



EARTHQUAKE

FOREST FIRE

PANDEMIA COVID-19

TSUNAMI

*Responding to
Natural Disasters &
Emergencies:*
**Proposed
Inclusive Design
Guidelines**
for Architecture
and Urban Planning

*ARCHITECTURE FOR ALL
WORK PROGRAMME,
AFA WP*

**International
Union of Architects**

UIA World Congress,
July 2021, Rio de Janeiro

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DEDICATED TO:

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ABSTRACT

In the past year several natural disasters and emergencies have had a profound impact on our everyday life: one salient example is the global coronavirus pandemic.

However, the degree to which these situations impact our lives depend on the choices that we, as architects, make on the urbanism of our cities and the design of our buildings. With this document, we undertake two goals.

First, we review the potential responses from the point of view of inclusive Architecture and Urban Design perspective.

Second, we propose concrete inclusive guidelines that will serve the practitioner with solutions to the problems that arise in our everyday work.

PRESENTATION

Thomas Vonier FAIA RIBA
UIA President (2017-2021)

Designing for those least able to cope with disaster

Disasters can and do strike in every part of the world, in many different guises: volcanoes, earthquakes, tsunamis, hurricanes and other extreme weather events, vast wildfires, massive mudslides, industrial accidents, and now –yet again– in the form of a pandemic health crisis.

Architects have long made efforts to identify steps to mitigate disasters, reduce their impacts, or cope with them. Not adequately addressed: the inordinate toll disasters take on those who are least equipped to handle them, in terms of their physical, mental, and sensory abilities, and in terms of socioeconomic and environmental circumstances that may place them at greater disadvantage.

In this work of remarkable breadth –with examples from Canada, Libya, Spain, Italy, the Netherlands, Chile, and other places– the authors explore how better to protect persons with disabilities and populations that are especially vulnerable.

Through personal accounts, often citing documented research, the authors examine codes, protocols, design measures, and best practices in disaster relief that can help to improve the capacity of persons with disabilities to attend to their own well-being during disaster, until aid arrives.

This report exemplifies how the UIA international working bodies –in this instance, the *UIA Architecture for All* work programme– can make significant contributions, not just to the understanding of issues, but to the very steps architects can take to address them. Please let me sound a note of gratitude and congratulations to all concerned.

FIRST SECTION **INTRODUCTION** ————— 6

SECOND SECTION **CASE STUDIES** ————— 10

- **DISASTERS Versus the Disabled and the Built Environment.**
Case Study of Hong Kong / Tony S. F. Wong, Hong Kong ————— 11
- **Area of Rescue Assistance application.**
Case Study of Libya / Ahmed El Rida, Libya ————— 20
- **National Council of Architects, Planners, Landscapers and Conservationists.**
Case Study of Italy / Lilia Cannarella, Italy ————— 27
- **Natural Disasters and Emergencies in Chile actions in urbanism and architecture for people with disabilities.**
Case Study of Chile / Cecilia Leiva Muñoz; Kristine France Zúñiga; Ivonne Mella Vidal; Katia Jadue Lillo; Consuelo Ripollès (Collaborator), Chile ————— 32
- **On Thin Ice.**
Case Study of Canada / Marnie Peters, Canada ————— 53
- **Accessible emergency evacuation of people with disabilities and/or reduced mobility in sports competitions: Barcelona Olympic Pools.**
Case Study of Barcelona / Enrique Rovira-Beleta Cuyás Architect specialized in accessibility, Spain ————— 61
- **Sharing on Temporary Quarantine and related Facilities in Hong Kong.**
Case Study of Hong Kong / Architectural Services Department, HKSARG, Hong Kong ————— 72

THIRD SECTION **INCLUSIVE DESIGN GUIDELINES** Tony S. F. Wong, Hong Kong ————— 81

FOURTH SECTION **CONCLUSIONS** Eduardo Elkouss, Argentina - Spain ————— 97

FIFTH SECTION **BIBLIOGRAPHY / REFERENCES** ————— 101

FIRST SECTION

INTRODUCTION

“Education in all its forms, and for all the varied components of the societies of the world, is the bedrock on which civilizations are built.”

*Educational Architecture without Exclusions.
A Journey with the Architects of the World (2017).
Vassilis Sgoutas, Former President, UIA.*

Some preliminary considerations.

Title. This title has been conceived as a product of the consensus of two architects, Eduardo Elkouss and Cecilia Leiva Muñoz, whose extensive professional activities have developed independently, and in different areas. But curiously, we all converge on the principles of our Work Program "Architecture for All" of the UIA. The two of us have shared and co-attended congresses, biennials and symposiums events. This has been the product of information exchange that has been enriched by our own personal experiences.

01.- Description of the purpose.

This proposal focuses on three major subjects, I.-Natural Disasters, II.-Inclusive Design Guidelines, and III.-Architecture and Urban Planning, within the city and its natural urban surroundings such as buildings, streets, boulevards, walks, avenues, parks and plazas, and it has been conducted from an architecture and urban design point of view. With the objective of understanding such complex interrelation as a whole, we have also attempted to unify the innovative efforts provided by works from Architecture, and means of Transportation or Communications during recent decades. Other valuable contributions considered for this study come from various disciplines such as Sociology, Psychiatry, Pedagogy, Psychology, Education, Law or Anthropology.

02.- The structure.

This work is compiled in well-differentiated phases:

- a) A section devoted to the Introduction and the theoretical framework.
- b) A practical section in which several practical Case Studies are developed investigating recent natural disasters and emergencies. Case Studies summary: Hong Kong, Chile, Italy, Canada, Libya and Spain.
- c) The Inclusive Guidelines and Overall.
- d) Conclusions.
- e) Bibliography / References.

03.- Personal experiences.

As to our personal experiences on this subject, during the course of our life, working in both the public and the private sector, as local architects or free-lancers, we have found the problem of insufficient publications on the subject: Disaster Risk Reduction for the most vulnerable people, with little published research, press or internet articles from an Architecture for All perspective.

We have also visited many cities that are located in the following countries: Brazil, Chile, Hong Kong, Japan, Mexico, Spain, South Africa, South Korea, Tunisia or North America, among others.

04.- Statement.

The capacity for spreading knowledge that a World Congress of Architects offers, in our case the next one that will take place in the City of Rio de Janeiro in July 2021, in person or only telematically, is highly relevant and we should use it up. Also, there are people who have been involuntarily cast out from social mainstreams when massive earthquakes or floods take place. Now it's time to establish new guidelines in our architecture, public spaces and cities in favour of citizens when facing severe problems that have been caused by natural disasters.

Hence, all professionals involved in this matter, such as architects, should feel obliged to take measures that are intended to help citizens, particularly children, the elderly, people with reduced mobility, the visually-impaired, those with special needs, etc. So the new architecture should contemplate the needs of the 20% of the world population that until now has been regularly left out of standard rights.

05.- The demand.

Our societies today demand that the inclusive design of public spaces, buildings, and their cities in general, can adapt to emergency problems through comprehensive solutions, leading to the fact that architects, urban planners, industrial designers, interior designers, landscape architects, and other design specialists get to know how to anticipate, for example when a fire, a flood or an earthquake occurs. This implies that general guidelines are needed to adopt a design for all for mental, physical and sensorial disability. While as a result of this situation, today our level of consciousness affects us all, without distinguishing race, colour, religion or sex.

06.- World Congress.

In the World Congress in Rio de Janeiro, thousands of students are expected to attend, which can be a great opportunity to spread out the guidelines on this matter so they can learn and transmit this knowledge. Also, a Congress is part of continuous training, relevant to an architect's career, so it should be used as part of their updating or training courses. Being updated implies giving benefits back to the improvement of quality of life, and relying on the capacity to foresee natural disasters. It is worth noting that a congress should educate both architects, designers and students in general because education is the indispensable pillar of any society.

07.- The criteria.

Some objective criteria that should be taken into account when implementing an inclusive design are: structural study (with the incorporation of seismic indexes), evacuation pathways, shelter, regular revision of safety measures, simulations, technical training of personnel and specific equipment before an emergency, then specific disaster risk reduction plans for different types of risks and for each geographical area. These should be regarded not as an option, but as an obligation. The experience applied to the subject from architecture in different countries has been incorporated into this work, based on successful case studies facilitated from the different regions of the UIA.

08.- Covid-19 virus.

If we refer to a pandemic such as the one that concerns us today, it should be noted that it affects us in a massive way, although its impact is not the same for everyone. Which depends on the general conditions of the place. And it varies depending on the physical, mental, intellectual or sensory circumstances of each individual, in addition to the socio-sanitary characteristics of each environment, which are variable. All of this forces us to rethink governance mechanisms and to study and analyse multiple experiences, based on exemplary case studies that we may have references for each situation. This recent problem is currently experiencing massive transformation. The great difference that we see in this emergency is that it affects the world population, unlike others such as an earthquake that focuses on a specific area of our geography.

09.- Factors.

Factors such as the poor or even non-existent quality of the habitat, the possible climatic severity, the medical-sanitary services, other basic services such as water, electricity, sanitation, the availability of fuel or the possibility of transport, on the one hand; and on the other hand, social marginalization, the poverty rate, hunger, alcoholism or drug dependence, make us reflect on the numerous social and cultural barriers that continue to be demolished. And if in particular we add those developing countries or those with low or minimal levels of income, with very low economic indices, the risk of disaster is out of control, especially for groups of people with disabilities.

SECOND SECTION

CASE STUDIES

“Urban design and architecture are keys to a better quality of life for everyone.”

*World Architecture Day 2020, Monday, 5 October 2020
Thomas Vonier, President, UIA*

DISASTERS Versus the Disabled and the Built Environment

As presented to the AfA Meeting on 12 October 2020
Ar. Tony S.F. Wong, FHKIA, Director of ARCASIA Emergency Architects Ltd.
Hong Kong

ABSTRACT

Disaster events occur when the resources needed due to an unexpected impact exceed the capacity of a community or society to respond to that impact. Individuals with disabilities are placed at disproportionate risk in disaster situations, particularly with significant variations in the type and severity of disabilities. It is the vulnerable population we need to focus on. The situation is exacerbated by Urbanization and Climate Change. When disasters hit, multiple aspects of the society are impacted, and good coordination among all of them is challenging but critical to success.

The issue must be tackled holistically with an Emergency Management Process, with 2 stages and 4 phases. Contingency Planning Stage (Mitigation and Preparedness) and Emergency Response Stage (Response and Recover). They represent a Disaster Risk Reduction approach.

The article will further inspect the development of international cooperation on DRR led by UN, and will cover the International Decade for Natural Disaster Reduction (IDNDR), The Yokohama Strategy, United Nation Disaster Risk Reduction Office (UNDRR) the Hyogo Framework, and will go into more details on the Sendai Framework for Disaster Risk Reduction 2015-2030 and how it is linked to UN's Sustainability Development Goals (SDGs).

INTRODUCTION

Mankind has been facing numerous unpredictable adverse challenges throughout history. Earthquakes, Flood, Fire, Pandemic...etc. to name a few obvious ones. While we have developed certain capability to mitigate against these situations, they often come in so quickly and in such a scale that either we do not have time to respond to them, or we do not have capacity to handle them. **Disaster events occur when the resources needed due to an unexpected impact exceed the capacity of a community or society to respond to that impact** (World Health Organization, 2008).

The current status of our society is an equilibrium of various reaction to the internal and external environment, including some high occurrence natural disasters and emergencies. With limited resources, the built environment evolved to cater for the "normal" conditions, for the "majority" people, and for "anticipated" risks. This places individuals with disabilities at **disproportionate risk** in disaster situations, especially with less understood risks such as COVID19.

CHALLENGES OF DISASTERS AND THE DISABLED

While we have been improving our ability to handle such challenges, the situation is exacerbated by **Urbanization and Climate Change**. The former concentrates our population in particular locations, while the latter increases the frequency, magnitude as well as unpredictability of disasters.

Since the 1960s, the annual incidence of disasters 'delivered' via natural systems (e.g. floods, tsunamis, wildfires, earthquakes) has quadrupled to more than 400 events and 200,000 affected people per year in the early 2010s (International Disaster Database 2011).

A number of risk factors may combine to result in vulnerable settlements: agglomeration of population and assets, social inequalities, informal occupation of vulnerable areas, increased exposure to biological, chemical and physical hazards, and local climate phenomena such as 'heat island' effects (Alexander 1993; Pelling 2003; Twigg 2004; Wamsler 2014).

When disasters hit, **multiple aspects of the society are impacted**. For example, each disaster will not only create immediate damages, it will also disrupt essential supplies such as food and medicine which will create more tragedies. To mitigate it requires the cooperation of multiple authorities, with good coordination among all of them to manage the situation effectively.

The situation is even more complicated with respect to Disabled people, as **significant variations in the type and severity of disabilities** is already severely compromising their everyday experience, and this will be tragic with respect to their experience of disaster.

THE EMERGENCY MANAGEMENT PROCESS

There is a large body of knowledge behind responding to Natural Disaster and Emergencies. Over the years, it has developed from a reactive approach of defense and relief, to a proactive approach of pre-disaster and post-disaster actions. There are many theories of the process, but more or less similar along this line.

The attached figure is a summary I put together as a simple representation of the process (fig.1). There are 4 phases. Other models would indicate 6 or more phases as some phases can be further split. For example, Risk Assessment and Strategy Development could be 2 stages. The 2 Green stages, namely **Mitigation** and **Preparedness** are before disaster, and can be called **Contingency Planning**. Whereas the two Red stages, namely **Response** and **Recover**, are during and after disaster, and can be called **Emergency Response**. All in all, they represent a **Disaster Risk Reduction** approach.

EMERGENCY MANAGEMENT PROCESS

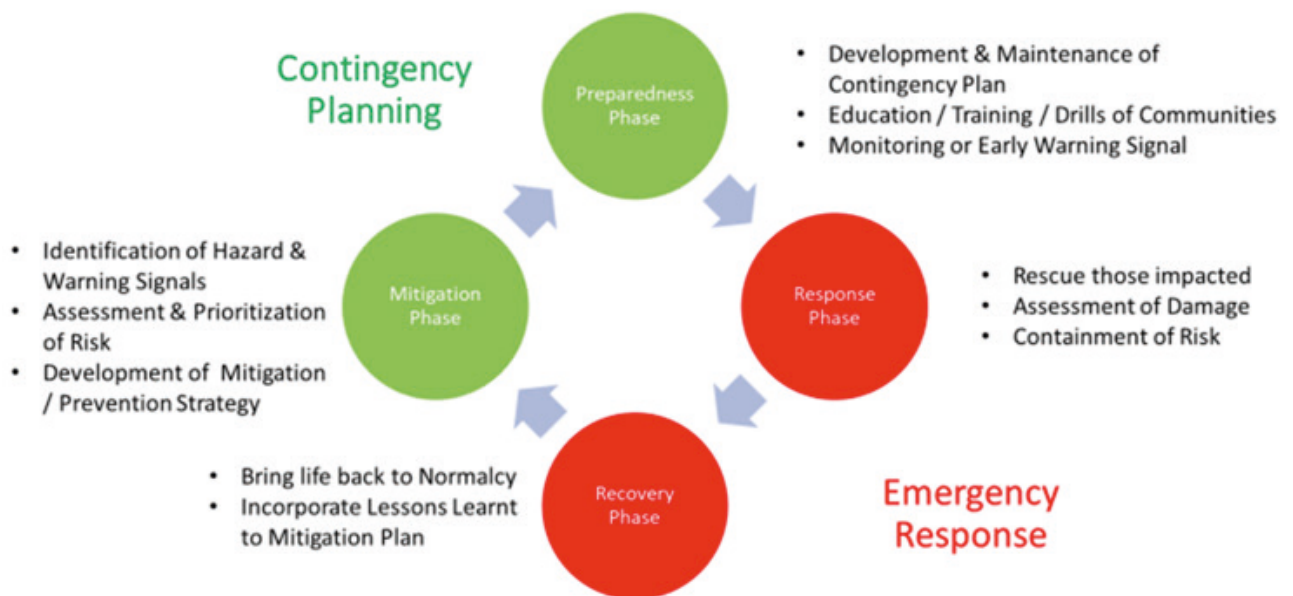


Figure 1. Emergency Management Process

Unfortunately, such processes are not widely known and understood by the general public, let alone practiced or drilled. Even for sophisticated organization or government, they are applied only to risk that we can commonly associated with, or the higher probability. This compromises our ability to deal with those which come beyond our anticipation, such as COVID19. The impact could be catastrophic should they happen.

