.
2010	India	Heavy rain	Eighteen children were killed when a school building collapsed after heavy monsoon rains in the northern state of Uttarakhand.
2010	Chile	Earthquake	The earthquake affected two million people, but struck on a Saturday, outside school hours. Eighty per cent of the students in the worst affected areas resumed school just one week later. Damage to schools was estimated at US\$2.1 billion, out of a total of US\$30 billion of total infrastructure damage.
2010	Philippines	High wind (typhoon)	Typhoon Megi damaged 28 schools, and 63 schools were used as evacuation centres disrupting the education.
2011	United States of America	High wind (tornado)	The tornado destroyed Joplin High School on a Sunday, when no one was at the school.
2011	Japan	Earthquake and tsunami	As a result of the disaster, 733 school students and teachers died or were listed as missing. In addition, 193 schools were destroyed, 747 schools were significantly damaged and 5,064 schools suffered minor damage.
2012	Thailand	Flood	In Bangkok, 2,600 schools and 700,000 students and teachers were affected by the flood. Damage to educational facilities was estimated at US\$224 million.
2012	Costa Rica	Earthquake	After the second strongest earthquake recorded in Costa Rica's history, 39 schools were damaged in the Nicoya Peninsula affecting more than 7,000 students. Up to May 2019, the 39 schools are still pending for refurbishment (Vizcaino, 2019).
2013	Taiwan Province of China	Earthquake	At least 37 students were injured while trying to escape from school buildings, and 174 schools were damaged.
2013	India	Earthquake	One school building collapsed, three buildings were damaged, and more than 40 students were injured.
2014	India	Flood	Thousands of school buildings were destroyed, and thousands more were damaged.
2015	Malawi	Flood	Hundreds of schools were destroyed or badly damaged, disrupting the education of about 350,000 children.
2015	Nepal	Earthquake	More than 575 schools were destroyed and 969 schools were damaged in 36 districts. More than 25,000 classrooms were destroyed or determined to be unsafe after the disaster.
2016	Ecuador	Earthquake	More than 280 schools were damaged, disrupting the education of up to 120,000 children.
2016	Haiti	High wind (hurricane)	More than 700 schools were damaged and about 86 schools were used as temporary shelters, disrupting the education of at least 150,000 schoolchildren.
2017	Sierra Leone	Landslide (flood)	The disaster affected 59 schools, primarily those in the Regent, Kamayama, Kaningo, Dwarzark, Culvert and Juba communities. While the number of students who died is unknown, 369 casualties and missing persons were reported as school-aged children.
2017	Mexico	Earthquake	The earthquake caused the collapse of a school building where 29 children died. More than 16,000 schools were damaged.

Year	Location	Event	Impacts on schools
2017	Antigua and Barbuda, Cuba, and several other Caribbean islands	High wind (hurricane)	Schools across Antigua and Barbuda and Cuba, as well as Anguilla, British Virgin Islands and Turks and Caicos Islands (British Overseas Territories) were damaged, disrupting the education of thousands of children.
2018	Ghana	High wind (storm)	A school building collapsed in heavy rain and wind at Dormaa Wassa in the Western Region. One student died and many were injured.
2018	Sudan	Flood	Three students died and eight were injured when a wall collapsed, due to torrential rain and flooding, at a girls' school in Omdurman. In total 211 schools were destroyed.
2018	Indonesia	Earthquake	In August, the Lombok earthquake (magnitude 7.0) damaged 458 schools. In September, the Sulawesi earthquake (magnitude 7.5) and tsunami caused the deaths of at least 2,100 people. The disasters affected about 184,000 students and 13,000 teachers, and damaged more than 1,200 schools.
2018	Philippines	High wind (typhoon)	Almost 35,000 schools were destroyed, and badly damaged. An estimated 160,000 children moved to evacuation centres
2018	Canada	Ordinary use	A bridge joining a condo building to an elementary school in Toronto collapsed on a Saturday morning. Although no one was injured, the incident raised serious safety concerns.
2019	South Africa	Ordinary use	Four students died and twenty-three were injured when a walkway collapsed at a school outside Johannesburg.
2019	Nigeria	Ordinary use	Twenty people died and forty were injured, mostly children, when a four-story building housing a school collapsed in Lagos. The building had been marked for demolition three times.
2019	Mozambique	Cyclone and flood	More than 260,000 school students were affected when more than 3,300 classrooms were destroyed. Many schools were used as shelters for the more than 142,000 internally displaced persons in Manica, Sofala, Tete and Zambezia provinces.
2019	Iran (Islamic Republic of)	Flood	About 160 schools have been destroyed in two provinces (Lorestan and Golestan), and 1,086 damaged. More than 170,000 students need some form of emergency assistance to continue their schooling in the coming months.

Source: Adapted from Bastidas and Petal (2012)

Some of the drivers that can explain the severity of impacts a learning facility will suffer during a disaster are: the level of its exposure, its location, its maintenance, its compliance (or lack thereof) with building codes, its construction quality and the construction technologies used, the availability of hazard information to which it has access, and, the level of planning and the budget allocated from responsible authorities.

Mitigation of the impacts of natural hazards requires financial resources that should be allocated after determining the risk of schools in the pre-disaster phase. The identification of risks and the provision of financial resources constitute the basis for the development of the Visual Inspection for defining Safety Upgrading Strategies (VISUS) safety assessment methodology.

2. SHAPING AND SUPPORTING THE SCHOOL SAFETY CONCEPT IN THE CONTEXT OF DISASTER RISK REDUCTION

2.1 Comprehensive School Safety framework

The Comprehensive School Safety (CSS) framework is the foundation for the collective work of the Global Alliance for Disaster Risk Reduction and Resilience in the Education Sector (GADRRRES) and the common approach of the Worldwide Initiative for Safe Schools (WISS).

The CSS framework provides a comprehensive approach to reducing risks from all hazards to the education sector by addressing both the education policies and plans aligned with disaster risk management at the national, regional, district and local level, as well as the three constitutional pillars of school safety (Fig. 2.1), which overlap, and are as follows.

1. Safe learning facilities (disaster-resilient infrastructure)

This pillar addresses school safety through structural components related to a school, including: site selection; building codes; disaster-resilient design and 'green' design; performance standards of buildings; training and supervision of construction workers; quality control; remodelling; retrofitting; and water, sanitation and hygiene.

Key actors: Education and planning authorities, architects, engineers, builders and school community members who make decisions about site selection and the design, construction and maintenance of as well as access to the facility.

2. School disaster management

This pillar addresses school safety through disaster management planning and processes, including: assessment and planning; physical, environmental and social protection; response skills and provisions; representative and participatory shared decision-making linked to school-based management; educational continuity planning; standard operating procedures; and contingency planning.

Key actors: Education sector administrators at national and subnational education authorities, and local school communities who collaborate with their disaster management counterparts in each jurisdiction. At the school level, the staff, students and parents are involved in maintaining safe learning environments through assessing and reducing structural, non-structural, infrastructural, environmental and social risks, and by developing response capacity and planning for educational continuity.

3. Risk reduction and resilience education

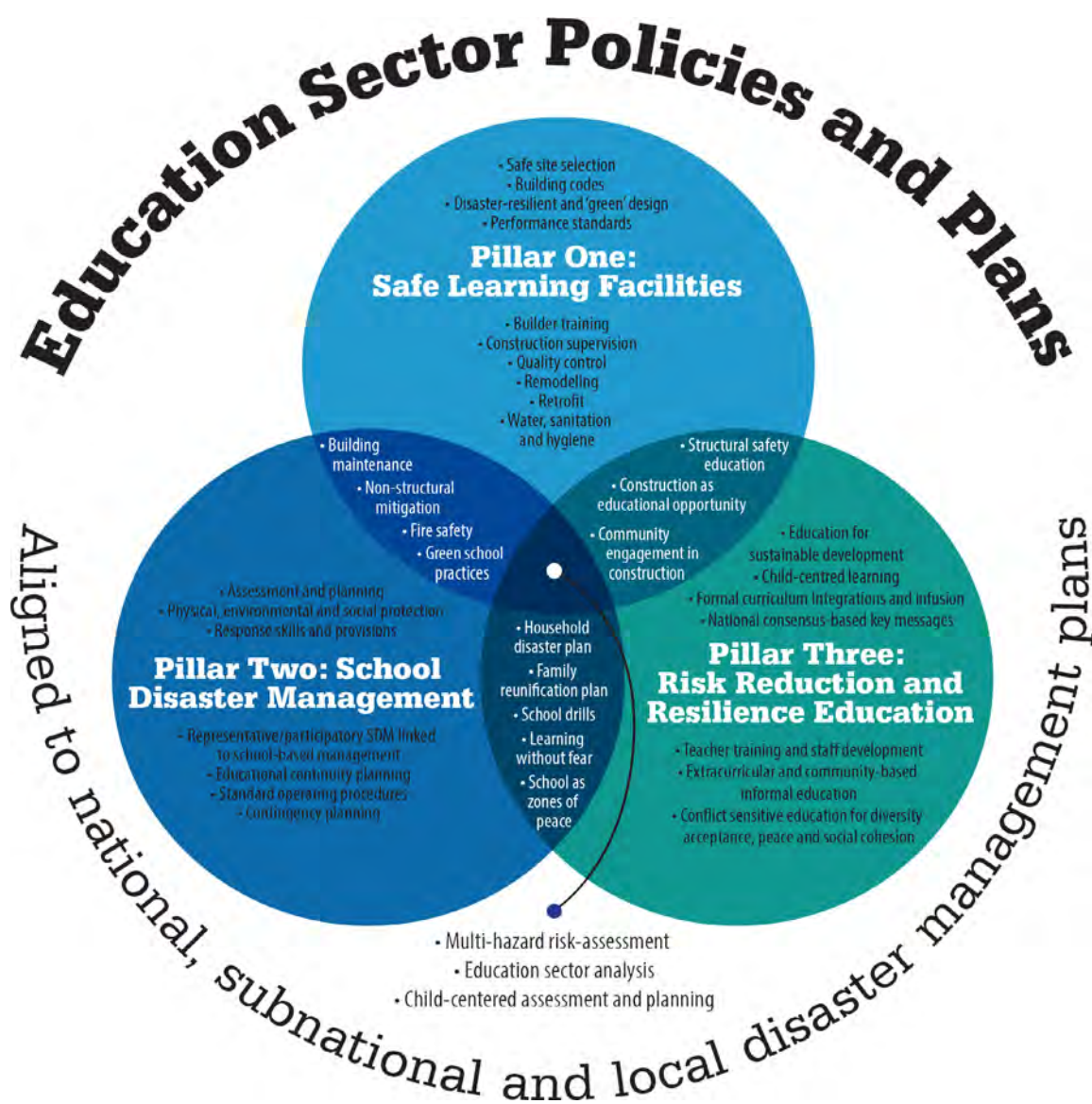
This pillar addresses school safety through education activities and systems, including: Education for Sustainable Development; child-centred learning; formal curriculum integration; national consensus-based key messages; teacher training and staff development; extracurricular and community-based informal education; and conflict-sensitive education for diversity, acceptance, peace and social cohesion.

Key actors: Curriculum and educational material developers, faculty of pedagogic institutes, teacher trainers, teachers, youth movements, activity leaders and students, all of whom are working to develop and strengthen a culture of safety, resilience and social cohesion.

The goals of the CSS framework are:

- To protect children and education workers from death and injury in schools
- To plan for educational continuity in the face of expected hazards
- To strengthen a disaster-resilient citizenry through education
- To safeguard education sector investment

Fig. 2.1 The Comprehensive School Safety framework



Source: GADRRRES (2017, p.3)

The core of the CSS framework is based on a holistic view that considers a multi-hazard approach to risk assessment, education sector development, and child-centred assessment and planning.