Also notable is that as part of the risk assessment process, a key part is on identifying “vulnerability”. This will highlight those in our population whom are most likely to be impacted. Naturally, Disabled people, or those whom have less ability to deal with disaster, are the ones we should pay the most attention.

DISASTER VERSUS THE VULNERABLE “MINORITY”

Traditional and general public view disable as associating with people of physical disability – loss of Mobility, Vision, or Audibility. But recently this has been expanded to those with mental and intellectual disability, as well as elderly. Even so, these are still the minority with the larger population. However, in applying the concept of Vulnerability, this immediately put a much larger population, which now includes Elderly, Children, the Poor, and in certain countries Women. They are indeed not the “Minority” at all.

It is established that disability disproportionately affects vulnerable populations. The impact is higher among women, the elderly, and those living in poverty, and occurs at higher rates in poorer nations (World Health Organization and World Bank, 2011).

Disasters also disproportionately affect vulnerable populations. They are more likely to be adversely affected by disasters than others (Norris et al., 2002; Peek & Stough, 2010; Thomas, Phillips, Lovekamp, & Fothergill, 2013).

UNITED NATION DISASTER RISK REDUCTION (UNDRR)

Given the increasing concern about the impact of disasters, the UN General Assembly declared 1990-1999 the **International Decade for Natural Disaster Reduction (IDNDR)**. Initially, IDNDR was influenced largely by scientific and technical interest groups. However, the broader global awareness of the social and economic consequences of disasters caused by natural hazards developed as the decade progressed.

In the World Conference on Natural Disaster Reduction in 1994, **The Yokohama Strategy** for a Safer World: Guidelines for Natural Disaster Prevention, Preparedness and Mitigation and its Plan of Action was adopted. The 10 principles of the Strategy are included in Appendix 1.

In 1999, the **United Nation Disaster Risk Reduction Office** was established (initially called UN International Strategy for Disaster Reduction – UNISDR). The International Strategy for Disaster Reduction (ISDR) was launched by the Economic and Social Council and endorsed by the General Assembly as an international framework for responding to the challenge presented to the international community by the increasing incidence and scale of disasters. UNISDR was created as an inter-agency secretariat of ISDR together with the Inter-Agency Task Force on Disaster Reduction. The UNISDR mandate was then expanded to serve as a focal point within the United Nations System for the coordination of disaster reduction and to ensure synergies among the disaster reduction activities of the UN system and regional organizations and activities in socio-economic and humanitarian fields. Further mandates are to promote public awareness and commitment, to expand networks and partnerships, and to improve knowledge of disaster causes and options for risk reduction, building on the Yokohama Strategy and Plan of Action and as follow-up to the International Decade for Natural Disaster Reduction. It was renamed to UN Disaster Risk Reduction Office (UNDRR) in 2019.

In The Second World Conference on Disaster Reduction held in Kobe, Hyogo, Japan in 2005, the **“Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters”** was adopted. This served as the guiding document in strengthening and building international cooperation to ensure that disaster risk reduction is used as a foundation for sound national and international development agendas. The 5 priorities are listed in Appendix 2.

In the Third United Nations World Conference on Disaster Risk Reduction held in 2015, the **Sendai Framework for Disaster Risk Reduction 2015-2030** was adopted as the first major agreement of the Post-2015 Development Agenda, with seven global targets and four priorities for action.

The Sendai Framework was dove-tailed with 2030 Agenda for Sustainable Development – the **Sustainability Development Goals (SDGs)**. Relevant SDG Goals are: SDG#9 Building Resilient Infrastructure, SDG#11 Sustainable Cities and Communities, and SDG13 Climate Change.

SENDAI FRAMEWORK 2015-2030

The Sendai Framework for Disaster Risk Reduction 2015-2030 is the successor instrument to the Hyogo Framework for Action (HFA) 2005-2015. And the HFA was conceived to give further impetus to the global work under the International Framework for Action for the International Decade for Natural Disaster Reduction of 1989, and the Yokohama Strategy for a Safer World 1994, and various initiatives in between.

It is a 15-year non-binding agreement which recognizes that the State has the primary role to reduce disaster risk but that responsibility should be shared with other stakeholders including local government, the private sector and other stakeholders. It aims for the following outcome: "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."

The Framework has 7 Targets, 4 Priorities, and 13 Action Items. Details are shown in the chart in Appendix 3.

Out of the 7 Targets of Substantial Increase and Reductions (figure 2), 2 are related to the Vulnerable Populations:

Reduce global disaster mortality.

Enhance international cooperation to developing countries.

Out of the 4 Priorities, there are also 2 which are relevant to the Vulnerable Populations.

Priority 1: Understanding disaster risk. "...understanding of disaster risk in all its dimensions of vulnerability, capacity, exposure of persons and..."

Priority 4: Enhancing disaster preparedness for effective response, and to «Build Back Better» in recovery, rehabilitation and reconstruction. "...prepared ahead of the disaster, is an opportunity to «Build Back Better» through integrating disaster risk reduction measures. Women and persons with disabilities should publicly lead and promote gender-equitable and universally accessible approaches during the response and reconstruction phases."



Figure 2. Seven Targets of the Sendai Framework

SUMMING UP

As a summary, the nature of Disaster and Challenges to Universal Design both relate to people and situation “out of norm”. But disasters disproportionately affect the Disabled and in considering vulnerability, they should deserve more investment and attention. However, given the lower chances of occurrences and the substantial investment and attention required, they are often not prioritised. It can only receive its due consideration if the value of human life, in particular those of the disadvantaged, are improved.

There is a full body of knowledge behind Emergency Management, but it is not well known or practiced by the general population. A better education to the general population is needed.

United Nation has a long-term global program dealing with DRR, and some of the principles will benefit the improvement of the inclusivity when dealing with Disaster.

Appendix 1. Yokohama Strategy for a Safer World 1994

The ten Principles of Yokohama Strategy for a Safer World 1994 are:

1. Risk assessment is a required step for the adoption of adequate and successful disaster reduction policies and measures.
2. Disaster prevention and preparedness are of primary importance in reducing the need for disaster relief.
3. Disaster prevention and preparedness should be considered integral aspects of development policy and planning at national, regional, bilateral, multilateral and international levels.
4. The development and strengthening of capacities to prevent, reduce and mitigate disasters is a top priority area to be addressed during the Decade so as to provide a strong basis for follow-up activities to the Decade.
5. Early warnings of impending disasters and their effective dissemination using telecommunications, including broadcast services, are key factors to successful disaster prevention and preparedness.
6. Preventive measures are most effective when they involve participation at all levels, from the local community through the national government to the regional and international level.
7. Vulnerability can be reduced by the application of proper design and patterns of development focused on target groups, by appropriate education and training of the whole community.
8. The international community accepts the need to share the necessary technology to prevent, reduce and mitigate disaster; this should be made freely available and in a timely manner as an integral part of technical cooperation.
9. Environmental protection as a component of sustainable development consistent with poverty alleviation is imperative in the prevention and mitigation of natural disasters.
10. Each country bears the primary responsibility for protecting its people, infrastructure, and other national assets from the impact of natural disasters. The international community should demonstrate strong political determination required to mobilize adequate and make efficient use of existing resources, including financial, scientific and technological means, in the field of natural disaster reduction, bearing in mind the needs of the developing countries, particularly the least developed countries.

Appendix 2. Hyogo Framework for Action

The Hyogo Framework for Action (HFA), which ran from 2005 to 2015, set five specific priorities for action:

1. Making disaster risk reduction a priority;
2. Improving risk information and early warning;
3. Building a culture of safety and resilience;
4. Reducing the risks in key sectors;
5. Strengthening preparedness for response.

Appendix 3. The Sendai Framework for Disaster Risk Reduction 2015-2030

SCOPE AND PURPOSE

The present framework will apply to the risk of small-scale and large-scale, frequent and infrequent, sudden and slow-onset disasters, caused by natural or manmade hazards as well as related environmental, technological and biological hazards and risks. It aims to guide the multi-hazard management of disaster risk in development at all levels as well as within and across all sectors.

EXPECTED OUTCOME

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.

GOAL

Prevent new and reduce existing disaster risk through the implementation of integrated and inclusive economic, structural, legal, social, health, cultural, educational, environmental, technological, political and institutional measures that prevent and reduce hazard exposure and vulnerability to disaster, increase preparedness for response and recovery, and thus strengthen resilience.

TARGETS

- Substantially reduce global disaster mortality by 2030, aiming to lower average per 100.000 global mortality between 2020 – 2030 compared to 2005 – 2015.
- Substantially reduce the number of affected people globally by 2030, aiming to lower the average global figure per 100.000 between 2020 – 2030 compared to 2005 – 2015.
- Reduce direct disaster economic loss in relation to global gross domestic product (GDP) by 2030.
- 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.
- Substantially increase the number of countries with national and local disaster risk reduction strategies by 2020.

- Substantially enhance international cooperation to developing countries through adequate and sustainable support to complement their national actions for implementation of this framework by 2030.
- Substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to people by 2030.

PRIORITIES FOR ACTION

There is a need for focused action within and across sectors by States at local, national, regional and global levels in the following four priority areas.

- **Priority 1 - Understanding disaster risk.**
Disaster risk management needs to 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.
- **Priority 2 - Strengthening disaster risk governance to manage disaster risk.**
Disaster risk governance at the national, regional and global levels is vital to the management of disaster risk reduction in all sectors and ensuring the coherence of national and local frameworks of laws, regulations and public policies that, by defining roles and responsibilities, guide, encourage and incentivize the public and private sectors to take action and address disaster risk.
- **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.
These can be drivers of innovation, growth and job creation. Such measures are cost-effective and instrumental to save lives, prevent and reduce losses and ensure effective recovery and rehabilitation.
- **Priority 4 - Enhancing disaster preparedness for effective response, and to “Build Back Better” in recovery, rehabilitation and reconstruction.**
Experience indicates that disaster preparedness needs to be strengthened for more effective response and ensure capacities are in place for effective recovery. Disasters have also demonstrated that the recovery, rehabilitation and reconstruction phase, which needs to be prepared ahead of the disaster, is an opportunity to “Build Back Better” through integrating disaster risk reduction measures. Women and persons with disabilities should publicly lead and promote gender-equitable and universally accessible approaches during the response and reconstruction phases.

GUIDING PRINCIPLES

- Primary responsibility of States to prevent and reduce disaster risk, including through cooperation.
- Shared responsibility between central Government and national authorities, sectors and stakeholders as appropriate to national circumstances.
- Protection of persons and their assets while promoting and protecting all human rights including the right to development.
- Engagement from all of society.

- Full engagement of all State institutions of an executive and legislative nature at national and local levels.
- Empowerment of local authorities and communities through resources, incentives and decision-making responsibilities as appropriate.
- Decision-making to be inclusive and risk-informed while using a multi-hazard approach.
- Coherence of disaster risk reduction and sustainable development policies, plans, practices and mechanisms, across different sectors.
- Accounting of local and specific characteristics of disaster risk when determining measures to reduce risk.
- Addressing underlying risk factors cost-effectively through investment versus relying primarily on post-disaster response and recovery.
- “Build Back Better” for preventing the creation of, and reducing existing, disaster risk.
- The quality of global partnership and international cooperation to be effective, meaningful and strong.
- Support from developed countries and partners to developing countries to be tailored according to needs and priorities as identified by them.

Area of Rescue Assistance Application Case Study of Libya

Ahmed El Rida, Architect & urban planner (Accessibility Consultant)

Architects and Building designers worldwide are not sufficiently aware of what must be done to make buildings accessible. And the understanding of design approaches is very general. My country, Libya, is not an exception to this.

Enabling people with disabilities to enter and use buildings is not sufficiently understood in our region, let alone thinking about how to evacuate people with disabilities.

In 2016, I launched my training program, Universal Design of Built Environment "Design for All" (UDBE-DFA). The core of this training is to go through the main building elements, and to rethink the traditional design of these elements according to the Universal Accessibility point view. Thus, we address the design of the internal stairs, which are often the escape stairs at the same time.

Within the course material I use to carry on analyses of the vertical and horizontal circulation of the building, stairs are one of the main issues. In stair design, there are important points in which accessibility standards are not properly applied; among them, we can highlight the absence of handrails in the stairs or an existing but inadequate design.

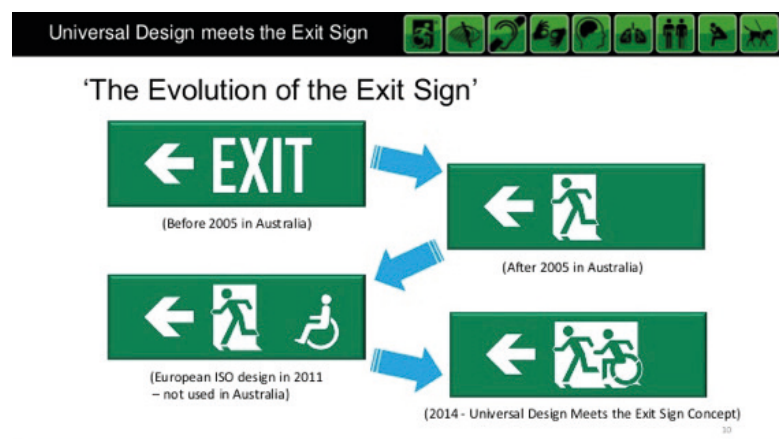
In order to address the design of accessible stairs, I use the standard ISO21542-2011, which includes the following guidelines:

- The rise and tread of the steps within flights shall be uniform. For the purpose of safe assisted fire evacuation, the rise of a step should not have a height greater than 150 mm, and its going should be not less than 300 mm. The minimum going of the tread shall be 260 mm, and the maximum rise shall be 180 mm. Due to safety reasons and anthropometric differences, it may be recommended to increase the minimum depth of the going.
- Spiral and curved stairs are not recommended.
- There needs to be sufficient space for an evacuation chair to travel downstairs while providing space to accommodate contraflow, i.e., emergency access by firefighters and rescue teams, and the people are still evacuating from the building. The clear unobstructed width, exclusive of handrails and any other projections, e.g., portable fire extinguishers, notice boards, etc., of the flight of single or multi-channelled stairs should be not less than 1,500 mm. The surface width of a flight of stairs should not be less than 1,700 mm.
- Handrails provide a means of support, stability and guidance for the user, so they will help most people to go up or down a flight of steps or a ramp. During an evacuation, their importance is greater because they become helpful for all building users.
- Profile of a handrail.
- Continuity of a handrail.
- The horizontal extension of a handrail shall be of not less than 300 mm beyond the first and last nosing of each flight.

Due to the training also including accessibility standards, I address many international standards, but the focus always remains on ISO 21542-2011 (Building construction — Accessibility and usability of the built environment).