To secure a comprehensive approach to school safety, policy- and decision-makers, as well as practitioners, should:

- Ensure that every new school is a safe school. When building a new school, the school site chosen should be safe in relation to all hazards that pose unacceptable risk and have the potential to result in unacceptable losses. Furthermore, the facility should follow disaster-resilient design and construction principles through the adoption and enforcement of building

codes with pre-defined building performance standards

- Implement a prioritization strategy for the retrofitting or replacement of unsafe schools that also accounts for the potential relocation of schools in unsafe sites
- Minimize structural, non-structural and infrastructural risks in order to ensure safe evacuation from school buildings or to be able to use them as shelters (even if the use of schools as shelters is highly discouraged)
- Incorporate access and safety considerations for students and staff with disabilities
- Determine options for ensuring educational continuity when schools are to be used as temporary com-

- munity shelters
- Ensure that children can safely access schools, for example by pedestrian paths/bridges and river crossings
- Adapt water and sanitation facilities to potential risks
- Implement climate-smart interventions to enhance water, energy and food security
- Plan for continuous monitoring, financing and oversight of ongoing facilities in terms of their maintenance and safety

2.2 Global coordination for school safety

2.2.1 Global Alliance for Disaster Risk Reduction and Resilience in the Education Sector

The need for strengthening networking and promoting cooperation among international organizations for strategically working on school safety has become a priority in line with the development of school safety policies within the international agenda.

Following the Second World Conference on Disaster Risk Reduction that took place in 2005, a cluster was created to collectively advance the achievement of the Hyogo Framework for Action goals through knowledge and education. The cluster was recognized as a thematic platform of the United Nations International Strategy for Disaster Reduction, – nowadays the United Nations Office for Disaster Risk Reduction (UNDRR) – the Thematic Platform on Knowledge and Education. The platform was made official in 2006, and was composed of relevant United Nations bodies, international non-governmental organizations and selected regional partners.

Alongside the development of global frameworks concerning school safety, the platform reviewed its mission and objectives and evolved into GADRRRES in 2013. This alliance aims to support countries in their achievement of the Sustainable Development Goals and the targets established within the Sendai Framework for Disaster Risk Reduction and Paris Agreement.

GADRRRES is a multi-stakeholder mechanism comprising United Nations agencies, international organizations and global networks. Regional and country-level organizations also work with the alliance. The purpose of GADRRRES is to strengthen global coordination, increase knowledge, and advocate for risk reduction education and safety in the education sector. The alliance works to ensure that all schools are safe from disaster risks and all children can learn in a culture of safety.

The alliance partnership developed and endorsed the strategic CSS framework. Moreover, GADRRRES partners have developed several tools for implementing school safety policy and actions in support of CSS framework. These tools contribute to disaster risk reduction in the education sector and have been developed for use by

decision- and policy-makers, as well as practitioners and other stakeholders involved in managing school safety issues. Some tools target communities and a larger audience, such as children and their parents.

One of these tools is the VISUS methodology. Supporting in particular the core of the CSS framework – a multi-hazard approach for risk assessment – as well as the elements of pillar 1 of the CSS framework (safe learning facilities), the VISUS methodology is a fundamental part of the CSS Assessment Suite developed by GADRRRES.

2.2.2 Global Program for Safer Schools

Funded by the Global Facility for Disaster Reduction and Recovery (GFDRR) and developed in alignment with GADRRRES partners, the Global Program for Safer Schools (GPSS) was launched in 2014. It was built on the experience and lessons learned from World Bank safer school projects in Colombia, Philippines, and Turkey, among others. The program operates mostly within the first pillar of the CSS framework, safe learning facilities. Together with UNESCO, GFDRR leads the efforts on the first pillar and aims to facilitate and encourage government investment in the safety and resilience of new and existing school infrastructure.

In recognition of the fact that the learning crisis is being exacerbated by natural hazards, GPSS works to promote the inclusion of hazard-related policies for the education sector at both the global and country level. The inclusion of such policies can be achieved through strengthening the dialogue between decision-makers and stakeholders, and making the process easier to navigate and more financially and technically accessible.

The pillars and actions of GPSS have been integrated into World Bank education infrastructure operations and promoted through the Roadmap for Safer Schools (World Bank, 2017). An enhanced version, the Roadmap for Safer and Resilient Schools (RSRS), will be launched later this year. The roadmap is the methodological framework applied by GPSS to support in-country activities. It consists of eight steps which follow a logical sequence from diagnosis to analysis, and planning at scale. Figure 2.2 shows a summary of the phases and steps.

The implementation of the VISUS methodology at the local or national level could support step 1 (School infrastructure baseline) in phase 1 (Diagnosis) of the Roadmap for Safer Schools. When the methodology is applied, all of the objectives of this first step can be accomplished, that is:

- Identify the quantity and quality of existing school infrastructure
- Determine the exposure of school infrastructure to natural hazards
- Evaluate the potential shortfall of new school infrastructure
- Estimate the scale of potential repair, retrofit, (re) construction or relocation needs

In countries or regions where information does not exist or there are gaps in information, the school infrastructure baseline is crucial. Cooperative efforts among the World Bank and UNESCO have been implemented in the diagnosis phase, notably in El Salvador, Indonesia, Mozambique and Peru. Box 1 presents the example of Mozambique.

Box 1 Developing a school infrastructure baseline for Mozambique: a national priority supported by the World Bank and UNESCO

Mozambique's Ministry of Education and Human Development has taken steps to improve the safety of its education infrastructure as a national priority. With the support of the World Bank and UNESCO, the first comprehensive multi-hazard risk assessment for the education sector and an analysis of various retrofit and reconstruction options were developed for Mozambique. The assessment and analysis were accompanied by adaptation and implementation of the VISUS methodology for multi-hazard school safety assessment for 100 schools initially. The implementation of both methods of assessment facilitates comprehensive risk assessment in learning facilities and provides fact-based practical information to help decision-makers identify areas of concern and prioritize investments. The results of the risk assessment are currently being used to inform a large school retrofitting programme throughout Mozambique, supported by the World Bank.

The pilot project for the VISUS methodology included a stakeholder workshop to introduce the methodology and establish key partnerships for its adaptation to the Mozambique context and several workshops to build local capacity to use the methodology and train staff. The stakeholder workshop, held in September 2017, was facilitated by VISUS experts who had participated in the first pilot project for VISUS implementation in El Salvador in 2013.

The implementation then began in November 2017 with a series of three training sessions. The first covered the use of the VISUS methodology by decision-makers. The second focused on the theoretical aspects of the methodology to train teaching staff of the Eduardo Mondlane University and technical staff of the Ministry of Education and Human Development and the National Institute for Disaster Management of Mozambique. The third training session focused on the practical use of the VISUS methodology for assessments on the ground. Participants included staff of the Faculty of Architecture of the Eduardo Mondlane University, as well as final-year students of the faculty, all of whom were trained in conducting risk assessment in schools using the methodology.

The training concluded with a practical exercise: the survey of six schools in Maputo. The teaching staff and students then applied their new knowledge to conducting a survey and field assessment of the remaining 94 schools in the pilot project, which were located in Maputo Province. The data were collected using VISUS codification forms and the mobile phone app VISUS Finder.



VISUS Surveyors in Mozambique (Photo credits: Torres 2017)

The data from the school surveys and field assessments were processed and validated by staff at the Eduardo Mondlane University and the Safety and Protection Laboratory of the University of Udine, Italy. Once the validation was complete, individual school reports were made available in GIS file format; these reports were also shared in a mapping tool as geo-localised data. A collective report was prepared and presented to the decision-makers of the Ministry of Education and Human Development of Mozambique.



VISUS Surveyors in Mozambique (Photo credits: Torres 2017)

The implementation of the VISUS methodology for multi-hazard school safety assessment in Mozambique was supported by the World Bank, the Belgian Development Agency (Enabel) and UNESCO.

| 3. SCHOOL SAFETY IN UNITED NATIONS CONVENTIONS, DEVELOPMENT AND HUMANITARIAN FRAMEWORKS, REGIONAL DECLARATIONS, AND IN THE 2030 GLOBAL AGENDA

School safety has within these past three decades become a priority for many governments, to be taken into consideration when developing national policies and plans. School safety is recognized by United Nations conventions and the international development and hu-

manitarian frameworks of the 2030 Agenda for Sustainable Development. It has quickly also gained recognition in several regional frameworks and declarations. A description of these conventions and frameworks as they relate to school safety follows.

3.1 United Nations Convention on the Rights of the Child

The urgency to protect children from the impacts of natural hazards and climate change is rooted in the articles of the United Nations Convention on the Rights of the Child (UNCRC). The Convention was adopted and opened for signature, ratification and accession by United Nations General Assembly resolution 44/25 of 20 November 1989 (United Nations, 1989). The UNCRC contains 54 articles covering children's rights from the civil, political, economic, cultural and social point of view. These articles apply to all children, independent of their ethnicity, gender, language, religion, national or social origin or other status.

The Convention relates to school safety:

- Article 3 (best interest): the best interests of the child shall be a primary consideration in all actions that affect children
- Article 4 (implementation of the Convention): Par-

ties must do all they can to ensure every child can enjoy his or her rights by creating systems and passing laws that promote and protect children's rights

- Article 6 (right to life): Children have the right to live a full life. Parties should ensure that children survive and develop healthily
- Article 24 (right to the best possible health): Parties must provide children with good quality health care, clean water, nutritious food, a clean environment, and education on health and well-being so that children can stay healthy
- Article 28 (right to education): primary education must be free, and different forms of secondary education must be available to every child. Discipline in schools must respect children's dignity and their rights
- Article 31 (right to play): Children have the right to relax, play and to join in a wide range of leisure activities

3.2 Hyogo Framework for Action

The education sector had a central role in the international agenda for disaster risk reduction under the Hyogo Framework for Action (2005–2015): Building the Resilience of Nations and Communities to Disasters. Established at the Second World Conference on Disaster Risk Reduction that took place in 2005 in Japan, the Hyogo Framework defined the work that was required from all sectors and actors to reduce disaster losses (UNISDR, 2007). Governments, international agencies, disaster experts and many other partners developed

and agreed on the Hyogo Framework for reducing disaster risk.

The Hyogo Framework was endorsed by 168 countries, which were united by the common aim of substantially reducing disaster losses by 2015 by building the resilience of their nations and communities to disasters under five priorities for action (UNISDR, 2007):

- 'Priority for action 1: ensure that disaster risk reduc-

tion is a national and a local priority with a strong institutional basis for implementation'

- 'Priority for action 2: identify, assess and monitor disaster risks and enhance early warning'
- 'Priority for action 3: use knowledge, innovation and education to build a culture of safety and resilience at all levels'
- 'Priority for action 4: reduce the underlying risk factors'
- 'Priority for action 5: strengthen disaster preparedness for effective response at all levels'

The education sector was presented in priority for action 3 as essential to disseminating information on disaster risk and building a culture of safety.

3.2.1 Mainstreaming disaster risk reduction in schools: the pioneering Asian commitment

The adoption of the Hyogo Framework for Action has been followed by a series of international commitments for mainstreaming disaster risk reduction with a focus on education infrastructure. An example is the statement resulting from the Fifth Meeting of the Regional Consultative Committee on Disaster Management, known as the Hanoi RCC5 Statement, which was ratified by 19 Asian countries who met in Viet Nam in May 2005 for the meeting. Recognizing the terrible possible outcomes of poor preparedness to disasters, the countries committed to mainstreaming disaster risk management in development and enhancing regional cooperation by introducing disaster risk management into school curricula and promoting hazard resilience in the construction of schools.

The priorities of the Hyogo Framework regarding school safety were reaffirmed in Asia during the Second Asian Ministerial Conference on Disaster Risk Reduction in 2007, which resulted in the Delhi Declaration on Disaster Risk Reduction in Asia. The declaration encouraged national governments to commit to and invest in national sustainable development strategies, plans and programmes in education and infrastructure. Governments recognized the importance of disaster risk reduction in the education sector and making schools safer for children. Later in 2007, during the Asia-Pacific regional workshop on school education and disaster risk reduction, several United Nations agencies committed to supporting Asian countries and defined an agenda for action, which was called the Bangkok Action Agenda.

3.2.2 International agendas for school safety during the implementation of the Hyogo Framework for Action

The first years of the Hyogo Framework for Action focused on mainstreaming school safety in disaster risk reduction strategies. This led to the establishment of the Ahmedabad Action Agenda for School Safety during the International Conference on School Safety held in 2007 in Ahmedabad, Gujarat, India. Based on priority for action 3 of the Hyogo Framework for Action, the Ahmedabad Action Agenda emphasized the need for knowledge, innovation and education in building a culture of safety and resilience. This priority aligned with Goal 2 of the United Nations Millennium Development Goals (which concluded in 2015): Achieve Universal Primary Education. The participants of the conference recognized that every child has both the right to education and the right to safe and sustainable living, thereby setting themselves the goal of achieving these together. Different priorities for school safety were defined in the Ahmedabad Action Agenda, including one focusing on the importance of guaranteeing disaster-resistant school infrastructure.

In 2008, one year after the Ahmedabad Action Agenda had been established, another International Conference on School Safety was held, this time in Islamabad, Pakistan. This conference, organized in partnership with several United Nations agencies and other international organizations, addressed the lack of resilience of school buildings, which caused the death of 17,000 children during the 2005 Kashmir earthquake. The conference covered the risks to which built infrastructure of learning facilities is often exposed and investigated the role school safety could play in building a culture of resilience within communities. The Islamabad Declaration on School Safety, the official outcome of the conference, encouraged the provision of technical, financial and human capacity support for school safety from governments and stakeholders.

Alongside the efforts that were being made in Asia to strengthen education infrastructure and invest in creating a culture of resilience within schools, many concerns were raised on the right of children to receive an education in emergency and disaster situations. These concerns were reflected in the Panama Declaration on Disaster Risk Reduction in the Education Sector, which was signed at the International Conference for Disaster Risk Reduction in the Education Sector in Latin America and the Caribbean in 2011, in Panama City, Panama. The declaration encouraged countries in Latin America and the Caribbean to make efforts to implement a policy for the evaluation and improvement of existing school infrastructure.

3.3 School safety in the development and humanitarian frameworks of the 2030 Global Agenda

In 2015, momentum for the international agenda for school safety increased as it interconnected with global efforts for sustainable development in the face of climate change and increasing vulnerabilities. Significant challenges and opportunities related to school safety were identified, and priorities for action were presented. The five main global frameworks shaping the development and humanitarian agenda to 2030 are the Sustainable Development Goals (SDGs), the Sendai Framework for Disaster Risk Reduction, the Paris Agreement, the New Urban Agenda and the Agenda for Humanity. Under these frameworks, school safety has become a priority in order to achieve the goals and targets measuring their implementation. WISS, which builds on the CSS framework, was launched in 2015 (GADRRRES, 2015) and aims to promote actions and initiatives for school safety worldwide.

3.3.1 Sustainable Development Goals

The SDGs comprise a call for action that recognizes that ending poverty must go hand-in-hand with strategies for economic growth and must address social needs, including education, health, social protection and job opportunities, while tackling climate change and environmental protection. The SDGs build on the success of the Millennium Development Goals and aim to make further progress in ending all forms of poverty. The SDGs are unique in that they call for action by all countries – poor, middle-income and rich – to promote prosperity while protecting the planet.

The ‘Transforming our world: the 2030 Agenda for Sustainable Development’ resolution was adopted by the United Nations General Assembly on 25 September 2015, and within it, school safety plays a significant role and has a commitment to be achieved by 2030, as stated in paragraph 25 of the resolution (United Nations, 2015a, p.7):

‘We commit to providing inclusive and equitable quality education at all levels – early childhood, primary, secondary, tertiary, technical and vocational training. All people, irrespective of sex, age, race or ethnicity, and persons with disabilities, migrants, indigenous peoples, children and youth, especially those in vulnerable situations, should have access to life-long learning opportunities that help them to acquire the knowledge and skills needed to exploit opportunities and to participate fully in society. We will strive to provide children and youth with a nurturing environment for the full realization of their rights and capabilities, helping our countries to reap the demographic dividend, including through safe schools and cohesive communities and families’

The 2030 Agenda adopted 17 SDGs, with 169 associated targets. Particularly relevant for school safety are Goals 4 (‘Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all’) and 11 (‘Make cities and human settlements inclusive, safe, resilient and sustainable’). Safe building facilities are regarded as a high priority, as highlighted in Goals 4.a, 11.5 and 11.7:

- 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.’ (United Nations, 2015a, p.17)
- 11.5: ‘. . . significantly reduce the number of deaths and the number of people affected . . . by disasters . . . with a focus on protecting the poor and people in vulnerable situations.’ (United Nations, 2015a, p.22)
- 11.7: ‘. . . provide universal access to safe, inclusive and accessible, green and public spaces, in particular for women and children, older persons and persons with disabilities.’ (United Nations, 2015a, p.22)

3.3.2 Sendai Framework for Disaster Risk Reduction

Adopted on 18 March 2015 by 187 Member States of the United Nations, the Sendai Framework for Disaster Risk Reduction 2015–2030 is the main outcome of the Third United Nations World Conference on Disaster Risk Reduction, which was held in Japan. The Sendai Framework aims at the ‘substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries’ (United Nations, 2015b, p.12). It calls for reducing disaster damage to critical infrastructure and disruption of basic services, among which are educational facilities and services.

This goal is expressed in target (d), the fourth of the framework’s seven global targets, which aims to ‘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’ (United Nations, 2015b, p.12). Among the indicators adopted by the United Nations General Assembly Resolution A/RES/69/283 of 23 June 2015 for the measurement of this target, D-1 (‘Damage to critical infrastructure attributed to disasters’), D-3 (‘Number of destroyed or damaged educational facilities attributed to disasters’) and D-6 (‘Number of disruptions to education services attributed to disasters’)

are particularly relevant (United Nations, 2015c).

Whereas in the Hyogo Framework for Action mention of the education sector was limited to an acknowledgement of the importance of disseminating knowledge, in the Sendai Framework, the focus on educational facilities is further developed.

The Sendai Framework also defines four priorities for action (United Nations, 2015b):

- **Priority 1. Understanding disaster risk.** Disaster risk management should be based on an understanding of disaster risk in all its dimensions of vulnerability, capacity, exposure of persons and assets, hazard characteristics and the environment. Such knowledge can be used for risk assessment, prevention, mitigation, preparedness and response
- **Priority 2. Strengthening disaster risk governance to manage disaster risk.** Disaster risk governance at national, regional and global levels is very important for prevention, mitigation, preparedness, response, recovery, and rehabilitation. It fosters collaboration and partnership
- **Priority 3. Investing in disaster risk reduction for resilience.** Public and private investment in disaster risk prevention and reduction through structural and non-structural measures are essential to enhance the economic, social, health and cultural resilience of persons, communities, countries and their assets, as well as the environment
- **Priority 4. Enhancing disaster preparedness for effective response and to “Build Back Better” in recovery, rehabilitation and reconstruction.** The growth of disaster risk means there is a need to strengthen disaster preparedness for response, take action in anticipation of events, and ensure capacities are in place for effective response and recovery at all levels. The recovery, rehabilitation and reconstruction phase is a critical opportunity to build back better, including through integrating disaster risk reduction into development measures

Particular relevance to safe learning facilities is stressed in Priority 3, for the achievement of which it is fundamental that critical infrastructure, in particular schools and hospitals, is integrated with disaster risk reduction measures so that they can withstand hazards and maintain their functionality (United Nations, 2015b, paragraph 30, p.19):

‘To strengthen, as appropriate, disaster-resilient public and private investments, particularly through structural, non-structural and functional disaster risk prevention and reduction measures in critical facilities, in particular schools and hospitals and physical infrastructures; building better from the start to withstand hazards through proper design and construction, including the use of the

principles of universal design and the standardization of building materials; retrofitting and rebuilding; nurturing a culture of maintenance; and taking into account economic, social, structural, technological and environmental impact assessments’

Through the Sendai Framework, countries and stakeholders have committed to developing strategies for ensuring school safety.

3.3.3 Paris Agreement

Concerns related to school safety have been raised within the context of climate change mitigation and adaptation. The main exponent of the international agenda on climate change is the Paris Agreement, signed in 2015 during the United Nations Climate Change Conference in Paris and ratified under the United Nations Framework Convention on Climate Change.

The central aim of the Paris Agreement is to strengthen the global response to the threat of climate change by keeping the global temperature rise this century well below 2 °C above pre-industrial levels and to pursue efforts to limit the temperature increase even further, to 1.5 °C.

The importance of school safety assessment and safe educational facilities is included in the following articles of the Paris Agreement:

- Article 7, paragraph 9(c), which is about ‘the assessment of climate change impacts and vulnerability, with a view to formulating nationally determined prioritized actions, taking into account vulnerable people, places and ecosystems’ (United Nations, 2015d, p.10)
- Article 8, paragraph 1, which is about recognizing ‘the importance of averting, minimizing and addressing loss and damage associated with the adverse effects of climate change, including extreme weather events and slow onset events . . .’ (United Nations, 2015d, p.12)
- Article 8, paragraph 4, which is about recognizing the need for ‘areas of cooperation and facilitation to enhance understanding, action and support . . . (e) Comprehensive risk assessment and management . . .’ (United Nations, 2015d, p.12)
- Article 11, paragraph 1, which stresses the need for capacity-building ‘to take effective climate change action, including, inter alia, to implement adaptation and mitigation actions . . .’ (United Nations, 2015d, p.15)

3.3.4 New Urban Agenda

In 2015, the need to find solutions to the specific challenges faced by cities also found its place within the international development agenda among the other frameworks. Stating the fact that by 2050, the world's urban population is expected to nearly double, making urbanization one of the twenty-first century's most transformative trends, the New Urban Agenda, adopted on 20 October 2016 at the United Nations Conference on Housing and Sustainable Urban Development (Habitat III) in Quito, Ecuador, aims to reconsider urban systems as spaces where sustainable development and resilience can be achieved. Populations, economic activities, and social and cultural interactions, are increasingly concentrated in cities, which poses massive sustainability challenges in terms of housing, infrastructure, basic services, food security, health, education, decent jobs, safety and natural resources, among other challenges.

The New Urban Agenda claims that through good management, urbanization can provide the key to a better future for both developing and developed countries. However, poor management and urbanization can lead to aggravated risks and vulnerabilities. According to the Agenda, cities and human settlements are seen as representative of their social functions, guaranteeing 'equal access for all to public goods and quality services in areas such as food security and nutrition, health, education, infrastructure, mobility and transportation, energy, air quality and livelihoods' (United Nations, 2017, paragraph 13, p.5).

In the adopted agreement, signatory countries have expressed their commitment to 'promoting the development of integrated and age- and gender-responsive housing policies and approaches across all sectors, in particular the employment, education, health-care and

social integration sectors, and at all levels of government – policies and approaches that incorporate the provision of adequate, affordable, accessible, resource-efficient, safe, resilient, well-connected and well-located housing, with special attention to the proximity factor and the strengthening of the spatial relationship with the rest of the urban fabric and the surrounding functional areas' (United Nations, 2017, paragraph 32, p.12).

Moreover, countries committed to 'promoting appropriate measures in cities and human settlements that facilitate access for persons with disabilities, on an equal basis with others, to the physical environment of cities, in particular to public spaces, public transport, housing, education and health facilities . . . in both urban and rural areas' (United Nations, 2017, paragraph 36, p.13).

3.3.5 Agenda for Humanity

The Agenda for Humanity was developed at the World Humanitarian Summit, which took place in Istanbul in May 2016. With five core responsibilities, the Agenda comprises a commitment to changing the approach to addressing and reducing humanitarian need, risk and vulnerability at the global scale.