The introduction of the already-mentioned standard reads: “The purpose of this International Standard is to define how the built environment should be designed, constructed and managed to enable people to approach, enter, use, egress from and evacuate a building independently, in an equitable and dignified manner and to the greatest extent possible”. From this quote, I would like to highlight the word evacuate because it raises the question of how people with disabilities will leave the building if they are on the upper floors in a state of fire, for example.

When this question is asked to architects, they are alert and curious about the solution, which seems difficult or impossible. I usually start by show this diagram from Australia:



I use it as a way to inspire the designer to think in a contemporary way, giving them the impression that many things have changed and evolved. At the same time, I relate the latter form (2014 – Universal Design Meet the Sign Concept) to the first principle of comprehensive design, Equitable use. Based on that, we reach the idea of Area of Rescue Assistance. The first shape I show up regarding it is the drawing from ISO21542-2011.

The first application for an Area of Rescue Assistance in Libya is a complex of buildings that the National Oil Corporation (NOC) intends to build in Benghazi in the future. The task of implementing its design was assigned to the Italian company ARTELIA, which has a subcontractor in architectural design BOERI.

The Oil Corporation has appointed 8 Engineers of its staff to supervise the design stages. This team hired three consultants from outside the Corporation:

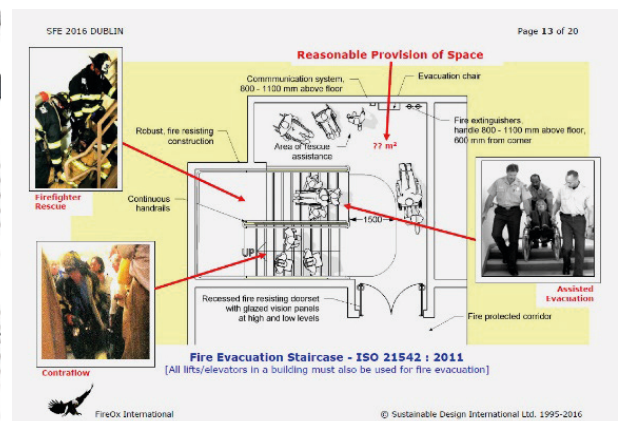
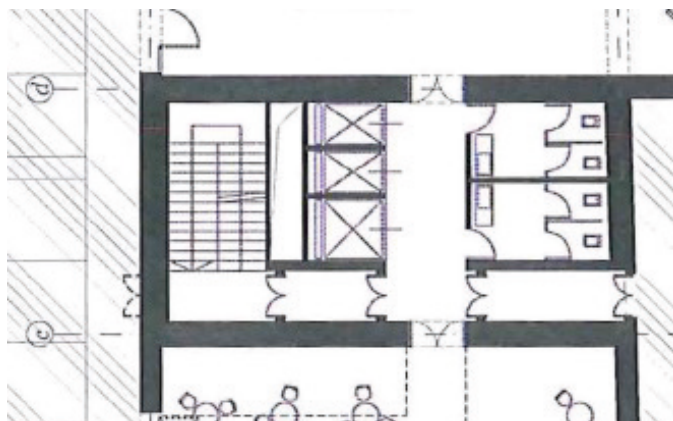
1. Aziza Safur, the head of the Architecture department at the University of Benghazi, whose role is to help with architectural issues in the project.
2. Younis M. Obeidi, a civil engineering consultant in manmade river. He has to supervise the civil engineering and structural issues.
3. Ahmed El-Rida, as an accessibility consultant.

So, the total number of the supervision team is of eleven people, and their task is to receive the designs for each stage, annotate them if necessary, and return them to the designer or approve them.

Because the National Oil Corporation pays special attention to safety issues, this was an important factor for the acceptance of modifying the original design and adding Area of Rescue Assistance.

In *The Universal Accessibility Review, Report No 2*, I included the following: “Building Accessibility today must include **Fire Safety for All**. Safe evacuation during a fire incident must include people with disabilities (PWD), people with reduce mobility (PRM), elderly people, pregnant women...etc., all of these need help when using stairs”.

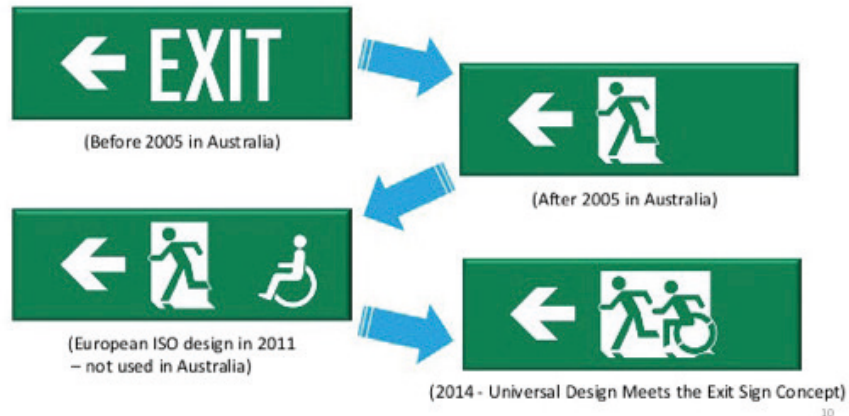
Beside the previous paragraph I also attached the following drawings:



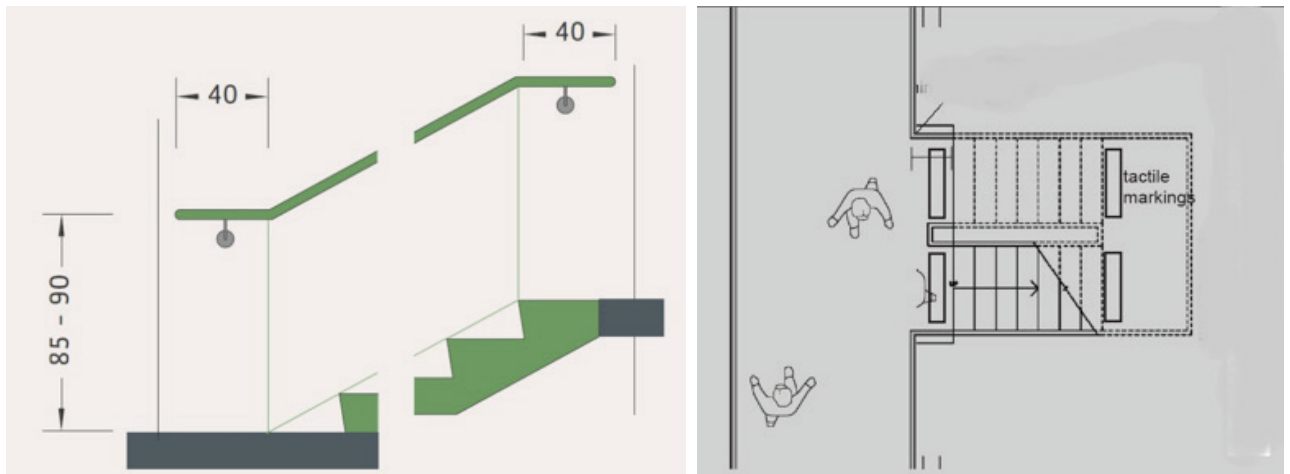
The drawing in the left side is the original design proposed, while the one in the right is the illustrated design by Sustainable Design International Ltd., which is used in the ISO21542-2011.

My report also includes that in the areas of rescue assistance, it is essential to keep fire evacuation routes free. In the last 15 years, there was a rapid development in the consideration and application of fire safety for all. The stairway design is the cornerstone to develop the best practices. The evolution of the exit sign diagram clearly shows this quick development.

'The Evolution of the Exit Sign'



The ends of the handrails must be continued at least 30 cm above the step edge when entering and leaving, something we can see in the following drawing.



After Report No. A, the maps were updated without regard to the areas of rescue assistance. Therefore, the observation was repeated again in Report No. 3. However, safety for all has not been considered yet, so here are no areas of rescue assistance.

Accessibility includes ease of independent approach, entry, evacuation, something that can be seen in the following examples:

EXAMPLE 1: FORM INTERNATIONAL STANDARDS ISO 21542

“building space directly adjoining, and visible from, a main vertical evacuation route, robustly and reliably protected from heat, smoke and flame during and after a fire, where people can temporarily wait with confidence for further information, instructions, and/or rescue assistance, without obstructing or interfering with the evacuation travel of other building users”.

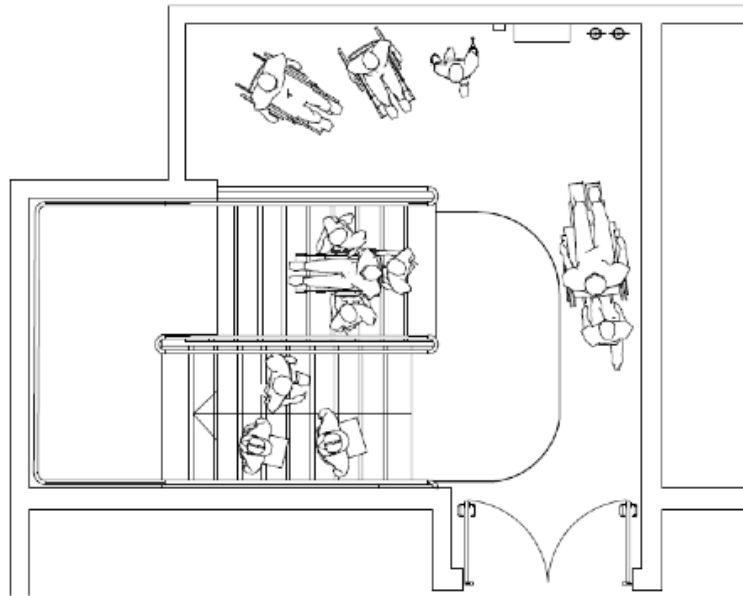
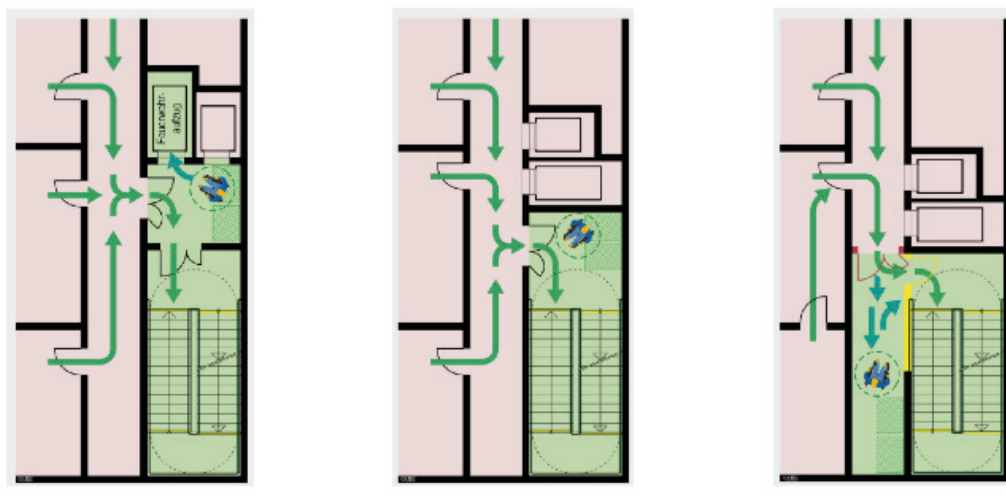


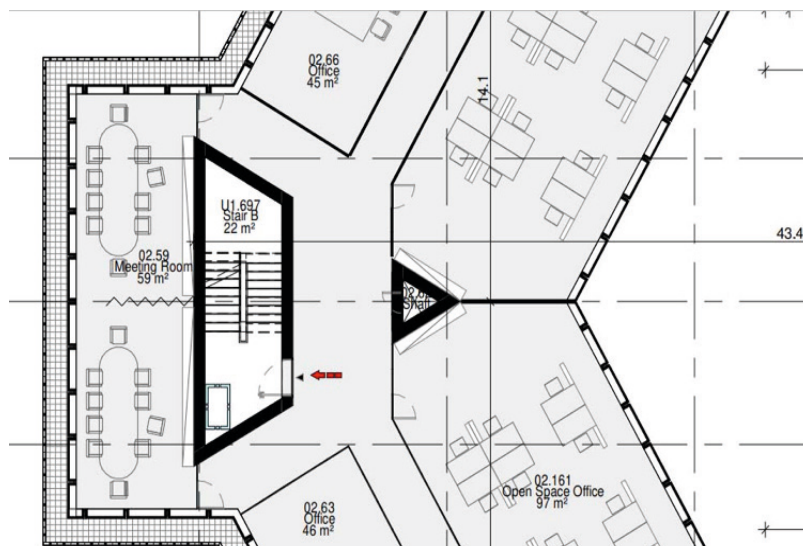
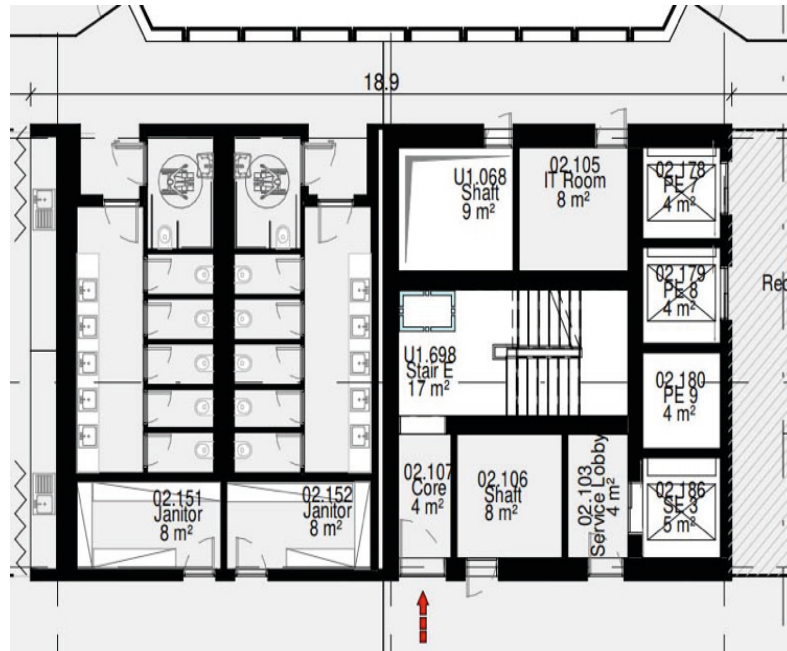
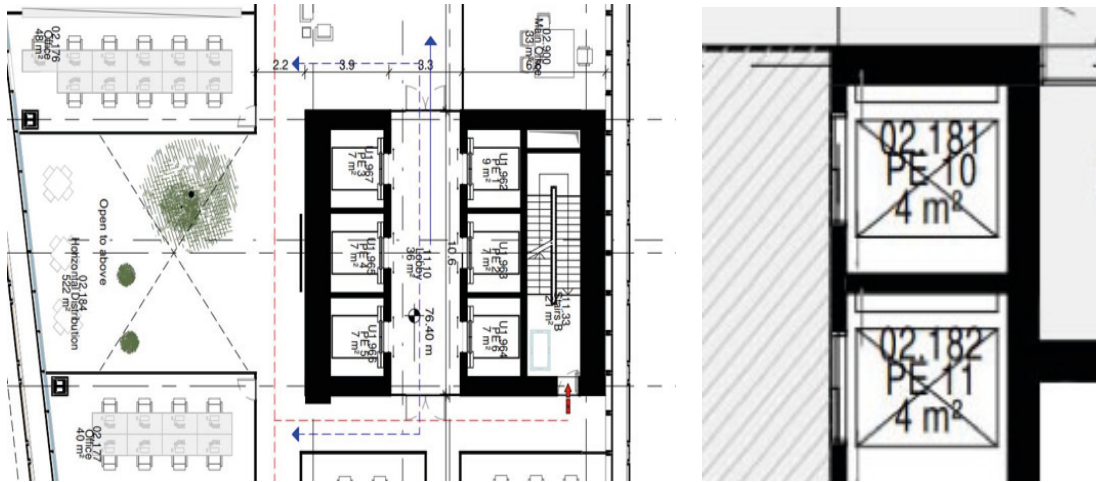
Figure 62 — Example of fire evacuation staircase with an adjoining area of rescue assistance

EXAMPLE 2: FORM ONORM B 1602 AUSTRIAN STANDARDS



In addition to the reports, there were meetings with the supervision team as well as with the design team of the company. This project will be a pride for everyone, because it has preceded the local applications in Libya and perhaps in the neighbouring regions as well.