Under the Agenda, humanity – people's safety, dignity and right to thrive – is placed at the heart of global decision-making. Particularly relevant to school safety is Responsibility 3 ('Leave no one behind'), which stresses the importance of ensuring universal access to education, including in times of crises, and focuses on gender and youth empowerment. Equally relevant is Responsibility 5 ('Invest in humanity'), which calls for appropriately investing in disaster risk reduction (United Nations, 2016).

3.4 Global commitment to school safety: Worldwide Initiative for Safe Schools

In 2015, following the adoption of the Sendai Framework for Disaster Risk Reduction, UNISDR (since May 2019 UNDRR), together with other members of GADRRRES, launched WISS to promote coherent and coordinated global action on school safety. UNDRR has coordinated the development of the Worldwide Initiative for Safe Schools (WISS) as a global umbrella government-led partnership programme for school safety implementation that encompasses key safe school initiatives in support of resilient educational facilities, school disaster management, and disaster risk reduction and resilience education. WISS has been endorsed by all GADRRRES members and has rallied the political commitment of more than 50 countries aiming to implement school safety actions.

WISS aims at securing political commitment and fostering the implementation of safe schools globally. The initiative motivates and supports governments in their development and implementation of national school safety policies, plans and programmes, keeping in mind the three pillars of CSS. It offers technical assistance and expertise, notably by GADRRRES members and partners, to support interested governments in implementing CSS at the national level. The VISUS methodology is one of the technical resources provided by GADRRRES in support of WISS.

The main objectives of WISS are (UNDRR, 2019a):

- 'To promote governments' good practices, expertise and achievements in safe school implementation for possible replication in other countries and regions'
- 'To identify remaining challenges to effectively implement school safety'
- 'To support governments in developing national strategies for school safety as part of existing national disaster risk reduction and education policies and plans'
- 'To offer technical assistance and particular expertise as required by governments, around the core three pillars of safe schools'

The WISS programme is structured around three key components (GADRRRES, 2017, p.3):

1. 'Global Advocacy and Policy Support component, which supports governments in making safe schools a national priority as part of their education sector and national disaster risk reduction strategies, poli-

cies, plans and budget by 2020'

2. 'Technical Assistance component, which implements a comprehensive approach to school safety through the following technical pillars of the CSS framework:
 - Safe learning facilities and safe access structural assessment, safe site selection and design, reconstruction and retrofitting
 - School disaster management, including educational continuity planning, enhanced preparedness through drills and simulation exercises, and safe access to potable water and sanitation
 - Risk reduction and resilience education through the integration of risk reduction, resilience and climate change into the school curriculum, and informal education and consensus-based key messages for households and communities'
3. 'Progress Monitoring and Reporting component, which tracks and reports on progress in implementing safe schools on the ground, including progress on technical, policy, institutional and legal aspects'.

3.5 Regional initiatives on school safety

To facilitate achievement of the objectives of WISS, two regional Initiatives have emerged in recent years – in South-East Asia and the Caribbean. These regional initiatives aim to reinforce cooperative actions among neighbouring countries that share similar challenges in terms of exposure to hazards as well as a common vision on the ways and means to implement concrete actions for school safety. It is expected that other regions, notably Africa, Central and North Asia, Europe, Latin America, the Middle East, and the Pacific, will follow with their own initiatives in the coming years (Fig. 3.1).

3.5.1 ASEAN Safe Schools Initiative

In 2009, the Association of Southeast Asian Nations (ASEAN) Agreement on Disaster Management and Emergency Response (AADMER) entered into force. This is a legally binding instrument on disaster risk reduction with school safety as a strategic component. In order to achieve the objectives of the AADMER Work Programme (2010–2015) in the education sector, the ASEAN Safe Schools Initiative (ASSI) was established in 2013 under the purview of the ASEAN Committee on Disaster Management Working Group on Prevention and Mitigation. ASSI aims to support the implementation, facilitate the scaling up and ensure the sustainability

of actions across the region in order to promote a safe and secure learning environment for children in ASEAN countries.

Under the new AADMER Work Programme (2016–2020), ASSI remains a priority initiative in Priority Programme 2 (Build Safely – Building Safe ASEAN Infrastructures and Essential Services). Output 2 of this programme addresses a scaled-up ASSI.

ASSI is driven and implemented by the governments of ASEAN countries, in particular by their ministries of education and national disaster management agencies. ASSI receives technical support from the Asia Pacific Coalition for School Safety, a multi-stakeholder mechanism composed mostly of the members of GADRRRES, the Asian Disaster Preparedness Centre, and other partners, such as Mercy Malaysia and the AADMER Partnership Group (ASSI, 2018).

The VISUS methodology has already been implemented in two countries that are proponents of ASSI: Indonesia and the Lao People's Democratic Republic.

3.5.2 Caribbean Safe Schools Initiative

During the Caribbean Safe School Ministerial Forum held in April 2017, regional commitment to disaster risk management in the education sector was reaffirmed, resulting in the Antigua and Barbuda Declaration and the Caribbean Road Map on School Safety. The Declaration bases its understanding of school safety on the definitions provided by the CSS framework and the Model Safe School Programme in the Caribbean. It engages with WISS and aims to build resilience in the education sector by securing human and financial resources and coordinating with disaster management bodies on the implementation of school safety strategies. By strengthening collaboration and coordination mechanisms, it provides a framework that can be used to track and measure progress on the implementation of actions.

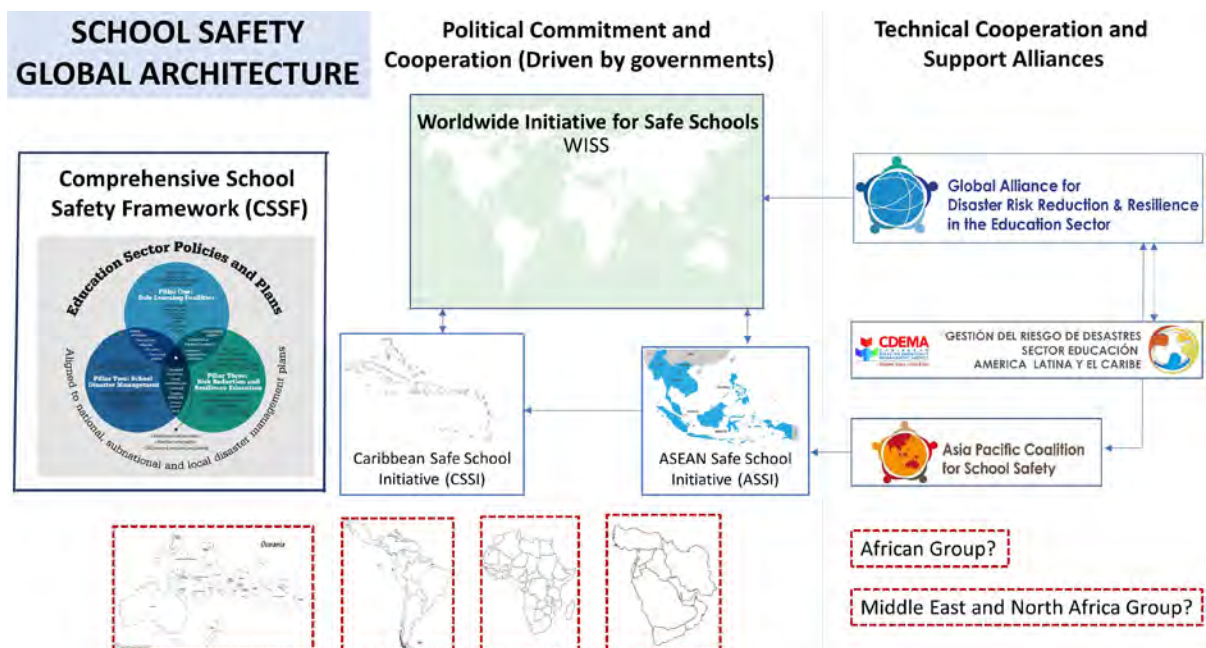
The Antigua and Barbuda Declaration, which was ratified by the Group of Caribbean Ministers of Education, guides the Caribbean Safe School Initiative (CSSI) for the upcoming years through specific actions, which are presented in the Caribbean Road Map on School Safety. To implement CSSI, all participating countries include the road map actions in their respective work plans. The ministers are responsible for following up on the implementation process, which will be the subject of periodic reporting at the Ministerial Forums.

The priority areas of CSSI to be pursued are as follows:

- Develop enabling policies and national plans and strategies
- Secure human and financial resources
- Enhance and implement a standardized school safety assessment
- Develop a safe school standard
- Review and develop multi-hazard school safety plans and guiding documents
- Improve coordination among stakeholders
- Review and update disaster risk management components in the curriculum
- Train school staff, families and the community in disaster risk management

CSSI is driven and implemented by the governments of Caribbean countries, in particular by their ministries of education with the support of national emergency management offices (UNDRR, 2019b). CSSI receives technical support from the Group for Disaster Risk Reduction in the Education Sector in Latin America and the Caribbean, an inter-agency platform composed mostly of the members of GADRRRES, and from the Caribbean Disaster Emergency Management Agency.

Fig. 3.1 School Safety Global Architecture



4.

UNESCO'S CONTRIBUTION TO THE SCHOOL SAFETY AGENDA

The role of UNESCO in the school safety agenda was introduced when presenting the work of GADRRRES. Global objectives to improve the education sector were captured in SDG 4 (Education), which developed into ten targets that are listed in the Education 2030 Framework for Action (UNESCO, 2016). This framework, launched in November 2015, entrusts UNESCO with leading the school safety agenda. As the lead United Nations agency for education, UNESCO is engaged in the conceptual shift in thinking away from post-disaster reaction and towards pre-disaster action. UNESCO focuses on building disaster resilience, including emergency response and long-term recovery, while promoting quality education for all – children, youth and adults.

To improve access to quality education on sustainable development, UNESCO contributes to Education for Sustainable Development (ESD) – it is the lead agency and responsible for management and coordination of the Global Action Programme on ESD.

UNESCO contributes to the education sector by:

- Supporting Member States in developing education systems to foster high quality and inclusive life-long learning for all
- Empowering learners to be creative and responsible global citizens
- Advancing education for all and shaping the future international education agenda

UNESCO's provision of support to countries for the development of their educational activities focuses on issues of sustainability, including climate change, biodiversity, disaster risk reduction, water, cultural diversity, sustainable urbanization and sustainable lifestyles. Policy-makers are provided with the information they need

for including ESD in their policies and plans, and they are advised and supported throughout the process of doing so. UNESCO also encourages the training of teachers to ensure that ESD is integrated into school curricula, and generates discussion around the criticality of ESD through international meetings and events, and publications and other information tools.

UNESCO helps strengthen education systems in times of emergency and crisis, when it is critical that families, including children, are informed of and educated about safe behaviours. UNESCO, taking upon itself the responsibility of maintaining school safety as a global priority, operates at a multidisciplinary level, connecting education to natural and social sciences, culture and communication in order to create a global culture of resilience.

It is crucial that children and youth are guaranteed uninterrupted access to quality education. In emergencies and crises, UNESCO helps strengthen the capacities of Member States to provide access to quality educational opportunities, addresses threats to the education system and leads response and recovery efforts. The Inter-Agency Network for Education in Emergencies was co-founded by UNESCO to support efforts related to education in emergencies. Such efforts seek to bridge the gap between the development and humanitarian response nexus, through capacity-building initiatives aimed at creating technical expertise and by conducting research and providing training.

The VISUS methodology is one of UNESCO's tools for achieving the above-mentioned efforts and moving towards a sustainable future where safety and the right to education of children and youth is a priority.

| 5. MULTI-HAZARD SCHOOL SAFETY RISK ASSESSMENTS: TYPES AND LEVELS

The definition of a rational, effective strategy for risk reduction and climate change adaptation based on level of risk, points of weakness, countermeasures and costs is required in order to ensure the safety of strategic major public buildings, such as schools. Administrators and policy-makers must make decisions within a limited budget on various safety interventions in the schools of a specific territory. Having a quick but reliable assessment methodology, which allows them to characterize the initial situation and also supports them with concrete information for decision-making, is imperative. Moreover, when a priority of intervention is necessary, a multilevel approach is useful for facilitating the decision-making process to upgrade the safety level.

VISUS is a rapid visual assessment that can be complemented with other methods of assessment, especially advanced numerical models that can determine expected annual losses. These models are useful for obtaining single or multiple hazard risk estimates for school buildings of most representative typologies located throughout the territory being analysed. They normally start with the compilation of a school building database, focusing on the structural typology, geometrical configuration and date of construction. These kinds of models provide information about the cost-effectiveness and convenience of retrofitting existing schools so that they can better withstand a specific hazard in identified hazard-prone areas.

The results of these risk assessments are currently used to inform large school retrofitting programmes, but they also provide essential information about territories where a rapid visual assessment should start. A rapid visual assessment will be required because probabilistic methods fail to provide a holistic view of the situation at each school, which might be different from the preliminary assumptions, notably in the structural typology of each building, or in other areas of concern such as the threats present in green or open areas, the location of the school, the non-structural elements of buildings and the level of building maintenance.

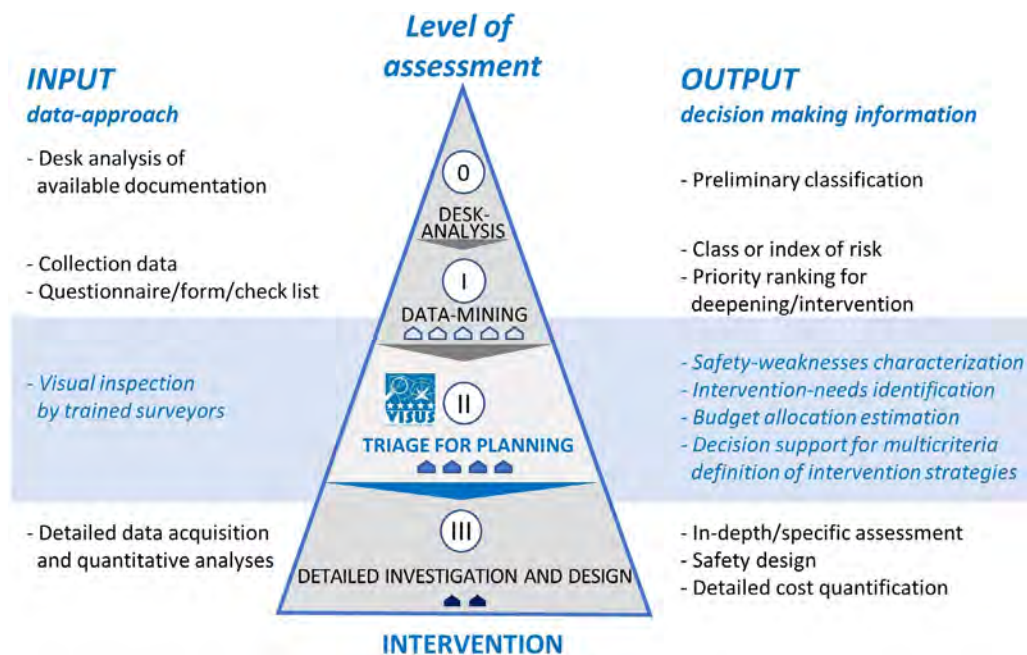
Different levels of assessment can be used for different requirements (Fig. 5.1). Low levels of assessment (desk analysis and data mining levels in Figure 5.1) are usually implemented by collecting data (e.g. from questionnaires, forms and checklists). These approaches allow a quick ranking of buildings through indices. Nevertheless,

such approaches are not detailed enough to properly answer all of an administrator's concerns, and in most cases, the input data are not accurate.

Deeper analyses (detailed investigation and design level in Figure 5.1) can answer the majority of an administrator's concerns, with in-depth and specific assessments, detailed design and cost quantification. However, these inspections are very costly and time-consuming, and they rely on the available expertise within the country – which sometimes is non-existent – limiting the number of facilities that can be inspected.

Researchers suggest adopting a level of assessment that is intermediate between the low- and deep-level assessments noted above. Such intermediate assessment is founded on visual expert-based inspections and technical triage assessments, such as the VISUS methodology. Technical triage assessments and expert judgement pre-codification processes are the two main elements on which the VISUS methodology is based.

The outputs of the VISUS technical triage are directly usable by administrators as decision-making support for defining safety upgrading strategies. Furthermore, the outputs permit the characterization of safety weaknesses, intervention needs and costs with a certain degree of detail by a rapid, economical approach. It is worth noting that the VISUS methodology has been developed to characterize a large number of schools from a single visit to each one, providing uniform and comparable evaluations and thus facilitating the planning of intervention strategies.

Fig. 5.1 *VISUS assessment can be considered as a technical triage of school facilities for planning purposes*

The pre-codification of expert reasoning facilitates the transfer of knowledge to local decision-makers, engineers and other scientists, and surveyors, and this transfer strengthens or creates local capacities. At the same time, the training on general concepts encompassed in the implementation of the VISUS methodology, together

with the development and utilization of the related tools (e.g. the handbooks), contributes to increasing the knowledge and awareness of safety issues by decision-makers, scientists and surveyors.

5.1 Comprehensive School Safety Assessment Suite

The CSS framework (see section 2.1) aims to support the prevention of death and injury in schools, the assurance of educational continuity, the prevention of loss of education sector investments and the development of a culture of safety. At the heart of a holistic approach for school safety is multi-hazard, child-centred assessment for awareness, education, planning and decision-making. GADRRRES members have developed a template of targets and indicators to monitor and encourage progress towards school safety, and GADRRRES partners have developed tools and methods for doing so. The tools and methods are to be used flexibly and to be localized, as appropriate, to support the implementation of CSS, including the VISUS methodology.

They are designed for:

- Salience (relevant to CSS)
- Scalability (designed for universal application)
- Sustainability (with local capacity)
- Effectiveness (with outputs usable for planning action)
- Efficiency and affordability
- Empowerment (rather than being extractive)

The tools and methods have been developed to assist decision-makers and stakeholders in the education sector in assessing the conditions of school facilities. The tools and methods use a triage assessment approach. The assessment can be pre-populated with existing school location data and linked to data in education management information systems.

CSS First Step is a crowd-sourcing app for engaging students and communities in identifying hazards and risks as they relate to their local school. It is the first tool of the CSS Assessment Suite, and it aims at increasing community awareness of disaster risk. The second tool is the CSS School Self-Assessment Survey, a paper survey and tablet-based application for non-technical assessment. The tool has been developed for school management committees and visiting school officials, and serves to record hazards and assess conditions of school facilities. The third tool of the CSS Assessment Suite is the VISUS methodology (Table 5.1).

Table 5.1 *Comprehensive School Safety Assessment Suite*

TOOL	INPUTS	FROM	OUTPUTS	TO
1. CSS First Step: Community Awareness	Hazard/Risk maps Desk review of available data Crowd-sourced & other views	Public records Students Community members	Crowd-sourced perception data: E-mail to responder Online visualisation	School community Local education administrators Advocacy Awareness Interest Salience
2. CSS School Self-Assessment: Internal Assessment (Pillars 1, 2,3)	Pillars 1, 2, 3 quick survey Photographic reportage EMIS & geo-informatics	School safety committees Visiting education administrators	School-based self-assessment School report District report Online visualisation Searchable database	School management National & district education administrators Local input Program development Capacity-building Flagging for technical Pillar 1 inspection
3. VISUS CSS: Visual Inspection for defining Safety Upgrading Strategies (Pillar 1)	Visual inspection/detailed data Application of criteria Quantitative and qualitative analysis Photographic reportage EMIS & geo-information	External trained survey teams: Technical inspectors from Ministry of Education Surveyors from local Universities or vocational schools	Capacities for technical assessment created in the country Individual school report Collective report (including budget estimations) Online visualisation Searchable database	School management National & district education administrators Characterisation Recommendations Cost-estimate – funding allocation Prioritisation
4. Detailed investigation and design	Deep technical investigation Quantitative analysis	Trained structural engineers	Detailed investigation and design	In-depth assessment for design and delivery of retrofit or replacement

Source: Adapted from GADRRRES, 2019.

6. VISUS METHODOLOGY FOR DECISION-MAKING FROM SCIENCE-BASED EVIDENCE

The VISUS methodology facilitates the decision-making process for defining rational and effective safety upgrading strategies, and allows decision-makers to make science-based decisions on where and how they should invest their available resources for strengthening, in an efficient and economical manner, the safety of schools and of their students and teaching staff.

The VISUS methodology helps administrators and decision-makers to answer specific questions such as:

- What is the safety situation of the learning facilities in question?
- Which schools need priority interventions?
- What are the reasons for intervening in those schools?
- What types of interventions are needed?
- How much would the interventions cost?

- How many interventions are possible with the available resources?
- How can the level of risk be communicated to the educational community?

VISUS aims at providing decision-makers with information that allows them to answer these and other questions and at supporting them in rational and effective strategic planning for the safety upgrading of existing schools. In order to do so, VISUS pre-codifies expert reasoning and reproduces it in an automated way. The implementation of VISUS for assessing the safety of schools follows four phases: preparation and organization, implementation of the survey, elaboration of data and reporting (see Volume 3 for a detailed description of the implementation process).

6.1 Preparation and organization

The preparation and organization phase covers the adaptation and training of the methodology. The adaptation aims to adjust the methodology to the circumstances of the geographical area where the assessment will be performed in terms of the typologies of buildings, hazard profile, and costs of construction and refurbishment.

The VISUS methodology enables the creation and/or reinforcement of the capacities within a country through the training it offers. When implementing the methodology, three types of training are required:

- **Training of decision-makers** (i.e. national, sub-national and local authorities, school administrators)

on the importance of performing multi-hazard school safety assessments and on the principles of the VISUS methodology

- **Training of trainers** (i.e. the people who will train and support the surveyors) to build local capacities and ensure the sustainability of the project in the long term
- **Training of surveyors** (i.e. civil engineers, structural engineers, architects, design professionals, building officials, construction contractors, firefighters, architecture or engineering students, or other individuals with familiarity with or a background in building design or construction) on the use of the VISUS methodology for assessing schools

6.2 Survey

The survey phase is carried out by locally trained VISUS surveyors who collect information for each school using pre-codified VISUS survey forms (see Volume 3, section 3), either in a paper-based or electronic format. Surveys are performed by teams of three surveyors, in three hours for each school in average.

The VISUS survey forms comprise six pages divided into seven sections, which correspond to the survey phases (see Figures 6.1, 6.2 and 6.3), and present the information to collect using visual representations.

Fig. 6.1 VISUS survey forms: SP0, SP1 and SP2

The figure displays three VISUS survey forms, labeled SP0, SP1, and SP2, arranged in a grid. Each form is a detailed checklist for assessing school safety and infrastructure.

- SP0: VISUS MULTI-HAZARD SURVEY GENERAL INFORMATION**
 - School Information:** School name, State/Country, Address, City, District, and School type (Public, Private, Religious, Other).
 - Contact Information:** Contact name, Email, Phone, and Fax.
 - Survey Team:** Name and Contact of the survey team.
 - Use of the School:** Sections for School hours, School activities, and School facilities.
 - Hazardous Events - Experienced:** A grid of icons representing various hazards (e.g., Flood, Fire, Earthquake, etc.) with checkboxes for 'Yes' or 'No'.
 - Reference Events Characterization:** A section for characterizing reference events, including a table for 'Predicted Peak Flood' with columns for 'Flood depth', 'Flood velocity', and 'Flood duration'.
- SP1: VISUS MULTI-HAZARD SURVEY LOCATION INSPECTION**
 - Location Inspection:** A grid of icons representing various location-related hazards (e.g., Proximity to flood, Proximity to fire, etc.) with checkboxes for 'Yes' or 'No'.
- SP2: VISUS MULTI-HAZARD SURVEY SCHOOLYARD INSPECTION**
 - Schoolyard Inspection:** A grid of icons representing various schoolyard-related hazards (e.g., Proximity to flood, Proximity to fire, etc.) with checkboxes for 'Yes' or 'No'.