In the below drawings are different examples of the final applications in different buildings of the project:



Area of Rescue Assistance in Architecture Education

At Berenice University of Architecture and Urbanism, I started the first ever official course on Universal Design, named Universal Accessibility & Design for All. This course, modelled for architecture students, involves both theory and practice, and is offered according to a Design for all approach, deepening recognition of human diversity and its various needs.

During the UA&D4ALL, students are introduced into the elements of buildings and urban environment: walkway, car parking, pedestrian crossing, entrances, corridors, doors, stairs, lifts, toilets, etc., with the objective of setting new standards and new innovations projects, of providing examples and technical materials in how to apply the taught criteria in the different stages of works: planning, design, construction, and of how to apply universal accessibility in existing buildings or infrastructures.

In the course, students also learn about the overview of the accessibility standard and how it is implemented, so they learn how to assess, audit, report, and provide Universal Design recommendations.

Within the Curriculum, in the course of studying the elements of the building, and when we consider accessible stairs, I introduce the idea of fire safety for all and show the method of Area of Rescue Assistance. This usually leaves students with the sensation that they have learnt something good that will serve to help others.

Currently I have ten students in the Universal Accessibility & Design for All course. Nine of them are students of the fourth year, the seventh semester, and one is a third-year student from the fifth semester. Throughout the course, each student will choose an existing project, often from projects that have been suspended in Libya as a result of the war. These projects will be an exercise on auditing accessibility as well as providing solutions from students according to the Universal Accessibility and Design for All approach. In these project, we expect students to deal with the topic of scape stairs and to implement the idea of Area of Rescue Assistance.

National Council of Architects, Planners, Landscapers and Conservationists

Coordinator of the CNAPPC Accessibility and Universal Design Work Group; Arch. Lilia Cannarella. Italy

WORK GROUP ACCESSIBILITY & UNIVERSAL DESIGN

The National Council of Italian Architects, Planners, Landscapers, and Conservationists works in synergy with the 105 chambers of the architects of Italy, through working groups set up on different strategic objectives of architectural and urban policies. The working group on Accessibility and Universal Design was established in July 2018, and it's composed of 6 members with specific skills in the field. The members are the expression of the Councils of the Italian Chambers; the working group is coordinated by the National Councilors, Lilia Cannarella and Luisa Mutti.

The main objectives and research focus on:

- The harmonization of international standards with national legislation;
- The implementation of national legislation for the removal of all architectural barriers;
- The exchange of good practices between Italian regions and territories regarding the removal of architectural barriers to ensure an optimal quality of life and access to services for all.

GOOD PRACTICES EMERGENCY RELIEF FOR DISABLED PEOPLE

In Italy

Although Italy has ratified all the main agreements in the field of international humanitarian law, the Civil Protection and other entities in charge of emergency management have not yet adopted national “guidelines” that standardize civil protection activities by establishing universal and accessible parameters. To date, therefore, we are proceeding by signing operational rescue protocols, to the detriment of a homogeneous adaptation to the provisions of the UN Convention with regard to people with disabilities. The more concrete guidelines can be found in the Verona Charter “On the Rescue of People with Disabilities in the Event of Disasters”, a document declaring the intentions of the participants in the Consensus Conference held in Verona on the 8th and 9th of November 2007, which gave rise to the drafting of the Verona Charter on the rescue of People with Disabilities in Case of Disasters.

Adopted in 2007, the Verona Charter aims to outline a common and universal vision regarding all aspects of the activities necessary to guarantee the protection and safety of people with disabilities in situations of risk and emergency.

This document is to be considered as a reference point for planning the management of emergency situations in which people with disabilities may be found, both as a result of disasters and as a result of human events, providing for the management of emergencies as follows:

- People with disabilities have to participate in the planning of activities and in the search for solutions to reduce the risk in emergency situations. This also needs to be based on various types of disability.
- The potential of new technologies must be fully realized and used to support people with disabilities and to ensure equal treatment even in emergency situations.
- During emergency situations, both the containment of physical damage and the containment of the alteration of the psychological state must be taken into account.
- Information related to safety procedures must be correct, easily understandable, accessible by all, and adequate. It also has to take into consideration the different types of disabilities.
- All actors involved in risk management situations and rescue processes should be sensitized, informed, trained (including practical exercises and cross-training), and motivated to fulfil their responsibilities even when it comes to meeting the needs of people with disabilities in emergency situations.
- Also, in the simulation plans there is the presence of people with various disabilities.

The good practices adopted in the Calabria Region

In 2015, The Calabria Region and, in 2019, the National Civil Protection Department promulgated two very important operational guidelines for the protection of people with disabilities, as referred to in art. 11 of the United Nations Convention on the Rights of Persons with Disabilities, 2006.

The DGR 135/2015 of the Calabria Region reports the minimum contents for the integration of the Municipal Emergency Plans for aid to people with disabilities. Municipalities that have a civil protection plan, even expeditious, will be able to use the following scheme for the rescue of people with disabilities.

Municipalities must verify that their plan contains the minimum contents listed in the manual of the National Department of Civil Protection approved with the O.P.C.M. 3606/07 and in the DGR n° 472/2007 of the Calabria Region, and that consistency with the intervention model is respected, making the necessary changes and additions to its plan.

The integration to the plan concerns the “synoptic map of the disability” and the escape route detection map. After evaluating the current legislation on privacy, with regard to the acquisition of data relating to people with disabilities, it was decided to acquire data relating to people with disabilities present in the area through a self-assessment form, published in the concerned Register of Municipality (as resolved within the conference of services organized by the municipality of Casali del Manco).

Involvement of people with disabilities for the integration of the Civil Protection Plan

The participation process of all stakeholders, and of people with disabilities in particular, is guaranteed by institutional procedures managed by the local administrations, which is based on some fundamental principles:

- Involvement in the planning of people with disabilities, family members and voluntary associations.
- People with disabilities must be active subjects of the civil protection system for the planning and management of the various stages of the emergency.
- Need to create a territorial network of aid actors that supports the planning and definition of measures, safeguards and procedures.
- Improvement in inclusive terms of information and training of disabled people and caregivers.
- Experimentation of emergency plans. Comparison and training are the cornerstones of planning, so the exercises are a fundamental tool for understanding, modifying and adapting priorities in an emergency, according to the territorial characteristics of the Municipality concerned.
- The training of municipal technicians and volunteers in the field of disability must be adequate and continuous.
- Within the plan, inclusive communication methods must be defined in emergency and emergency management situations.

To this end, technical tables have been set up in various municipalities in Calabria with all the local associations and bodies responsible for the protection of people with disabilities.

The main subjects involved in the Technical Table are:

- The Mayor of the municipality.
- The Head of the Technical Office.
- The Guarantor of the rights of people with disabilities of the region.
- The Associations present in the area (for example FAND Calabria and FISH Calabria).
- The Rescue Without Barriers Association.
- A representative of the Civil Protection of the Calabria Region.

Drafting of synoptic mappings and experimentation

The Calabria Region, as part of its legislative activities, has shown a growing attention to issues related to the protection of people with disabilities. Several municipalities in the region have integrated their plans and launched experiments through exercises and simulations.

The integration to the municipal emergency plan must contain the following information (represented also graphically).

- Maps that will show the location and the division according to the type of the emergency areas
- Sheet
- An emergency psychologist.
- The location of disabled people located in the territory, thanks to a differentiated and specific symbolism in relation to the different disabilities.

SHEET 1: Emergency areas for sheltering people with disabilities;

SHEET 2: detection of escape routes;

SHEET 3: Intervention model;

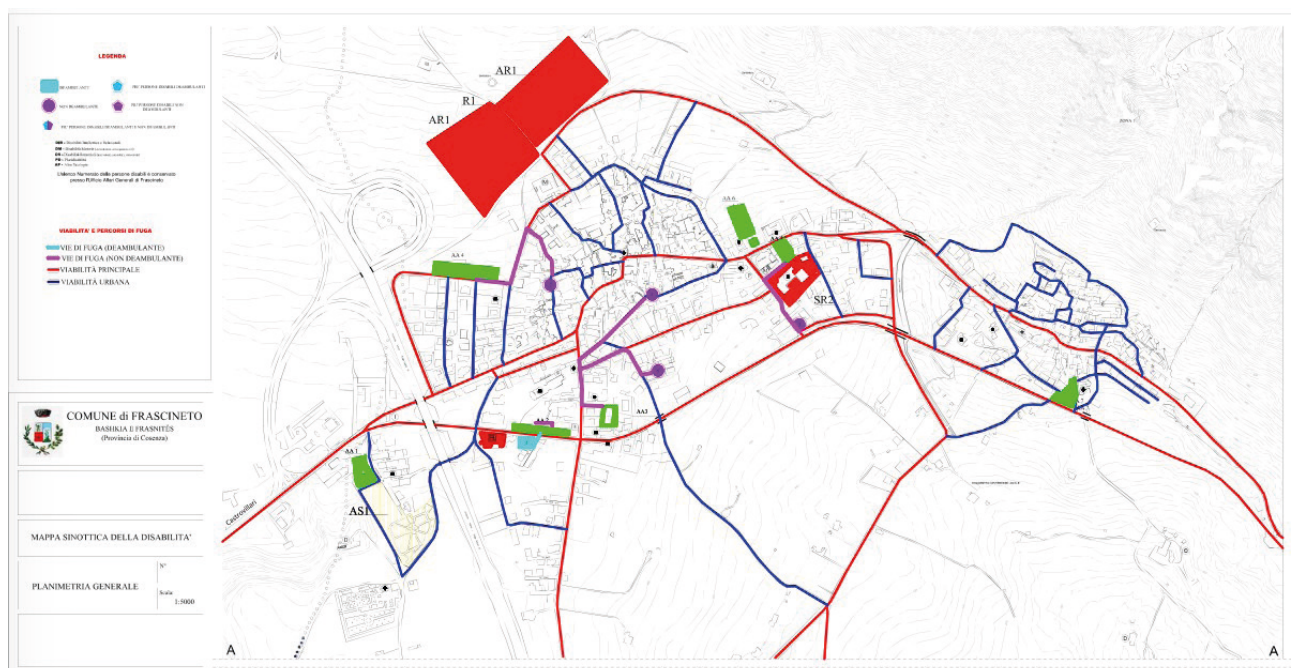
SHEET 4: Resources to be used for rescue;

facsimile of the sheet;

instructions for compilation;

instructions for drawing up the synoptic map of disability.

Some examples The Municipality of Frascineto



PERCORSI DI FUGA

Scheda di Rilevamento	
Caratteristiche	
Viabilità (S.S. S.P., S.C., VIA, VICO) Località Comune Provincia Area di Attesa n. _____ Percorso (Indicare il percorso fino area di attesa) Percorso Alternativo Barriere architettoniche presenti: <input type="checkbox"/> scalini <input type="checkbox"/> percorsi < 1 m <input type="checkbox"/> pendenze eccessive <input type="checkbox"/> spazi ridotti <input type="checkbox"/> percorsi di ghiaia o a fondo dissestato <input type="checkbox"/> oggetti sporgenti Fabbricati a rischio con possibili crolli: <input type="checkbox"/> in Pietre distante dell'area di attesa m..... <input type="checkbox"/> Muratura distante dell'area di attesa m..... <input type="checkbox"/> Mista distante dell'area di attesa m..... <input type="checkbox"/> calcestruzzo distante dell'area di attesa m.....	
Indagine sui Rischi	
Area a Rischio idraulico NO <input type="checkbox"/> SI <input type="checkbox"/> Indicazione riportata nel Piano di Assetto Idrogeologico Regionale Classificazione del Rischio	<input type="checkbox"/>
Area a Rischio di frana NO <input type="checkbox"/> SI <input type="checkbox"/> Indicazione riportata nel Piano di Assetto Idrogeologico Regionale Classificazione del Rischio	<input type="checkbox"/>
Classificazione Sismica OPCM n°3274 del 20/03/2003	Zona 1 <input type="checkbox"/> Zona 2 <input type="checkbox"/>
Note	

CARATTERISTICHE AREE PER DISABILI			
Località			
Altitudine			
Coord.	N	E	
Proprietà			Superficie Totale (m ²)
			Superficie Coperta(m ²)
Casello Autostradale più vicino:			
Natura della Superficie:			
Vie di accesso: Larghezza			
Elettricità	da attivare	<input type="checkbox"/>	esistente <input type="checkbox"/>
Gas	da collegare	<input type="checkbox"/>	esistente <input type="checkbox"/>
Linee telefoniche	da collegare	<input type="checkbox"/>	esistente <input type="checkbox"/>
Acqua	da collegare	<input type="checkbox"/>	esistente <input type="checkbox"/>
Fognatura	da realizzare	<input type="checkbox"/>	esistente <input type="checkbox"/>
Presenza di fabbricati		NO <input type="checkbox"/> SI <input type="checkbox"/>	distanza area
Servizi igienici già fruibili		NO <input type="checkbox"/> SI <input type="checkbox"/>	Numero [][][]
Servizi igienici non autosufficienti		NO <input type="checkbox"/> SI <input type="checkbox"/>	Numero [][][] almeno 1 ogni 5 persone
Disponibilità posti letto		NO <input type="checkbox"/> SI <input type="checkbox"/>	Numero [][][]
Centro sanitario		NO <input type="checkbox"/> SI <input type="checkbox"/>	distanza area
ALTRI RISCHI INDOTTI (SPECIFICARE)			
Es. (stabilimento di g.p.l. ecc.....)			

Future developments

The experience of the Calabria Region is contaminating other regions of Italy that have adopted these procedures to reduce the risk of disasters for disabled people. Many municipalities have active planning tables in which people with disabilities participate through numerous associations, present at national and territorial level.

The CNAPPC Work Group Accessibility & Universal Design has initiated a dialogue with the National Civil Protection, which is the Institution in charge, in order to adopt national guidelines in this regard.

Natural Disasters and Emergencies in Chile actions in urbanism and architecture for people with disabilities

Universal Accessibility Committee – Architect College of Chile A.G.
Cecilia Leiva Muñoz, President of the Universal Accessibility Committee;
Ivonne Mella Vidal; Katia Jadue Lillo; Kristine France Zúñiga.
Consuelo Ripollès (Collaborator)

SUMMARY

Within the framework of action for Disaster Risk Reduction, established by the UN in Sendai for the 2015-2030 period, and as part of the research to generate an international contribution, this document is aimed as a presentation at the next World Congress of Architects, to be held in the city of Rio de Janeiro in July 2021.