Fig. 6.2 VISUS survey forms: SP3 and SP4

The figure displays two more VISUS survey forms, labeled SP3 and SP4, arranged in a grid. Each form is a detailed checklist for assessing building safety and infrastructure.

- SP3: VISUS MULTI-HAZARD SURVEY BUILDING EXTERNAL INSPECTION**
 - Building External Inspection:** A grid of icons representing various building external hazards (e.g., Proximity to flood, Proximity to fire, etc.) with checkboxes for 'Yes' or 'No'.
- SP4: VISUS MULTI-HAZARD SURVEY BUILDING INTERNAL INSPECTION**
 - Building Internal Inspection:** A grid of icons representing various building internal hazards (e.g., Proximity to flood, Proximity to fire, etc.) with checkboxes for 'Yes' or 'No'.

Fig. 6.3 VISUS survey forms: SPS and SPN

The figure displays two forms used in the VISUS methodology. The left form, titled 'VISUS MULTI-HAZARD SURVEY SCHOOL SKETCH and NOTES' (SPS), features a large grid for sketching and a section for notes. It includes fields for 'Building plan', 'School complex property', 'Access to school complex', 'Access to school buildings', 'North direction', and 'School ID CODE'. The right form, titled 'VISUS MULTI-HAZARD SURVEY NOTES' (SPN), is a large sheet for taking notes, also featuring a 'School ID CODE' field.

6.3 Elaboration

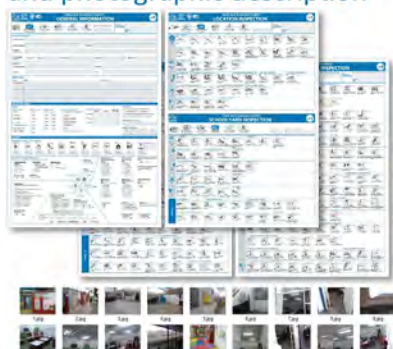
The elaboration phase of VISUS implementation comprises the automated application of algorithms based on the VISUS evaluation criteria to the VISUS survey data. The elaboration of the data uses an automated tool (software) – the VISUS elaboration tool – that imports the survey information and creates the VISUS outcomes

(Fig. 6.4). The VISUS outcomes are a set of indicators used to support decision-makers in defining safety upgrading strategies, a database with all the acquired and elaborated information, the individual and collective reports, web maps and statistics on outcomes (Fig. 6.5).

Fig. 6.4 The VISUS survey data are elaborated through the VISUS elaboration tool, which is based on the VISUS evaluation criteria

Survey data

VISUS multi-hazard survey forms and photographic description

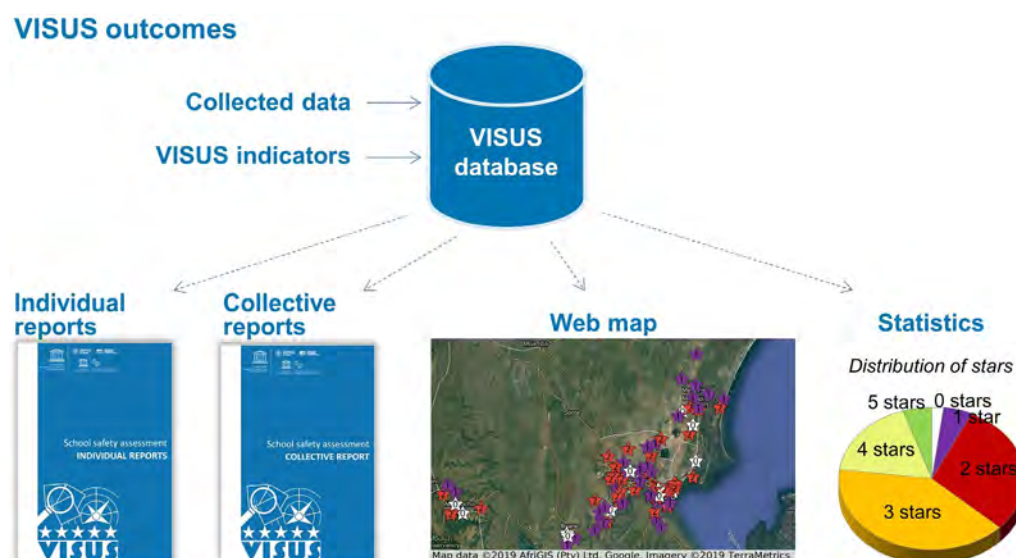


Reports

Individual reports
Collective reports



Fig. 6.5 Summary of the outcomes provided by the VISUS methodology



6.4 Reporting

VISUS generates final reports for supporting decision-makers. The reporting phase results in the creation of:

- An **individual report** for each assessed school, which provides an in-depth analysis of the findings from the school safety assessment, including all technical information collected in the field (see Fig. 6.6 and Volume 3, section 5.2 for a detailed description)
- A **collective report**, which provides an overview of the outcomes of the school safety assessments of all the learning facilities assessed (see Fig. 6.7, 6.8 and 6.9 and Volume 3, section 5.3 for a detailed description)
- The **VISUS maps**, with the geolocation of each school and a summary of the outcomes in VISUS safety stars (see Fig. 6.10 and Volume 3, section 5.4 for a detailed description)

The collective and individual reports provide information concerning a school's characteristics: size, location, open areas, number and use of buildings (main or ancillary), types of buildings (permanent, semi-permanent or temporary), number of classrooms, and number of people (disaggregated by gender). They also provide information concerning the status of accessibility by people with reduced mobility, water and sanitation, maintenance, technological and other equipment, comfort and security.

The reports provide the global indicators resulting from the multi-hazard assessment in terms of specific warnings and the absence or presence of concern for the safety of people. They also provide information on the need to improve a specific building or open area

(schoolyard) in relation to the five issues analysed by the methodology (i.e. location/site, structural global, structural local/envelope, non-structural and functionality) and in relation to the hazards for which negative impacts are expected. Another indicator provided in the reports is the VISUS multi-hazard safety stars, which provide an overview of the level of safety of each school building and each learning facility.

The reports provide information on the safety upgrading actions proposed for the site, the open areas (schoolyard), the main buildings and the ancillary buildings. They indicate the level of intervention required, which is important information for planning, as some of the buildings may not be usable during the intervention phase. Finally, the reports indicate the financial commitment required for the safety upgrading of the school assessed in the form of a budget estimate. The estimate is presented as a percentage of the cost of building a new structure with the same number of classrooms in accordance with the reference construction standard of the country.

Fig. 6.6 VISUS individual report layout, showing organization of the contents

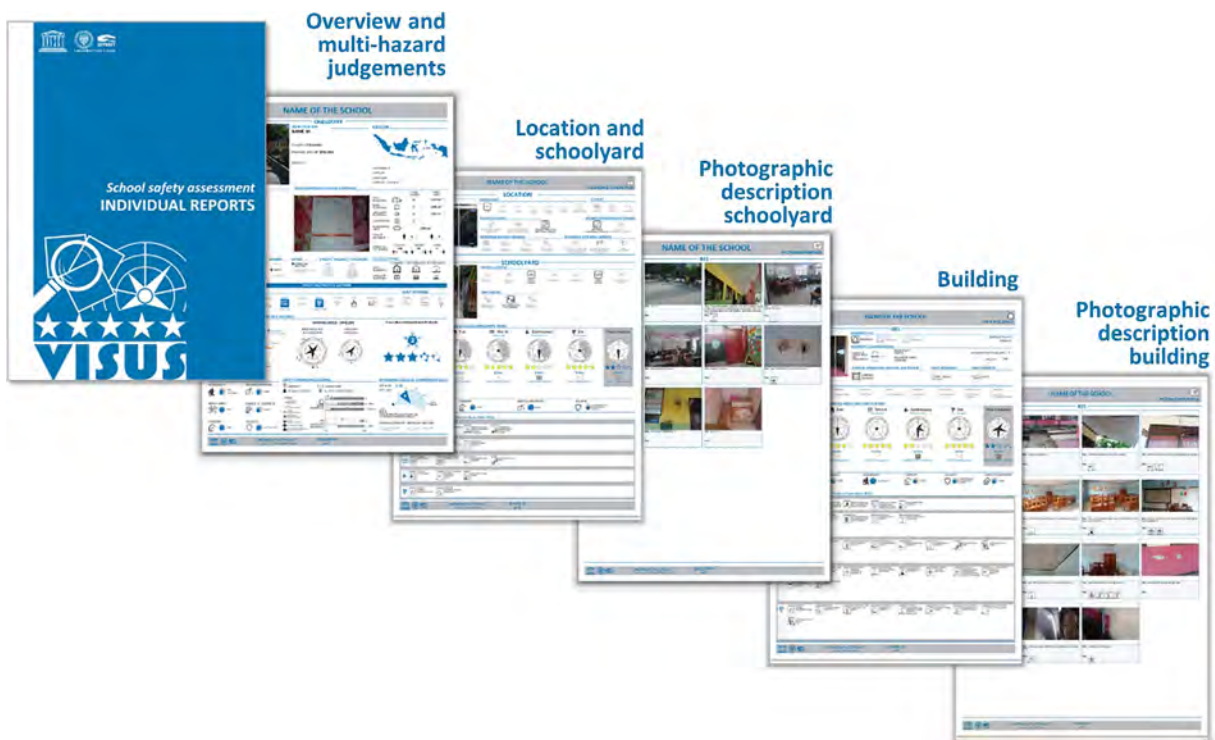


Fig. 6.7 VISUS collective report layout, showing organization of the contents

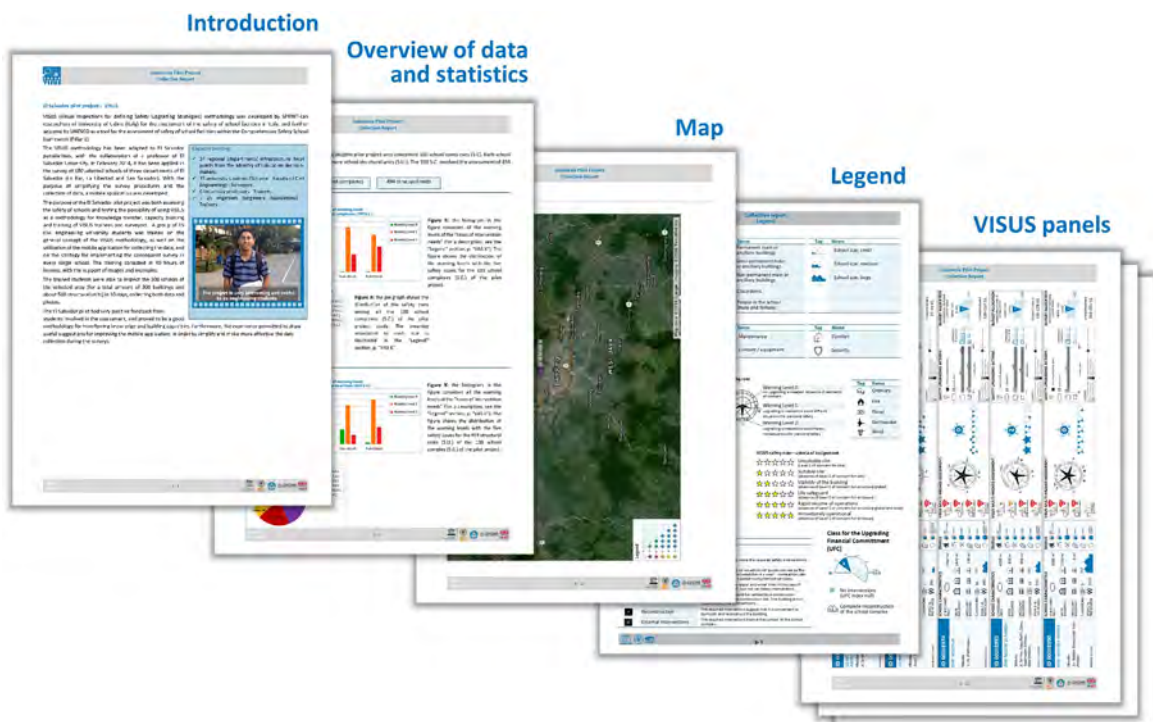


Fig. 6.8 Collective report: VISUS panel with summary information for each school



Fig. 6.9 Collective report: legend for interpreting the VISUS panel

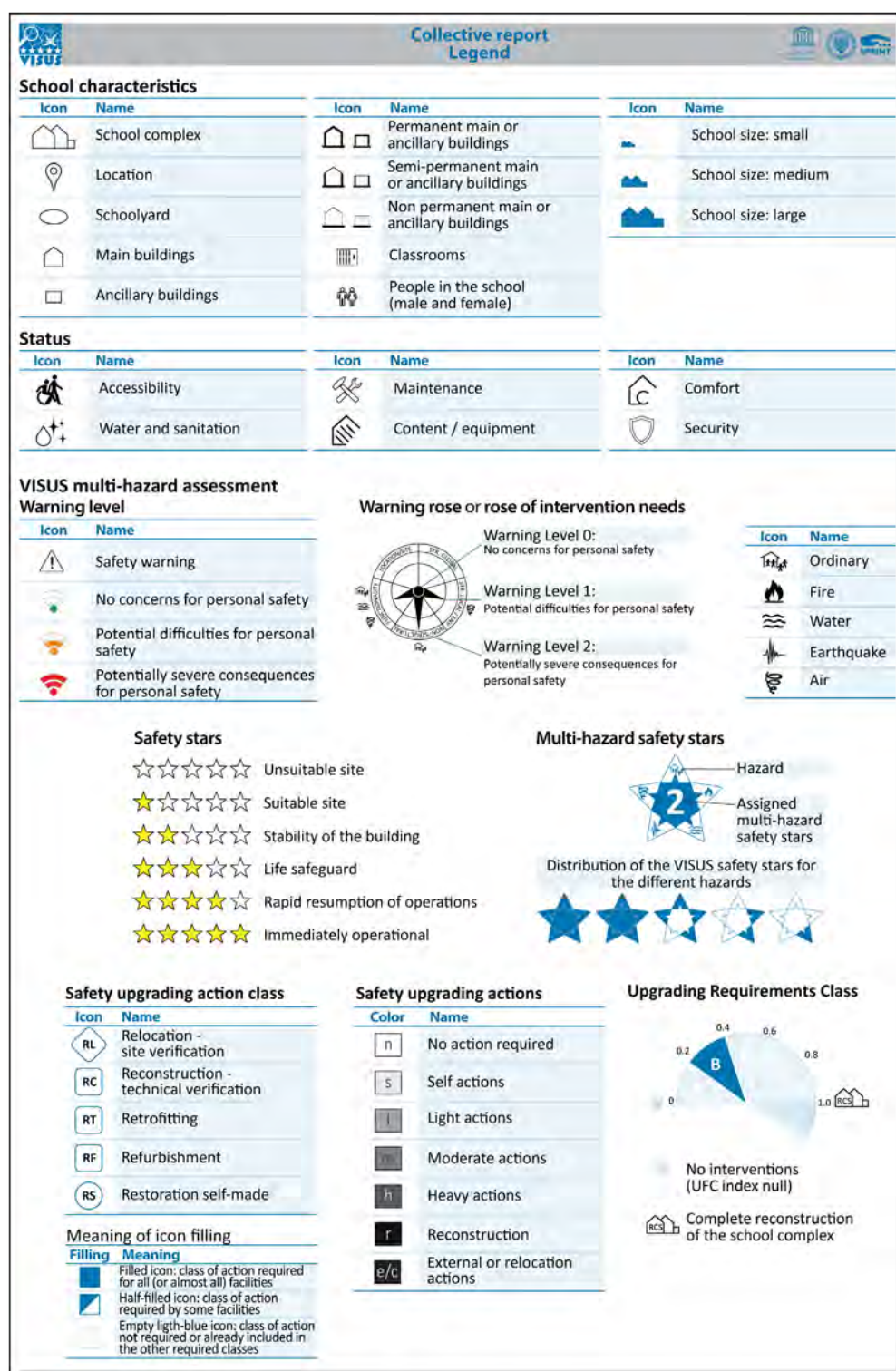
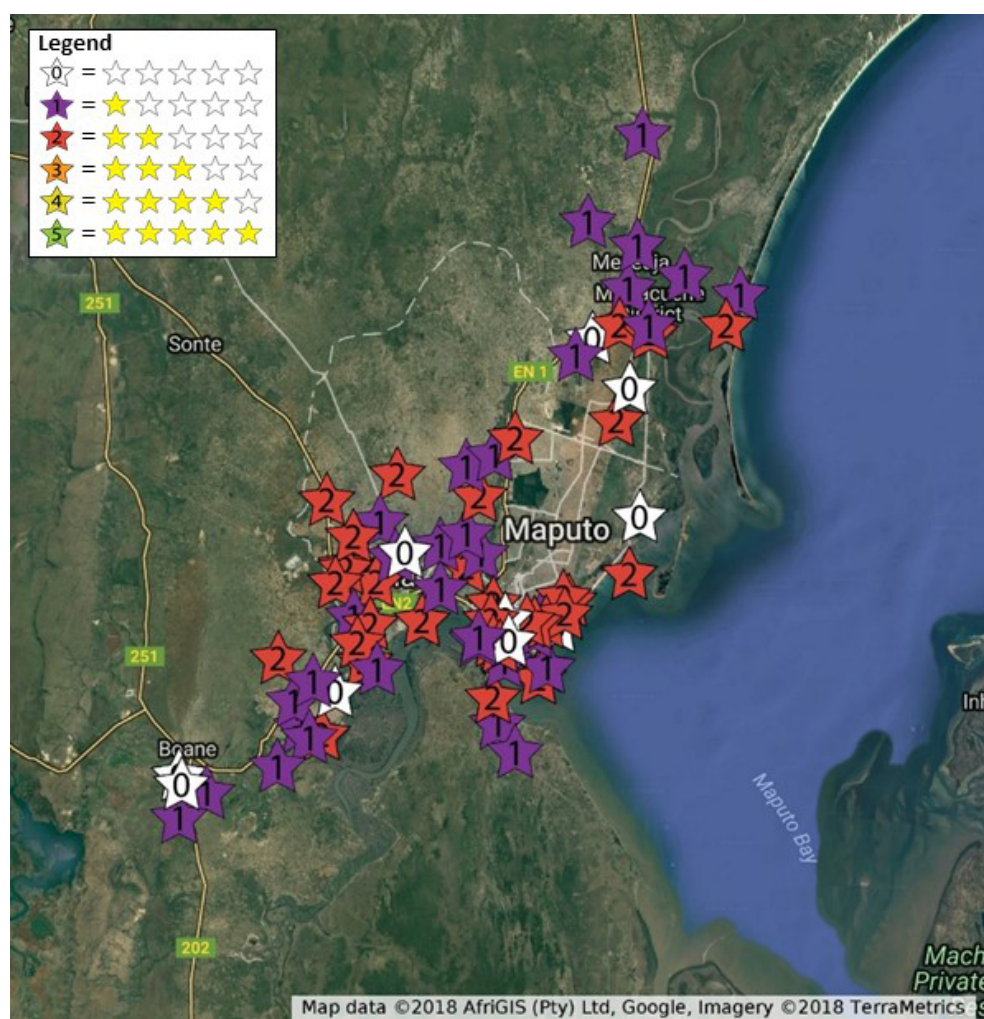


Fig. 6.10

VISUS map: example showing the summary of outcomes of the VISUS multi-hazard assessments



6.5 Strategies for upgrading the level of safety of learning facilities

Implementation of the VISUS methodology provides information that decision-makers working in various ministries and departments can use as the basis for collaboration on defining the most appropriate strategy for increasing the level of safety of all assessed schools and the interventions to be implemented – restoration self-made, refurbishment, retrofitting, reconstruction or relocation (the ‘5Rs’).

Depending on the results of the VISUS assessment, various options for safety upgrading can be prioritized. These options are described in the following subsections of this chapter.

Decision-makers may prioritize interventions to schools taking into consideration that any of the strategies to be implemented should contemplate the following objectives for securing learning facility safety in a holistic manner:

1. Resilient construction (applying seismic, wind and other hazard-related construction codes)
2. Sustainability (in terms of, for example, energy maximization, construction materials and water consumption, among others)
3. Learning spaces that maximize quality education
4. Linkage between the development of the local community and the school

6.5.1 Prioritization by exposure to a specific hazard or multiple hazards

Decision-makers can consider relocating all or some of the schools that have been flagged as highly exposed, and therefore concerning owing to their location. In this case, a site verification is recommended to explore the

feasibility of improving the site conditions before deciding on a relocation strategy, and cost-effectiveness should be taken into consideration. Return periods of specific hazards could also be considered in the analysis of decision-makers, but it is important they understand that a return period or a recurrence interval is an average time or an estimated average time between events; that is, these are statistical measures based on probability assumptions.

Prioritization by hazard could be an option if funding is available for a specific hazard. For instance, if the national government has launched a large programme for prevention of impacts of seismic events, decision-makers at the ministry of education may face an easier task of obtaining resources within the national budget for implementing earthquake-related interventions. This case is similar to climate change related hazards: substantial funding mechanisms have been made available at the international level for adaptation and mitigation actions.

6.5.2 Prioritization by physical vulnerability

Buildings identified as having serious concerns in terms of their structural performance may require special attention from decision-makers. If an assessed building has been flagged as unstable, a detailed assessment to determine its usability is urgent. Buildings have collapsed without being triggered by any hazard (see section 1).

6.5.3 Prioritization by number of occupants

In countries, school contexts in which education services are provided to a large number of students and that present some level of concern should be prioritized in the strategy of decision-makers. Nevertheless, schools with a small demand but that are considered unsafe should also be considered in the strategy. Some of these small schools could be closed temporarily or permanently, and students could be transferred to neighbouring schools while safety works are implemented.

6.6 VISUS: a decision-making support tool

Decision-makers can largely define the safety upgrading strategies by analysing the information in the map and the collective report, using the individual reports for refining their decisions. The information gathered and data generated by the VISUS methodology support the sustainability of the desired interventions, as the outcomes of the assessments will be able to be used by (a) national authorities to define and prioritize the budgets needed for future investments, and (b) by international and regional development banks to guide the design of future grants and loans for safety upgrading actions.