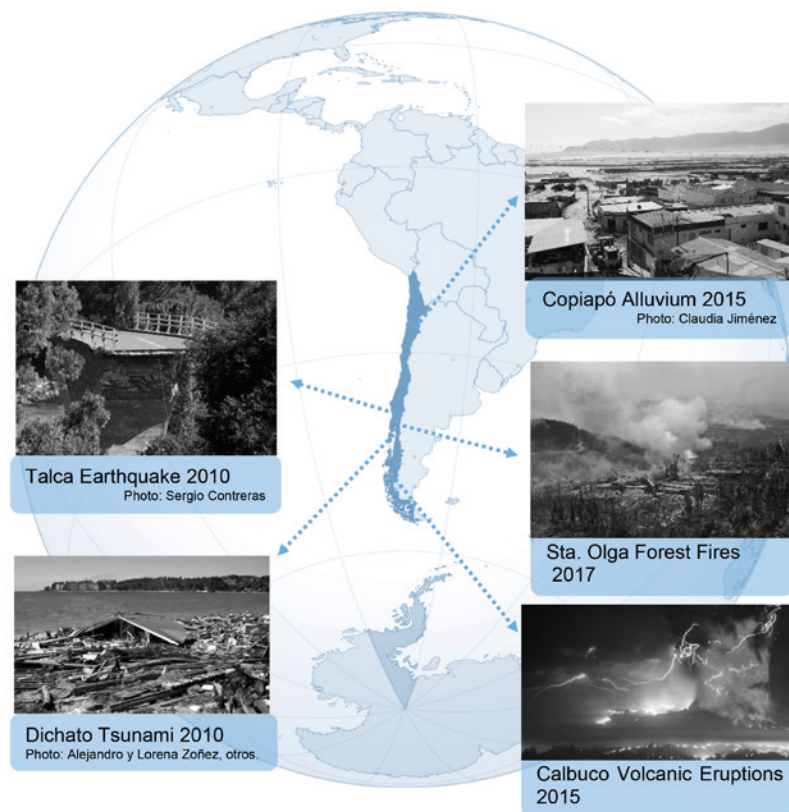
The study is carried out from the perspective of Chile's extensive experience in Natural Disaster Response (earthquakes, tsunamis, floods, volcanic eruptions, as well as wildfires) through a description of the experiences of these natural disasters and of their link with national public policies.

The aim of this research is to generate Recommendations for Inclusive Design in Urban Planning and Architecture Based on Disasters in Chile, converging in to a new challenge in how instances of safe evacuation of vulnerable people (people with disabilities, children, the elderly, people with permanent or temporary reduced mobility, etc.) are confronted. In this way, the right to independent and autonomous living (Law 20,422 Chile) also becomes relevant while facing natural disasters. The local and territorial planning proposed in this document, intended to help people with disabilities, will also benefit the general population.

As part of this research, in order to analyse each natural disaster in the context of the event process—which consists of the prior, during and aftermath, in the implemented measures framework in urban and rural environments—, international conventions, regulations, and Chilean public policies are reviewed.

Keywords: evacuation, emergencies, natural disasters, accessibility, independent living.

NATURAL DISASTERS AND EMERGENCIES IN CHILE



INTRODUCTION

This document has been prepared by the Universal Accessibility Committee of the Chilean Association of Architects. The workgroup consists of architects with experience in universal design applied in public spaces and buildings, as well as in law-making and education, and is focused on the inclusion of vulnerable people and their right to use cities autonomously and safely. The group is led by Architect Cecilia Leiva, “Architecture for All” workgroup representative in Chile, UIA Region III.

This work presents a series of guidelines in accordance with the UN-Sendai 2015 to 2030 International Guideline Framework. These guidelines concretely reduce natural disasters’ negative impacts on the most vulnerable people —people with disabilities, women, children, people with reduced mobility, the elderly, etc.—, by observing people and properties’ exposure degree, communities’ reaction ability, and environment’s hazard identification, thus, allowing better evacuation preparation and subsequent mitigation measures.

In order to achieve disaster risk reduction, it is essential to count with the participation of public institutions and civil society in all intervention areas. Coordination between different actors and consultants to design policies and strategies, raising awareness, and educating the population is a must because it will allow prevention response, recovery, rehabilitation, and reconstruction of localities and populations affected by natural disasters.

Moreover, this research is based on the International Convention on Rights of Persons with Disabilities, bearing in mind articles 9 and 11 of the Convention, where risk, emergencies and accessibility are explicitly mentioned. This Convention is mandatory for all countries that have ratified it at the UN. The Hyogo Framework for Action 2005-2015 is also reviewed with experiences gathered from institutions and their shortcomings, considering future challenges, both for Disaster Reduction and increasing resilience; the research is focused in this area.

Furthermore, unplanned urbanisation, inadequate land use management, climate change, and gaps in technologies use within the population are not specific to individuals, but to the economic, social, health, cultural and environmental spheres.

For this research development, the seven objectives established in Sendai 2015-2030 are considered, and from the main aims, urban planning and architecture guidelines are analysed for vulnerable people in situations of natural disasters and emergencies. The final objective is to improve resilience during the event in Chile and take measures to reduce the risk at new disaster.

The following is a description and analysis of recurrent natural disasters in Chile, which are:

- Earthquakes
- Tsunamis
- Landslides
- Volcanic eruptions
- Wildfires

EARTHQUAKE IN CHILE, 27TH FEBRUARY 2010

Author Cecilia Leiva Muñoz

In the history of earthquakes in Chile, the most recent one took place on the 27th of February 2010, it had a magnitude of 8.8 and caused a tsunami. It affected the country's central region, at 600 km in length and with the epicentre in Cobquecura, Bío-Bío region. It covered an area of 69% of the country's communes and a population of 12,800,000 people, with 525 fatalities.



Photo 1: Santiago, March 2010 (Sergio Contreras)

Thus, it is the second most important earthquake in the history of Chile, since the most important was in 1960 and, with a magnitude of 9.0, it caused great destruction in a vast area of the south of the country, specifically in the city of Valdivia, leaving in total more than 2,000,000 people affected.

By contrast, the 2010 earthquake in Haiti had a magnitude of 7.0 and caused a greater number of casualties, leaving 316,000 dead.

Prior, during and aftermath

In 2000, the Permanent Committee on Infrastructure, City and Territory was created in order to develop integrated public investment programs in urban infrastructure, with an impact on the reconstruction coordination. Prevention is the most important phase in Public Policy, including mandatory territorial planning and construction regulation, besides education and information actions. A critical aspect within the Chilean experience is the lack of risk maps and regulatory flood zones plans, due to a lack of studies. Regarding urban planning and management, Adequate State organisation in risk and natural disasters management is one of the most important issues in Latin America, considering the sustained growth of urban population and persistence of precarious settlements in the Region.

The factors that hindered emergency measures during the disaster were failure in the communications system, inaccuracies from the civil protection authorities during the coordination process, and late diagnosis of both the situation assessment and assistance to involved localities¹.

The immediate response in the evacuation stage included victims' rescue and aid, order restoration, and providing security to the population. The damage and quantity of victims' assessment gathered important data for the design of future reconstruction plans and programs. These tasks were performed by the Civil Protection Network, which consists of public and private institutions, volunteers, and organised communities with coordination of the National Emergency Office of the Ministry of Internal Affairs (ONEMI).

ONEMI was created in 1974 and it is the technical authority in charge of planning and coordinating public and private resources, to be invested in plans and management models for the prevention and handling of such disasters.

In this stage, during an earthquake, it is crucial to rely on Universal Accessibility in communications, inner and outer urban spaces, and procedures so every user can participate, reducing the negative effects of the emergency. In order to achieve this, it is necessary to identify and eliminate architectural, communicational, and cultural barriers, which can increase the risk level of people with disabilities in such emergency.

The next stage is rehabilitation, which consists in restoring basic services such as electricity, drinking water, telecommunications, road clearance, social assistance diagnosis and reconstruction plans, debris removal, damaged buildings demolition, temporary shelters outfitting, and design and location of transitional housing.

Reconstruction is the most prolonged stage, being necessary the implementation of a reconstruction plan with concrete actions of public investment, measurable results in indicators and deadlines in urban reconstruction. Because of it, there is a need to create special agencies to manage and implement reconstruction plans, such as FOREC after the earthquake in Armenia, Colombia².

After the 2010 earthquake, a reconstruction plan was created with significant public funds through tax increases, national budget reallocation and tax incentive law for private donations. Likewise, many new guidelines were created:

- In 2011, a new agency, the National Civil Protection Agency, was created with greater resources and emphasis on prevention, information with a national seismic monitoring network and coordination, and later damage assessment to buildings.
- Significant regulations modifications were also generated through decrees that modified the regulations at the time, NCh 433 Seismic Design Standard for Buildings and NCh 430 Reinforced Concrete, based on ACI 318.

1 Brain and Mora. 2012

2 Bresciani L. 2012

- State aid systems were defined through the Ministry of Housing and Urban Development by means of subsidy programs for the reparation and reconstruction of houses totally or partially damaged by the earthquake and tsunami, as well as for the victims, low-income groups, or vulnerable middle class.
- A Victims Registry and a certificate of damage issued by the Works Directorate of the corresponding Municipality were established with the aim of giving financial support to victims with no second home. The subsidy was set with two different objectives: to repair households and to build new housing.
- In terms of urban planning, regulatory plans, risk maps and master plans, which had not been previously considering natural hazards of urban settlement sites and vulnerability of areas occupied with housing, were updated.

The NGO Inclusiva is an organisation specialised in risk management aimed at disabled people. Its Director, Carlos Kaiser, proposed a National Emergency Plan which includes people with different types of disabilities as a part of the planification, evaluation and implementation, considering their needs during an emergency³.

Key Points

1. It was proved that the country, despite its geographical location and consequent seismic condition, has to be able to face disasters with a public policy of permanent emergency management and reconstruction process.
2. It is necessary to properly include natural hazards in land planning methods, something that should include dialogue between different actors with different interests on a particular place. This is aimed at considering the real hazard on habitable spaces, as well as the social and territorial consequences that arise when the hazards are materialised.
3. Universal Accessibility is necessary, both indoors and outdoors, in communications and procedures. This can be achieved by eliminating architectural, communicational, and cultural barriers with the aid of their users in order to reduce the risk on people with disabilities during an emergency.

Author Earthquakes Review - Cecilia Leiva Muñoz

Cecilia Leiva Muñoz is an architect from the Pontificia Universidad Católica de Chile 1977. Postgraduate course on urban violence, insecurity, and discrimination at Centro de Estudios Urbanos y Regionales (CEUR-CONICET) Argentina and United Nations Fund for Women BRAZIL AND SOUTHERN CONE 2008. Representative of Chile in the International Union of Architects UIA. IIR. America, "Architecture for All" work program.

President of the Universal Accessibility Committee. Chilean Association of Architects. Jury UIA representative of the C.A. in international competition of inclusive architecture for students at universities of La Paz. Bolivia 2017.

Participation in UIA conferences in Lima, Peru and Buenos Aires, Argentina. Work on normative issues for the integration of people with disabilities in the Ministry of Housing and Urbanism 1994 to 2010. Presentations at international congresses and conferences in Australia, Guatemala, Argentina, Bolivia, and Chile on issues of inclusion of people with disabilities in architectural design and safety in public space. Study of various accessibility standards at the National Standards Institute of Chile.

³ Kaiser 2013

DICHATO TSUNAMI, 27TH FEBRUARY 2010

Author Ivonne Mella Vidal

Out of natural disasters, tsunamis are catalogued among the most destructive due to the great number of human and material losses they caused. Therefore, since 2009, Chile, Colombia, Ecuador, and Peru have joined the International Tsunami Warning and Prevention Program by UNESCO.

Tsunami threats in Chile are caused by the underwater geographical location of the coastal edge, and although they are an extreme and rare natural event, they are among the most complex physical phenomena⁴.

Statistics show that 53% of the tsunamis recorded in the world have originated in Chile⁵, and it is important to note that for an earthquake to have tsunami-genic potential, it must have magnitudes greater than 6.5 on the Richter Scale, surface hypocentres (less than 60 kilometres) and oceanic epicentres near the coastline.⁶This combination defines the flooding maximum height difference along the coastal edge in Chile⁷.



Photo 2: Dichato, March 2010 (Daniel Campos Saballa)

Prior, during and aftermath

During the 8.8 earthquake and tsunami of the 27th February 2010, which occurred in the coast of Chile, current national regulations did not consider the risk of tsunami, and focused instead on flooding and mass removal, even though Chile has a coastline of almost 4,300 kilometres and countless has had tsunamis over time.

One of the first reported tsunamis occurred in 1550 in the city of Penco, 25 kilometres south of Dichato (where the study was based), so Don Pedro de Valdivia changed the settlement location to the "Valle de la Mocha"; today its name is Concepción, and it's located at the foot of Caracol hill.

By means of decree No. 156, of 2002, the "National Civil Protection Plan" was approved. Its main objective is to maintain, operate and control an Emergency Communications System that allows the assurance of communications between Municipalities, Regional, and Provincial Governments with the agencies that make up the Civil Protection System and the media. In addition, in the event of a disaster, it must coordinate and centralise the administration of emergency information, quickly and timely communicating the situation to their respective authorities and to the National Emergency Office.

4 Lagos, 2000

5 Mc Caffrey, 2007

6 Lagos, 2000

7 Satake et al., 2003.

The Intendancies, Governances and Municipalities developed a framework plan approved by the aforementioned decree (N°156/2002) in terms of civil protection. In support of this management, the National Emergency Office prepared the instructions with a local risk management methodology in matters of seismic and tsunami risk.⁸

In the tsunami that followed the 8.8 earthquake with epicentre in the sea, 63 km northwest of the city of Concepción, on February 27th, 2010, in the town of Dichato, Bío-Bío region, several waves were unleashed at different times during the night, the first happening only 20 minutes after the earthquake. The Emergency Office early warning centre did not give a timely evacuation warning since, according to Chilean legislation, it was the task of the Hydrographic and Oceanographic Service of the Navy.

Through the local risk management methodology for tsunami, the Emergency Office trained the coastal community authorities for years, teaching them that “any occurrence of a great intensity earthquake, which prevents people from standing up, which makes walls fall, towers collapse and manages to move some wooden houses, is enough to (...) apply the Emergency Plan and its Evacuation phase to safety areas”.

The lack of an evacuation notice to Dichato’s population was due to the lack of coordination between the Oceanographic Service and Emergency Office agencies. Neither of them gave an emergency warning for an eventual tsunami, not in a pre-emptive manner, even though the Oceanographic Service Technical Command has to issue an evacuation alert. Given the case that the Oceanographic Service is not able to issue the alert, Emergency Office’s Coordination Command can issue the alert. This miscommunication caused the death of 56 people.



Photo 3: Dichato, March 2010 (Daniel Campos Saballa)

In 2010, the Coastal Edge Reconstruction Plan of 18 localities was carried out. The Advisor Urbanist Iván Cartes, PhD and Academic in Architecture at the University of Bío-Bío, Concepción, was in charge of this plan. This is how Dichato’s Master Plan for Reconstruction was born: from ground zero towards the future; based on safety, quality of life, and sustainability.

By default, Master Plans lack legal force; however, these were incorporated in the Communal Regulatory Plans (PRC) modifications. By modifying these territorial planning instruments, according to the risks and areas affected by the tsunami, the Master Plan was allowed to become effective and applicable given the state of emergency (DDUI, 2010).

Even though this Master Plan development was carried out with community participation, people with disabilities had no voice nor representation, so it was not possible to cadastre their location within the district and show a community evacuation plan.

8 Final Report No. 32/12, on the Audit of the Emergency Catastrophe Program carried out in the Municipality of Tomé

Nevertheless, what keeps the fishing harbour's community safe is its collective memory, an oral tradition that is passed through generations: to evacuate to higher ground after an earthquake.