The VISUS outcomes enable decision-makers to:

- Assess the safety of learning facilities vis-à-vis hazards (i.e. water, fire, air or earth) and ordinary use
- Identify for each learning facility the main issues that threaten it in relation to the five issues of analysis: location/site, structural global, structural local/envelope, non-structural and functionality
- Identify the recurrent problems, if any
- Reinforce the national database of schools with more detailed information on safety vulnerabilities
- Support the creation of focused databases; for example, on typical damages caused by natural and human-induced hazardous events
- Determine if further assessment, study or analysis would lead to a better understanding of the vulnerability of the learning facility
- Hold a range of economic values, expressed on an upgrading financial commitment index, which suggests the budget allocation needed for increasing the level of safety of the assessed schools, in comparison to the actual cost of building a new school for the same number of students
- Acquire a summary of the safety upgrading actions to be implemented
- Implement a prioritization plan for self-made restoration, refurbishment, retrofitting, reconstruction or relocation of an unsafe school (on the basis of the information and the recommendations provided)
- Support the identification and definition of safety upgrading strategies for a large number of learning facilities

7. LINKING VISUS OUTCOMES WITH MANAGEMENT INFORMATION SYSTEMS

7.1 Education management information systems

An education management information system (EMIS) is an organized group of information and documentation services that collects, stores, processes, analyses and disseminates information for educational planning and management. The system's components include inputs, processes, outputs and feedback, which are integrated to achieve a specific objective. An EMIS manages a large body of data and information that can be readily retrieved, processed, analysed and made available for use and dissemination. It is a tool that uses systems theory, together with developments in computerization, to create a comprehensive approach to the collection and use of vast quantities of information on the education and training system.

As the potential users of data, education managers at ministries of education are systematically provided with accurate and timely information so that decision-making, planning, project development and other management functions and operations can be carried out effectively.

Given the 17 SDGs are interlinked, public policies and programmes in different sectors of development should build on each other. For example, regarding climate action (SDG 13), education policy-makers could be asking themselves how national curricula can be improved such that they increase awareness of environmental sustainability issues such as climate change, disaster risk reduc-

tion and sustainable lifestyles. These interlinkages go beyond the SDGs and could be also built on the targets of the Sendai Framework for Disaster Risk Reduction. In this sense, education policy-makers could also obtain information allowing them to report on number of schools collapsing or number of days that the education services has been disrupted, while gathering further information on the root causes of each indicator.

Effective EMIS can help policy-makers in this regard by interfacing with other sectors' information systems and thereby providing policy-makers with intersectoral data and analyses. These intersectoral analyses can inform policy and programme development at the subnational, national, regional and international levels (UNESCO, 2018).

From a planning perspective, the outcomes of VISUS implementation could be integrated into an EMIS and could provide information, among others, on the budget allocation required for the improvement of school infrastructure in a certain district or province. VISUS also provides information for asset management systems that monitor the operations and maintenance information of all the infrastructure assets in a country. These outcomes and systems allow ministries to easily identify infrastructure gaps and track the installation, use and maintenance of all school infrastructure in the country.

7.2 Regional school infrastructure programmes

7.2.1 School Infrastructure Regional Census

Developed by the Inter-American Development Bank, the School Infrastructure Regional Census (CIER) is a data collection instrument that facilitates school infrastructure management and capital planning. It is a software that organizes, quantifies and systematizes the inventory of educational establishments from surveys carried out by several countries in Latin America and the Caribbean. CIER allows an accurate assessment to be made of school infrastructure, which provides strategic information to guide the actions of management and develop better investment plans (Inter-American Development Bank, 2019).

VISUS outcomes could be incorporated in CIER and therefore improve the strategic information required to manage all elements related to school infrastructure in a country.

7.2.2 Model School Safety Programme for Caribbean Schools

Similarly, the Caribbean Disaster Emergency Management Agency has developed a toolkit accompanying their Model School Safety Programme for Caribbean Schools (CDEMA, 2019). Within the toolkit, there are two main assessment tools included in the Model; the Safety Assessment and the Green Assessment. The Safety As-

assessment contains a total of three checklists, seeking to gather information related to the schools' location, telephone number, email, demographics, construction, disaster and emergency training and disaster history. Also, the assessment is comprised of a series of questions built around international safety standards. Questions fall under the following categories: Disaster Planning; Emergency Planning; Safety Administration; Medical Emergencies; Physical Plant; Physical Safety; Protection of the Person and Hazardous Chemicals and Materials. At the same time, the assessment aims to collect information on the condition of school buildings and grounds that could potentially harm staff and students and which may make the school more vulnerable to hazards. The major categories of the Building Conditions Assessment include: Exterior Building Elements; Interior Building Elements; Mechanical Systems and Safety/Code Compliance. Specific details about the roof, ceiling, walls, windows, doors, lighting, means of exit and plumbing and

electrical are sought.

The Green Checklist assesses schools for the level of sustainability and environmental responsibility. The overarching green themes are: Sustainability Management; Natural Resources, Indoor Environment, Hazardous Chemicals and Materials, Facility and Grounds and Food Service.

At first glance, the assessment tools look very similar to the characterization phase of VISUS, notably in the data to be collected. This allows the complementarity with the VISUS methodology, as a part of the characterization part of the assessment tool. In this sense, the VISUS methodology could integrate the information collected in the check list of the toolkits to provide a more detailed diagnosis that will enable decision makers to develop actions for improving the safety of learning facilities.

7.3 VISUS post-disaster methodology

The VISUS post-disaster methodology is designed to help governments assess the safety of educational facilities in a quick, systematic manner following a disaster. As with the VISUS pre-disaster version of the methodology, VISUS post-disaster uses a technical triage approach to identify priorities for intervention and relies on expert judgement. It is, therefore, an ideal tool for use in the context of post-disaster needs assessments.

VISUS post-disaster provide decision-makers and the educational community with practical information that will allow them to make evidence-based decisions on the usability, need for stabilization -to prevent possible collapse-, and, reparability or not (and its technical convenience) of the assessed schools.

If an information system is already in place, and if it counts with the outcomes of the implementation of the VISUS methodology, the post disaster exercise would be implemented taking as basis this existing information. This, will make the exercise more efficient and faster, and will provide the post-disaster needs assessment with more precise data and estimations.

After a successful implementation of the VISUS post disaster method in Antigua and Barbuda during the aftermath of Hurricane Maria in 2017 (see the example provided in Box 2), UNESCO and SPRINT-Lab of the University of Udine (Italy) are working on the development of the multi-hazard VISUS post-disaster methodology guidelines.

Box 2 Implementation of the VISUS post disaster method in Antigua and Barbuda

Hurricane Irma, a tropical storm of historic intensity, had a devastating impact across the Caribbean islands. It was at peak intensity with near 300 km/h winds when it moved across Barbuda on 5-6 September 2017, destroying much of the island's infrastructure. As Antigua and Barbuda plans for recovery, its Ministry of Education, Science and Technology called UNESCO to support the post-disaster needs assessment aiming to inform the rebuilding process of educational and cultural infrastructure.

With regards to the education sector, both pupils and teachers from Barbuda have been temporarily transferred to schools in Antigua, where the infrastructure was less impacted by Irma. However, schools of both islands were inspected, to identify weaknesses and improve preparedness to face future natural hazards. The UNESCO Kingston Office, together with experts from the Italian Fire Corps, surveyed 51 school facilities in order to provide the information needed to ensure a swift recovery as well as better reconstruction phase. The locations surveyed included public educational institutions ranging from day-care, preschool, primary, secondary, vocational and tertiary level facilities.



School damages in Barbuda (Photo credits: SPRINT-Lab, 2017)

Overall, the damages in Barbuda, which was in the direct path of the hurricane, were severe for both educational and cultural infrastructure and assets. The city of Codrington in Barbuda was the most impacted. According to World Meteorological Organisation (WMO), future projections indicate that hurricanes will become more intense due to climate change and the history of past hurricane seasons in the Caribbean illustrates that Antigua and Barbuda remains likely exposed to risks associated to this frequent natural hazard; so it is imperative that such risks are taken into account when rebuilding infrastructures.

The VISUS methodology and tools were used for the assessment. The fact-finding mission was conducted quickly, over three days in October 2017. The team has been able to share conclusions and the analysis of the situation to the Government of Antigua and Barbuda. In the island of Antigua, the majority of the schools assessed were found to be safe or with physical vulnerabilities that are relatively easy to repair; and only two were flagged as unsafe. Instead of that in the island of Barbuda, schools were mainly unstable and unsafe.

8. THE WAY FORWARD

The VISUS methodology presented in these guidelines is envisioned to support policy- and decision-makers, providing them with the information necessary to implement safety upgrading actions. The methodology also facilitates the creation of a reliable inventory and database of school infrastructure that both considers exposure and vulnerabilities of the infrastructure to multiple hazards and informs EMIS and other systems developed to manage school infrastructure.

VISUS provides information for geographic information systems, such as locations of existing schools and their structural and non-structural characteristics, as well as hazard data, and this information is important for monitoring and reporting on the progress of local and national school infrastructure programmes over time. The methodology also helps in calculating the amount of, identifying the sources of and securing funding for effectively implementing a policy for safe school infrastructure.

The VISUS outcomes serve as baseline information for

further stages of design, implementation and monitoring of specific school safety infrastructure programmes.

One of the most important findings of the seven VISUS pilot projects (El Salvador, Haiti, Indonesia, Italy, Lao PDR, Mozambique and Peru) that have been implemented since 2010 is the recognition that regardless of the context, the capacity for implementing national assessments and obtaining information on exposure and physical vulnerability of schools is available in every country. Universities, technical and vocational education and training schools, professional associations and other stakeholders in every country can support the implementation of national programmes of action for improving the safety of schoolchildren and educational staff. To take advantage of existing capacity, further national and local coordination is required.

UNESCO foresees building and strengthening the capacity of countries to implement the VISUS methodology in its 193 Members States and 11 Associate Members through a five-year international programme.

8.1 VISUS international programme for assessing learning facilities: implementation

The key phases of implementation of an international programme for assessing learning facilities are as follows:

1. **Adaptation of the VISUS methodology** and its materials and tools (e.g. training materials, mobile apps) to the national context (e.g. hazard profiles, building typologies, local costs of construction). This phase includes:
 - Selection of national reference institutions (e.g. national and/or local universities)
 - Creation of a VISUS local committee of experts that comprises representatives of the ministries of education, public works and the environment, the national disaster management authority, national and local universities, and other disaster risk management stakeholders
2. **Organization of training sessions** aimed at building and strengthening local and national capacities for assessing learning facilities. Three different types of training are required as described in Volume 3, section 2.3
 - Training of decision-makers
 - Training of trainers
 - Training of surveyors
3. **Planning and development of assessment in the field**, which will be performed by surveyors using a mobile application for data collection in tablets
4. **Reporting on the assessment** on the basis of the information collected by the surveyors; during this phase, a collective report for the country and an individual report for each school are automatically created
5. **Provision of support for planning interventions** following four core principles expressed in section 6.5: 1) resilient construction; 2) sustainability; 3) learning spaces that maximize quality education; and, 4) linkage between the development of the local community and the school

The expected results from the implementation of the VISUS international programme for assessing learning facilities are presented in Table 8.1.

Table 8.1 *Expected results from the implementation of the VISUS international programme for assessing learning facilities*

21,581	Learning facilities to be assessed (prioritizing those belonging to the Associated Schools Network (ASPnet) and those located in UNESCO's Biosphere Reserves, Global Geoparks and World Heritage Sites)
416	National and local universities and vocational institutes to be involved
10x2	Regional trainings for decision-makers to be held
20	Regional technical trainings for trainers to be held
416	National trainings of surveyors to be held
193	UNESCO Member States involved (plus the 11 Associated Members of UNESCO)

8.2 VISUS international programme for assessing learning facilities: execution

This VISUS international programme for assessing learning facilities will be planned and implemented by UNESCO field offices, the section on Earth Sciences and Geohazard Risk Reduction, the section on ICTs in education, science and culture, the section on Education for Sustainable Development, and the Desk for Education in Emergencies. Scientific support is provided by the UNESCO Chair at the University of Udine, Italy, and the relevant scientific institutions in each country. Implementation will be done in close collaboration with national partners, particularly the ministries of education, the ministries of finance, the ministries of public works, national disaster management authorities, and national and local academic institutions.

9.

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**VOLUME 1 - Introduction to learning facilities assessment and
to the VISUS methodology**

VOLUME 2 - VISUS Methodology

VOLUME 3 - VISUS Implementation