Photo 4: Maps of Dichato Flood (SHOA 2016)

With this projected flooding chart from Dichato (2016) by the Oceanographic Service, it can be estimated that the flooding levels are alike those in the tsunami of the 27th of February 2010. Although this projected flooding chart exists, both commercial and residential population settlements continue being the same, not incorporating this variable in the new Communal Regulatory Plan.

Despite the high number of tsunamis in Chile, the State has not generated emergency plans which include the community (participatory emergency plans) and people with disabilities. We observe that the instrument for Regulatory Plans is not based on the Flood Charts elaborated by SHOA, done under internationally endorsed simulation methodologies.

The Emergency Office and Public Safety, in sight of the catastrophe suffered on the Chilean coast caused by the tsunami that happened in the 27th of February 2010, created the Specific Emergency Plan by Risk Variable TSUNAMI on the 1st of February, 2018, as well as complementary plans such as the National Emergency Plan, Regional Emergency Plan, Regional Emergency Plan by Tsunami Variable and Sector Emergency Plans. The technical bodies in this emergency variable are:

- Hydrographic and Oceanographic Service of the Chilean Navy
- National Seismological Center, University of Chile
- Research Center for Integrated Disaster Risk Management
- Ministry of Agriculture

The Tsunami Alarm National System establishes the threat of a tsunami. Initially the threat is assessed with preliminary earthquake characteristics. Later, sea stations register the water level variations through continuous monitoring. In this last condition, the Tsunami Alarm National System will determine the threat of tsunami using the records collected by tide gauges along the coast. A tsunami threat will exist when the amplitude is greater than 30 cm.

The only warning system in case of a major earthquake, corresponds to the provisions of the Oceanographic Service / National Emergency Office Protocol.

Key Points

1. Despite the large number of tsunamis in Chilean history, preventive measures have not yet been generated by the Government through participatory emergency plans for the whole community, including people with disabilities.
2. The territorial plans instrument is not based on technical data, such as Flood Charts generated by the Navy's Oceanographic Service, under internationally endorsed simulation methodologies.
3. Even though drills which include people with disabilities have been carried out in educational institutions along the coastline (see Annex I), they have not been evaluated and widespread to the general public in order to create new state policies for a better evacuation in the event of a tsunami.

4. It is essential to review the digital warning system in order to develop effective drills for the public where they know where to evacuate to, how identify their safety meeting point, and how people with disabilities or reduced mobility will be evacuated.

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TARAPACÁ LANDSLIDE, 25TH MARCH 2015

Author Katia Jadue Lillo

This natural disaster, common in the Andean region of Latin America due to the existence of a rugged geography with steep slopes, takes on different names —mudslides, alluviums, flows, huaycos (Peru)—, depending on the characteristics of their origin and the elements they carry (water, snow, stones, mud, etc.).

In northern Chile, these events may accompany the El Niño phenomenon, or they may be the result of a less intense rainfall that reaches significant runoff due to the lack of vegetation in the desert. Meanwhile, in the central and southern Andean foothills in Chile, they can be caused by melting snow or by seasonal rainfall increase. Landslides can also be caused by ruptures of water matrices in cities.



Photo 5: More than 40 cm mud height on the streets. Copiapó, March 2015 (Claudia Jiménez)

The eroding action of a landslides, which sweeps away everything it finds in its path, is usually more significant on the delta or deposit cone of ravines, which generally coincides with the location of human settlements. It is important to note that these natural events, although varying in intensity, are a periodic recurrence due to climatic effects.

This analysis focuses on mudflow, where water carries loose material (debris) down a hillside, gully or riverbed, and the area of study is located in a desertic area (northern Chile) with minimal rainfall throughout the year.

Prior, during and aftermath

In 1904, the instrumental measurement of rainfall was introduced in Chile, while in 1965 the recording of floods began. To date, these records include 15 events in different parts of the country, the most harmful being the Antofagasta Flood, that happened in the 18th of June 1991, and in which 91 people died, 35 went missing and 70,000 were affected.

However, we will focus our analysis on the most recent and bigger in magnitude, which served as a reference to craft the following measures. This flood occurred on the 25th of March 2015, in the Tarapacá Region, and left 31 dead, 16 missing and 16,588 affected people.

In this region, the average rainfall is of 2.6 mm per year, but during the landslide episode there was a rainfall of 25 mm per day.

On the 24th of March 2015, the increase in the flow of water in the streams began, these streams had been drying for the previous 20 years. The population, uninformed of the seriousness of the situation, looked out onto the banks to see how the streams filled with water, until the levels began to rise above the riverbed.

Urban areas located around rivers were cut in two, roads were cut off and the drinking water supply was ceased. All of this led to the collapse of the sanitation system, additionally there was no electricity and no internet connection, as the optic fibre cables were also damaged. Smaller villages were isolated, without communications or immediate help. There were also ecological effects, due to mine tailings' flooding.



Photo 6: House obstructed by debris left by the alluvium, Copiapó, March 2015 (Photo: C. Jiménez)

Schools were turned into shelters, and community organisations played an important role in coordinating the drinking water and food supply, as well as sanitation solutions. The use of helicopters for rescue and supply, military road construction and satellite telephones were essential to support the communities. The effort was not enough for the 8,994 affected families and the 8,957 damaged houses.

As a result, the Disaster Response Plan for the Atacama Region was created, but it makes no reference whatsoever to people with disabilities.

Subsequently, in 2017, a Flood Drill was carried out in Tocopilla, in the Antofagasta Region, which considered a series of actions for an inclusive evacuation aimed at vulnerable people. Its evaluation by the participants revealed failures in external aid, lighting system for the deaf and evacuation routes.

By 2018, 90% of the 8,629 housing solutions and 72% of the 99 reconstruction initiatives had been completed, but none of them included actions focused on people with disabilities.

The National Disability Centre (government service) has held several talks on how to respond to disasters, but these are not activities in which people with disabilities can influence state policies.

The National Emergency Office has a specific emergency plan for natural disasters instructions called "Prevent, Inform and Prepare Yourself". The following guidelines are for landslides:

If you live, work, or visit areas at risk of landslides, pay close attention to the following signs:

- Current weather forecasts and warnings.
- Heavy and sustained rainfall, higher than normal.
- Higher than normal ambient temperatures in mountain areas.
- Increased turbidity of water in watercourses.
- Sudden rise or fall in the level and flow of a watercourse.
- Loud background rumble, similar to the sound of many trucks approaching.

What to do in case of a landslide?

- If you are in the mountains, foothills or in the northern part of the country, do not go to ravines or gullies on rainy days.
- If you must evacuate, do so towards places that authorities have defined as meeting points or safety areas. If they do not exist, move away from the course of rivers, streams, and ravines.
- If a flood is approaching and you cannot evacuate to a meeting point or safety area, evacuate vertically to higher floors, roofs, buildings, or other structures.
- If you are driving and come to an area affected by a landslide, avoid crossing it and move away from the area.
- Stay away from the area affected by a landslide, others may happen nearby.
- Return to your home only when authorities indicate it is safe to do so.

Key points

1. It is important to note that, in the case of floods, meteorological studies make it possible to foresee the onset and the short-term forecast, giving an early warning and therefore calming the population regarding the duration of the event.
2. This condition should be an opportunity to generate better planning, since it is not only possible to know the season of the year in which the event generally occurs, but also the resulting course of the flood. These elements facilitate the possibility of taking precautionary measures.
3. Currently, the National Emergency Office, through its Winter Program, manages the prevention and mitigation of landslides, reducing the risks involved, but there are no special instructions for people with disabilities.
4. Even when drills are carried out to educate the population about floods, they have not been generalised, nor have they been conceived for people with disabilities.
5. Territorial planning instruments are not coordinated with the guidelines of other state agencies such as the Water Directorate of the Ministry of Public Works, the National Emergency Office, municipalities, etc.

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VOLCANIC ERUPTIONS

Author Kristine France Zúñiga

Chile borders the Andes mountain range, land of volcanoes. These frontiers are within the so-called Pacific Ring of Fire, one of the most dynamically unstable and active regions on Earth. There are about 90 potentially active volcanoes in our country, and there is an historical activity record of about 60 of them.



Photo 7: The Calbuco volcano was dormant for about four decades.

The most violent eruptions recorded in the 20th century was on the 10th of April 1932, when the Quizapú volcano (located in the province of Talca, Maule Region) erupted. Its gas column reached a height of 30 to 32 km. The tephra (ash and other elements product of an eruption which fall as rain) covered more than two million square kilometres, from Quilpué (central Chile) to southern Brazil.

The National Service of Geology and Mining is in charge of continuously monitoring volcanic activity and alerting Emergency Office of any event.

Prior, during and aftermath

The National Emergency Office has a specific emergency plan for volcanic eruptions, called “Chile Prepared - Volcanic Eruptions”, with a set of recommendations to prevent, inform and prepare the population for this type of disaster.

In this event, there are 4 types of alerts: Green, Yellow, Orange. and Red, as presented in the following table⁹.





	GREEN ALERT	YELLOW ALERT	ORANGE ALERT	RED ALERT
ACTIVITY	Without variation	Unstable	Significant variation.	Expected development of an eruptive event.
PHENOMENON	Habitual	Minor explosions, appearance of fumaroles, increase in monitoring parameters.	Probable increase in activity (compared to a lower level)	Major eruption imminent or ongoing.
¿WHAT TO DO?	Whithout danger to the population	Stay informed by the official channels of local and national authorities.	Stay informed, possible partial restrictions on Access into the volcano.	Follow the instructions from the authorities, possible evacuation.
REPORT	Monthly 	Fortnightly 	Daily 	Daily or according to process evolution. 

Table 1: Step for emergency information and evacuation

According to the technical evaluation report of the Volcanic Eruption Drill (2017)¹⁰ of the Villarrica Volcano, most of the meeting points allow the evacuated population to gather. However, the evaluation showed that most meeting points do not have signalling indicating the evacuees that they have reached a low volcanic danger zone. Access deficiencies were also detected for un-aided people with disabilities to reach these meeting points. This is due to the lack of buses adapted for people with disabilities to get to and from meeting points. Moreover, most of the rural roads are too rough and uneven for people with disabilities to evacuate freely and swiftly.

In terms of social behaviour, the evacuation was evaluated positively, as it was carried out without accidents; the evacuees were calm and, in most cases, people with disabilities were assisted in some way.

In order to improve the response quality to an event, the Emergency Office has developed a Volcanic Eruption Drills program in places close to active and dormant volcanoes. During these drills, information is provided in maps, simple symbols, and voice system.

Videos have been developed with sign language, audio, and easy graphic signs of the steps to follow in case of alert, evacuation, and information with emphasis on the preparation and support network for people with disabilities.¹¹ This has been named “Inclusive Preparedness”. In addition to this, there is a document with information on the steps to follow in a very illustrative way, which is easy for everyone to understand.

9 National Geology and Mining Service (SERNAGEOMIN). The ABC of Volcanoes

10 Technical Evaluation Report. Drill for eruption of Villarrica Volcano 2017

11 Volcanic Activity Recommendations. ONEMI 2020 Document and Video

Key points

1. The interest in the subject in relation to people with disabilities can be seen in academia and research. In 2020, Natalia Astudillo, PhD and geologist from SERNAGEOMIN, presented the results of her research on strategies and tools for the inclusion of people with disabilities in the field of geoscience education and their inclusion in school emergency plans in the Metropolitan and Los Lagos Regions from a geological perspective. Her work was presented at the last international geologists' talks cycle.¹²
2. It is important to consider adequate signage, in simple language and iconography, at key locations and shelters.
3. There is a clear need for emergency vehicles adapted for people with disabilities and the elderly, who require mechanical devices to enter and exit (vehicular and pedestrian routes).

WILDFIRES

Author Kristine France Zúñiga

The presence of wildfires in Chile has been recorded since colonial times, however, it was not until 1964 that information on the occurrence and damage caused by them began to be systematized. Many of them have caused casualties and destroyed millions of hectares, houses, and sources of work.



Photo 8: The fire has consumed about 400,000 hectares (4,000 km²) of forests and villages.

The National Emergency Office has a specific emergency plan for wildfires in their "Prevent, Inform and Prepare Yourself".

Prior, during and aftermath

The National Civil Protection Plan establishes the use of the international typology, with three degrees of alert, following the traffic light colour-code: Green, Amber and Red.

- Green (Preventive Early Warning): it is a state of monitoring and awareness reinforcement. The risk conditions monitoring a probable threat in progress, with its respective vulnerability conditions, allow a fast reaction time.
- Amber Alert: this is established when a threat grows in extent and severity, which leads to the assumption that it cannot be controlled with the usual local resources, and additional resources must be prepared to intervene, according to the evolution of the event.

- Red Alert: it is established when the event grows in extent and severity, requiring mobilisation of all necessary and available resources for assistance and control of the destructive event. A Red Alert can be established immediately with the necessary extent and coverage, without a prior Amber Alert, depending on the characteristics of the situation.

In the event of an evacuation, the Mobile Phone Emergency Alert System (SAE) was incorporated with the aim of warning, reinforcing, and giving instructions to people during a wildfire affecting a community (Preventive Evacuation). For this purpose, the National Emergency Office provides information to activate the Cellular Emergency Alert System.

There is also complementary support (air and land resources from Emergency Office and National Forestry Office) that are requested when the resources of the Basic Forest Fire Plan are being fully deployed or when resources are not available in a timely manner. The Emergency Office has the responsibility to manage the request for complementary aerial and terrestrial resources. In the face of an event or threat, emergency office’s Regional departments and Forestry Office’s Regional Coordination and Operations Centre define the possible degree of awareness and committed resources to activate the System, immediately minimising the risk of loss of human lives or damage to the population.

The “Report on people with disabilities in the fires in Chile, 31st of January 2017”, drafted by NGO Inclusiva,¹³ visualised and projected the number of people with disabilities affected by the fires in January 2017 in municipalities of the Metropolitan, Valparaíso, O’Higgins, Maule, and Bío-Bío regions. By crossing data from the National Emergency Office and the Second National Study on Disability¹⁴, a statistical projection was made of people with disabilities who were potentially affected.

REGIONS	PEOPLE WITH DISABILITIES
COQUIMBO	3.711
VALPARAÍSO	103.203
METROPOLITAN	58.277
O’HIGGINS	23.208
MAULE	33.514
BÍO-BÍO	175.082
TOTAL	396.995

Table 2: Estimation of people with disabilities affected per region

Emergency Office is planning the optimisation and improvement of territorial management (Communal - Provincial - Regional) where there should be a resource registry with prevention plans where the location of people with disabilities are clearly identified to establish support networks.¹⁵

Videos have been developed with sign language, audio, and easy graphic signs showing steps to follow in case of alert, evacuation and information establishing emphasis on the preparation and support networks for people with disabilities.

Furthermore, in recent years, the National Forestry Office has incorporated people with disabilities in nature parks that seek to have a good customer service to the public in the short term, which implies, among other things, strengthening social inclusion, facilitating access to wilderness, and trekking routes for vulnerable population, such as the elderly and people with disabilities.

13 Kaiser. Situations report of people with disability during the forest fires ONG Inclusiva 2017

14 II National Disability Study 2015. <http://endisc.senadis.cl/resultados.html>

15 Ricardo Toro Tassara. ONEMI Management and prevention and preparedness for forest fires. 2018

In the context of urban fires, regulations have been adapted due to negative experiences. One of the most outstanding cases is the Santa María tower blaze on the 21st of March 1981, with eleven fatalities. In this fire, it was found out that the design of the surrounding area did not allow fire engines to get close to the source fire, to attack it effectively, rendering any attempt to extinguish the fire fruitless. This situation led to a mandatory implementation of evacuation plans for high-rise buildings in the building code.

The Chilean General Ordinance on Urbanism and Construction provides for evacuation routes that lead to specifically designed evacuation floors or to an upper evacuation terrace, neither route considers people with mobility impairment. The low-visibility evacuation guidance systems provide emergency lighting, but there is no audible guidance for blind people.



Photo 9: Tower Santa Maria, march 21, 1981

Key points

1. Park inclusion programs, which seek a high standard of accessibility and attention to the public for vulnerable population, the elderly and people with disabilities, are essential to have an adequate evacuation plan where the staff in charge knows how to assist people with disabilities and provide them with all the information about routes, paths, and trails that are created within the parks and wilderness areas.
2. Information must be provided in at least two ways: visually and aurally; with simple language and iconography that must contain all the relevant information about inclusive evacuation plans and protocols.
3. At an urban scale, it is necessary to consider evacuation protocols and systems for people with disabilities in buildings. Nowadays, there is no effective sheltering areas in buildings, as the lobbies provided for in the current regulations are not to shelter people, but projected for emergency services, such as firemen where they connect to the dry and wet networks.

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Author, co-author and technical assistant in studies and research on universal accessibility, internationally recognized by Walk Visionaries 2015 and Zero Project 2018, as references for Latin America and for the creation of national norms and standard.

GENERAL CRITERIA

From the 5 different types of disaster analysed, common general criteria are concluded: State Inclusive Master Plans are required for Prevention, Evacuation and Reconstruction. These plans include the State (economy, safety, health, and education), social organisations and the private sector in particular.

Risk Management Law

- Include in the emergency plans the surveyed location of people with disabilities in order to design strategies for a timely evacuation.
- Identify and set up spaces with universal access, designed to include safety measures to be retrofitted as shelters in facilities that allow fostering large amounts of people during an evacuation, such as educational and sports centres, or other types of buildings able to foster people provisionally.
- Train the general population and their local organisations on inclusive evacuation plans, and containment and collaboration strategies to face different contingencies.
- Add charts, maps and visual information which cover the wide group of people with disabilities.
- Inclusive Preparation through videos explained with easy-to-understand sign language, audio, and graphic signs. The videos have to show the steps to follow in emergencies, evacuation and information focused on the people with disabilities support network.
- Proper signs in key places and shelters, using simple language and iconography.
- Disaster drills that consider action in an inclusive evacuation in order to guarantee the rescue of the whole population in the shortest possible time.
- Optimise both terrestrial and aerial resources and aid for a timely rescue with emergency vehicles modified for people with disabilities and the elderly.
- Emergency offices have to look upon having instructive material for each type of natural disaster threat; these instructions are composed of specific instructions for people with disabilities.

- Establish coordinated road networks to improve access to accessible emergency transportation, modified for people with disabilities and reduced mobility and their caretaker.
- Shelter network coordination that displays the available shelters with universal access and provides the number and identity of refugees. The refugee identification information is to be shared with their families and the National Emergency Office.

State evacuation plans and programmes

- Aerial and terrestrial resources coordination, from both the state and the private sector, to optimise the resources and the surveyed information into a swift people with disabilities rescue operation.
- Keep timely communication by satellite telephone, and other available means, for containment tasks during the waiting time prior to rescue in disaster areas.
- Local communities' organisations collaboration to support with water, food, sanitary installations and refugee's aid.
- Deploy the coordinated road network plan to evacuate the affected people with the suitable emergency vehicles.
- Coordinate public offices to systematically survey and organise a register where all the gathered information helps to determine the amount of affected population, material loss and the extents of the disaster area.

Reconstruction plans and programmes

- Damage assessment to implement a diagnosis, and local and general reconstruction policies, including the needs of people with disabilities.
- Design diagnosis tools which allow a constant improvement in the damage evaluation and affected quantification.
- Define inclusive and preventive design directives in constructions, urban spaces, and urban and rural planning public policies, which consider the wide range of natural disasters threats in the area.
- People with disabilities have to take part in reconstruction policies, in order to accommodate their needs.
- Special governmental financing through reconstruction programs and damaged housing restoration, aiming at integration.
- Craft disaster response plans at a local scale, referencing people with disabilities.
- Integration education in which universities include in their study and research programs the need to include people with disabilities, the elderly and vulnerable groups.

Urban planning instruments

- The urban planning instruments have to be synchronised with other governmental institutions' guidelines, encompassing evacuation as well as reconstruction phases.
- The national emergency office has to develop a plan to optimise and improve land management (local - communal - regional) to have a resources' registry and prevention plans to clearly identify people with disabilities' location and to set up aid networks during disasters, in collaboration with the National Disabilities Service.

SPECIFIC CRITERIA

Earthquake

- High-rise buildings regulations have to be updated including seismic design gathered from earthquake experiences. If people with disabilities can go up, they need to be able to safely come back down during an emergency.
- In urban planning, it is mandatory to include risk maps.
- Create seismic monitoring networks.

Tsunami

- Widespread emergency information networks to warn the affected population about the risk of a tsunami.
- A framework plan is to be implemented with a methodology to be applied during earthquake and tsunami threats.
- Create a reconstruction master plan that includes a preventive and inclusive design considering areas affected by a tsunami.
- Tsunami emergency plan in which public and private sector safety services coordinate.

Landslide

- Draft a landslide route chart in order to avoid it and include this information in the land management policies.
- Widespread emergency information networks to warn the affected population, including people with disabilities, about the risk of a landslide.
- The Rainy Season Program and the emergency office drills have to be destined to people with disabilities.
- Landslide evacuation drills have to be inclusive.

Volcanic Eruptions

- Plan implementation to face volcanic eruptions and warn, inform, and prepare the affected population.
- Precise signalling at meeting points which clearly show the evacuated people that they have arrived into a low volcanic danger zone.
- A Volcanic Eruption Drill Program is recommended in places close to active volcanoes together with an evaluation of the drills assessing the accident rate, evacuee's calmness, and aid to people with disabilities.

Wildfire

- The National Civil Protection Plan adopts international typology usage with awareness degrees (green, amber and red).

- During evacuation, an Emergency Cellular Alert System can be added in order to reinforce and give instructions to the affected people during a wildfire emergency threatening a community.
- The National Emergency Office, as a state organisation, supplies complementary aerial and terrestrial resources to the Forestry Agency.
- Within the building code, a mandatory evacuation route has to be included in high-rise buildings. Evacuation routes include stairwells which lead to an evacuation storey or to a higher floor evacuation terrace. These routes must be apt for people with disabilities.
- Guidance evacuation systems need to have emergency lighting for situations with low visibility and acoustic cues for blind people.

GENERAL CONCLUSIONS

1. Risk Management Law

Disaster risk management has to be conceived as a cross-sector effort which improves the self-care abilities of people both at an individual and at a collective level, which allows a real risk reduction.

Create public policies on accessibility, starting from inclusion, raising awareness on preventive measures in the face of disasters, where the participation of people with disabilities is fundamental to be able to propose efficient and effective application methodologies from and for people with disabilities.

2. Accessible evacuation routes

Urban planning instruments must consider accessible route's continuity in order to provide an efficient evacuation. Accessibility chains in households or buildings in general have to be followed to safety meeting points, public spaces, and buildings where people with disabilities and the most vulnerable can be evacuated. Therefore, it is vital to create an application methodology for different natural disasters.

3. People with disabilities and the elderly in risk zones register

A register, in which all the information gathered by different governmental offices and related institutions, is proposed. This register should be used to create prevention plans to face the different types of disasters. It is recommended that the elderly and people with disabilities register is public and administered by only one institution.

4. Local aid network

At a rural and at communities' levels, the register will improve evacuation efforts, and will help the aid and collaboration networks between neighbours can be established DURING the event.

5. Accessible signalling

Every evacuation plan and preventive information should be designed with signalling and infographics with simple and easy-to-understand pictograms and language. This is necessary so that everyone can understand the presented information. Cognitive access is vital to provide a clear perception of the provided information as well as of the evacuation routes.

6. Accessible Transportation

It is essential for the evacuation of people with disabilities and the elderly to implement an accessible transportation system at a local level. Moreover, it is also beneficial in rural areas, where shelters are far away or in unpaved roads because these conditions set a barrier for vulnerable people.

ANNEX 1: EVALUATION GUIDELINES EXAMPLE

Example evaluation guideline for disaster or emergency drills in Chile, specifically Earthquakes and Tsunami.

Inclusive preparedness actions:

6. Inclusive preparation action (answer before and after the drill)

Nº	MATTER	YES	NO	N/A
6.1	The special needs of people with disabilities were identified to provide adequate help.			
6.2	The internal alarm system is visible (lights) in the case of people with hearing disabilities.			
6.3	The roles of the members of the educational community to provide assistance were identified and practiced.			
6.4	People with disabilities are assisted, who require it, throughout the evacuation.			
6.5	A comprehensive system of companions was observed who assisted those who required it, according to their needs			
6.6	The entrances, safe areas and evacuation routes allow accessibility for people with disabilities.			
6.7	There is a circuit that is not interrupted in any section with unevenness, narrow doors, or obstacles.			
6.8	There is an inclusive emergency kit, adapted to the needs of people with disabilities.			
6.9	An external support network is identified for the evaluation. Examples: neighbors, police, firefighters, municipality, or others.			
6.10	The seismic protection places in the security zone are accessible in the sensory and in the physical.			
6.11	Tsunami evacuation routes are suitable for the movement of people with disabilities.			

On Thin Ice

Marnie Peters. Canada

The Arctic and Canada's North is currently experiencing massive transformation. The very real and immediate impacts of climate change, a rapid increase in industrial activity, and a growing influx of southern and foreign workers to previously isolated communities and regions are all contributing to an increased risk of natural and human-made disasters. While the potential of **catastrophic events pose a danger to all members of Arctic society, it is persons with disabilities and other vulnerable groups who are at greatest risk.**

Fires, floods, infrastructure failures, food shortages, oil spills and epidemics, all represent real, immediate and serious threats to Northern communities. These emerging threats exacerbate the existing vulnerability of Arctic and far Northern communities, almost all of which are dependent on air or seasonal sea cargo deliveries from the south for the basic necessities of life, in particular food and fuel. Limited access to medical services, accessible transportation, geographic isolation, issues related to housing and the extreme weather conditions characteristic of the Arctic climate are all obstacles to the active engagement, inclusion, and safety of persons living with disabilities in the far North.

It must also be noted that the percentage of persons with disabilities living in Canada's the far North is generally higher than of the general Canadian population with, for example, twice the rate of hospital admissions due to injury (Nunavut Report on Comparable Health Indicators, 2011). The incidence of deafness in Inuit adults (i.e. hearing loss in both ears) has been found to be 24.8% (Moffat, 1994) with 19% of Inuit children aged 5-6 experiencing impairment in one or both ears (Gov't of Quebec, 2004); Fetal Alcohol Spectrum Disorder is six times the national average (Chief Medical Officer, Yukon, 2000). While these and other similar statistics for disabilities in the North indicate an above-average incidence of impairment and vulnerability in these communities, it must also be recognized that health statistics in the North are generally under-reported. This is the result of many social, cultural and linguistic barriers well as an inherent suspicion on the part of many indigenous Northerners, the legacy of failed public policies of the 50's, 60's and 70's where

chronically ill or developmentally-challenged patients diagnosed by Government practitioners were regularly removed to facilities in the south and lost forever to their families.

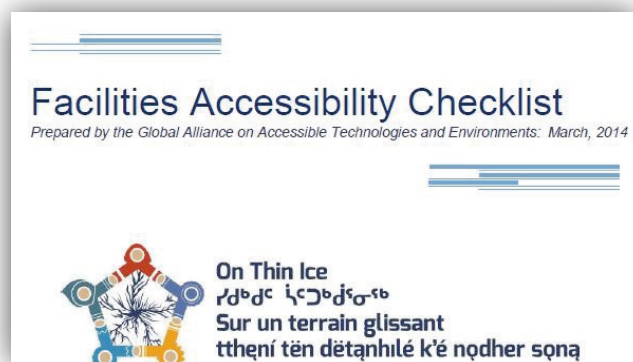
The objective of ON THIN ICE was to protect lives and improve the security, well-being, and inclusion of persons with disabilities (physical, cognitive and sensory) and other vulnerable populations in the Arctic. More specifically, this project sought to:

- Encourage regulatory compliance with relevant legislation, conventions, codes, and emergency protocols that protect the rights and safety of persons with disabilities and other vulnerable groups;
- Adapt international best practices in emergency management and disaster relief for persons with disabilities and other vulnerable groups to the unique geographical, cultural, and climatic situation of the far North;
- Increase public awareness and access to information on creating accessible environments, disability inclusive emergency preparedness strategies;
- Develop effective, as well as culturally- and linguistically-appropriate communication tools;
- Enhance emergency preparedness through disability inclusive emergency management exercise workshops and simulations;
- Improve the capacity of persons with disabilities to sustain their own lives and well-being in an emergency until help arrives;
- Establish the “No Friend Left Behind” program in all schools designed to encourage empathy and responsibility toward students with disabilities in the classroom and help ensure their safety in the event of an emergency in Northern schools.

PROJECT PHASE 1: **LEGISLATION, CODES AND STANDARDS**

Many of the organizations in the far North were unaware of the legislative obligations, whether it was to building codes and standards or to human rights. Therefore the first step was to determine relevant mandatory and optional legislation, codes and standards.

While organizations recognized there is a National Building Code in place, the far North lacks the expertise in accessibility to fully understand the impacts of addressing accessibility and more importantly, the detrimental impacts and consequences of failing to address it on people with a range of disabilities.



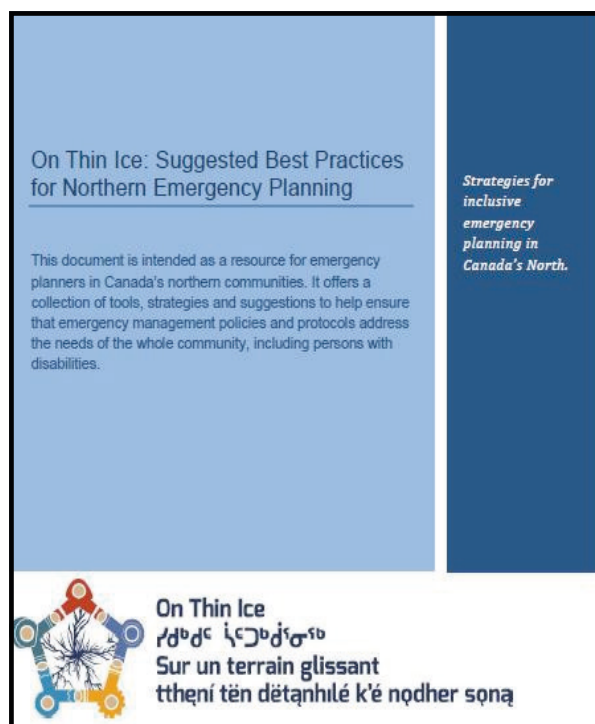
Developing a Facilities Accessibility Checklist to facilitate completing accessibility audits on community facilities and resources used in emergency situations was a necessary tool.

The guide was intended to be an assistive tool for individuals/organizations wishing and needing to evaluate the degree to which buildings and facilities met accessibility code requirements and standards. The checklists are based upon the technical specifications of the Canadian Standards Association (CSA) B651-10 Accessibility of the Built Environment Standard, and the National Building Code of Canada 2012 (NBC) as they relate to accessible design, with distinction made between them. Effort was made to simplify and condense wording and information, so as to allow for a more practical and user-friendly checklist for people without expertise in accessibility. Effort was also made to provide suggestions relevant to the use and construction of accessible buildings and facilities in a northern context.

PROJECT PHASE 2: **ADOPTION AND ADAPTATION OF BEST PRACTICES IN EMERGENCY PLANNING**

The On Thin Ice Project team conducted research into international best practices on emergency management that are inclusive of persons with disabilities, paying special attention to success stories in communications, use of technology and low-technology methodologies that have proven beneficial for use in other isolated or underserved regions of the world and that are appropriate for adaptation or implementation in communities in the far North.

A report was developed as a resource for emergency planners in Canada's northern communities. It offers a collection of tools, strategies and suggestions to help ensure that emergency management policies and protocols address the needs of the whole community, including persons with disabilities. The best practices presented in this document are currently in use in other jurisdictions, including several that are in use in the Nordic countries, many of whom experience similar; weather and climate, issues related to geographical isolation of communities, and the use of multiple languages.

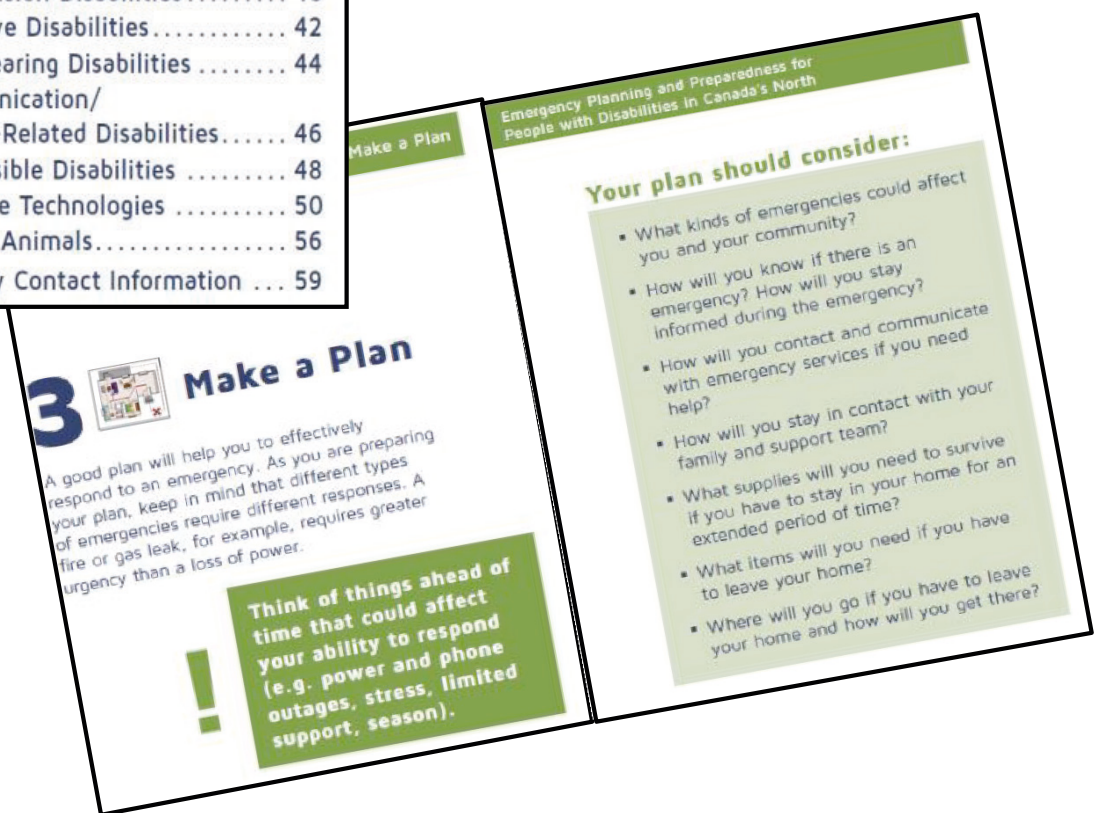


The best practices include information on the many ways to provide alternative means for the communication of information; strategies related to accessible sheltering; and the provision of accessible transportation to ensure the safety of persons with disabilities in an emergency or disaster situation.

This guide is intended to assist northern emergency planners and emergency management organizations (EMOs), as well as first responders and others who are responsible for the overall safety of Canada's northern communities, in developing emergency management strategies and plans that are inclusive of the needs of persons with disabilities. Recognizing that southern models of emergency management are not always suited for communities in Canada's North.

This handbook provides important emergency preparedness information for Northern persons with disabilities. The North is culturally and geographically diverse and the first part of the handbook provides general information about preparing for emergencies. The second half of the handbook includes tips and suggestions for different kinds of disabilities.

Be Aware	5
Create a Team	9
Make a Plan	11
Build a Kit	17
Responding to an Emergency	27
Tips for People with	37
Mobility Disabilities	37
Blind/Vision Disabilities	40
Cognitive Disabilities	42
Deaf/Hearing Disabilities	44
Communication/ Speech-Related Disabilities	46
Non-Visible Disabilities	48
Assistive Technologies	50
Service Animals	56
Emergency Contact Information ...	59



The handbook included the steps that people themselves need to take to help keep themselves safe until help could arrive. This included knowing the types of emergencies they could face, and checklists to help people develop personal emergency kits that would meet their needs. Everyone should have basic supplies on hand so that they can effectively respond to an emergency. The Ministry of Public Safety advises all Canadians to be prepared for a minimum of 72 hours. In the Arctic and Canada's far North, and especially in remote communities, people may need to be self-sufficient for up to a week. The guide helps people build a kit that reflects their local realities and personal needs.

PROJECT PHASE 4: EMERGENCY PLANNING TOOLS FOR EMERGENCY MANAGEMENT ORGANIZATIONS (EMOS)

First responders are eager to do the right things, and want to know what is the best way for them to provide assistance to people with a disability, particularly in an emergency situation. The project team worked with Northern not-for-profit groups and communities, First Responder organizations and persons with disabilities to build on the emergency management capacity of each community. The project incorporated the expertise of Northern groups such as the Arctic Rangers (part time military personnel resident in each community comprised entirely of Northerners, primarily Inuit and First Nations) as well as local volunteer Search and Rescue teams, Fire Departments and the local RCMP to adapt southern emergency protocols and tools to Arctic conditions and limitations and ensure that all existing Emergency Management assets are used to their maximum benefit. This phase involved the development of a number of tools and interactive workshops with EMO's and First Responders.

1. Tips and Tricks. Information for First Responders.



2. Disability Awareness Training for First Responders and EMOs.

A number of interactive workshops were held that included hands-on elements involving providing assistance to people with a range of different disabilities; learning to communicate without speaking, learning the challenges of evacuating people unable to provide assistance, etc.

3. Working with the EMOs and Department of Transportation – Plane Crash.



a range of disabilities being evacuated from a community.

The majority of communities in Canada's North are 'Fly-in Only' communities, not connected by any permanent roads. In some cases, there are winter roads enabling people to drive through forests and frozen lakes and rivers – but most are accessible only by plane.

As a result, emergency services are typically not immediately available from outside of the community, and plane crashes are a very real reality, particularly during community evacuations because of flooding or fires. The project team worked with First Responders, the EMOs and Department of Transportation on a simulation involving a crash of a plane full of elders and people with

PROJECT PHASE 5: EMERGENCY PLANNING TOOLS FOR NORTHERN SCHOOLS

The project team focused on developing tools and resources that would meet the needs of the communities in Canada's North. Throughout the project, it became clear that the schools and Departments of Education required tools related to

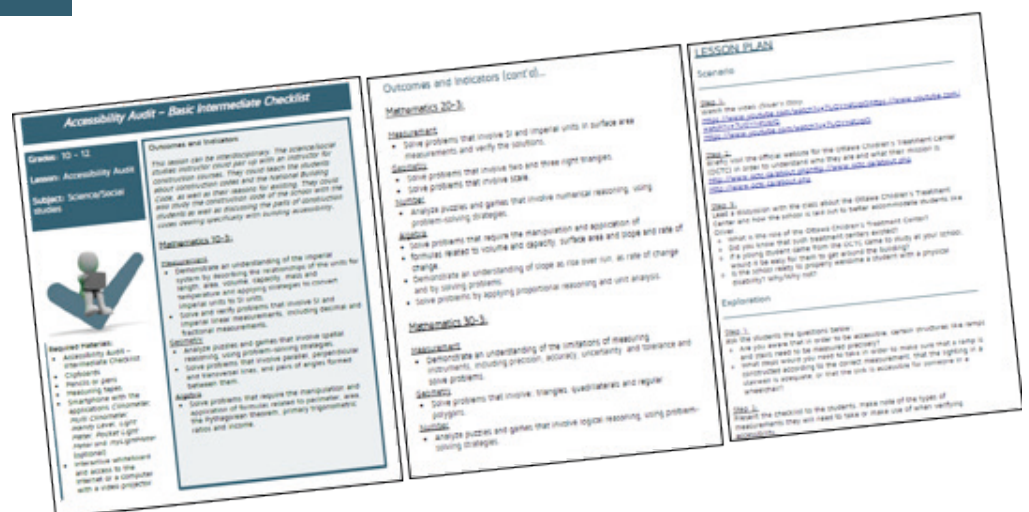
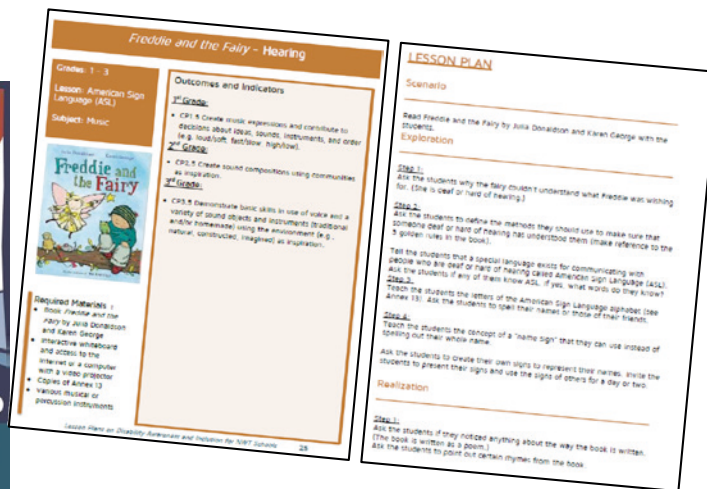
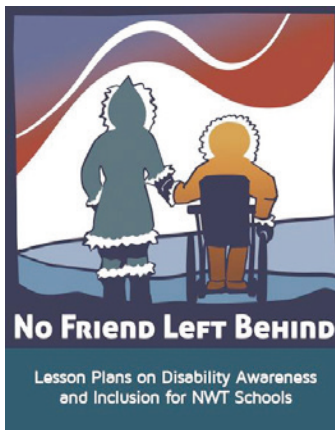
1. No Friend Left Behind

It was important that all kids in the school recognize that children with disabilities might need their help in an emergency.



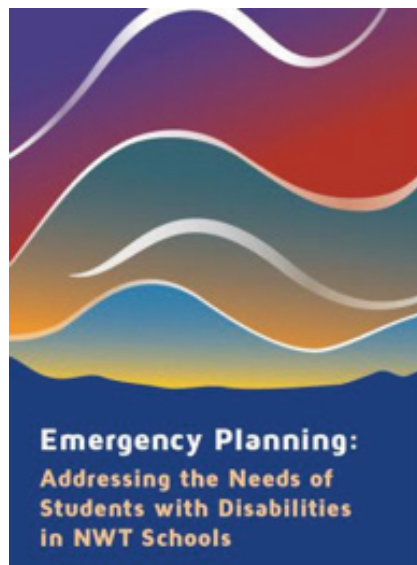
2. Lesson Plans - Disability Awareness

Children are curious by nature, and by understanding disability at an early age – they grow up to be more compassionate and understanding young people and adults. This ultimately results in a more inclusive society, where everyone is recognized for the valuable contributions they can make to society. Lesson plans were developed for grades 1 – 12, at a younger grades focusing on disability awareness through introducing topics in classes such as English and social sciences and physical education, and in older grades, focusing on how to create and maintain accessible and inclusive environments, using reasoning skills taught in classes such as math, science and engineering and addressing human rights in classes such as social sciences and law.



3. Emergency Planning: Addressing the Needs of Students with Disabilities in NWT Schools

The final step in the project was to assist the Departments of Education develop emergency plans for the school facilities that was inclusive of the needs of all students, including students with a range of physical, sensory and cognitive disabilities. The far North presents particular dangers associated with simply leaving the school during a fire, such as freezing cold temperatures, bears and other wildlife, lack of shelter, etc. it was particularly important to develop plans that included accessing community resources, such as snowmobiles and sleds for evacuating students with mobility devices, ensuring a plan and devices for communicating with people who are Deaf/deafened or hard of hearing, as well as people with communication disabilities, etc. The planning document recognizes the particular challenges of remote communities and integrates their already resourceful solutions.



 The image shows a sample form for a Personal Emergency Response Plan (PERP). The form is titled "Section 05 Personal Emergency Response Plans (PERPs)". It includes sections for "Student Information", "Abilities and Needs", and "Emergency Procedures". The "Student Information" section contains the following data:

Student Information	
Name	Miranda Catholique
Age	13
Support Person	Ms. Gargan

 The "Abilities and Needs" section includes:

Abilities and Needs	
Student Strengths	
Medical Needs	Miranda is comfortable with an emergency, she should be with a worker (Ms. Gargan) or Ms.
Communication Needs	
Sensory Needs	
Other Critical Information	
Emergency Kit Contents	

 The "Emergency Procedures" section is partially visible at the bottom.

The document includes information on evacuation, facilities management, staff training, developing individualized Personal Emergency Response Plans (PERPs), and providing assistance to students with disabilities.

Accessible Emergency Evacuation of people with disabilities and/or reduced mobility in sports competitions: Barcelona Olympic Pools

Author: Enrique Rovira-Beleta Cuyás Architect specialized in accessibility.
Director of the Rovira-Beleta Accesibilidad, SLP architecture and consulting studio.

UIC-Barcelona School of Architecture: lecturer in charge of the subject "Accessibility" and Accessibility review TFG. Director of the "Postgraduate in Accessibility and Design for All". (interactive online)

Publications: "White Book on Accessibility" -International Olympic Committee, "Guide to Accessibility of Material and Technical Aids for Sports Centers" Barcelona City Council; "Manual of Universal Accessibility in Sports Facilities" Higher Council of Sports and Spanish Paralympic Committee.

Collaborator in the drafting of accessibility regulations in force in Catalonia and Spain.

Responsible for the Accessibility Consultancy in the Sports Facilities and Olympic / Paralympic Villas of the Barcelona'92 Games. Facilities and pavilions of the Forum of Cultures Barcelona 2004. Zaragoza International Exhibition 2008. Monumental Complex of the Alhambra and Generalife of Granada, Nou Estadi Johan Cruyff FC Barcelona, Offices of companies collaborating with the ADECCO Foundation. Buildings of the City Councils of Barcelona and Badalona. Theaters and Libraries of the Department of Culture of the Generalitat of Catalonia. Accesses and entrances to PortAventura.

Winner of the Prize of the XIII Edition of the Randstad Foundation Awards 2018 in the category "Commitment and Inspiring Leadership", as a reference in the field of accessibility and creator of the concept of unnoticed accessibility.

Collaborators in the writing of this article: Eliana Pires de Souza, Architect specialized in accessibility.

ABSTRACT

The aim of this article is to analyze how the emergency evacuation of people with disabilities (PWD) and / or of people with reduced mobility (PRM) in sports facilities is conditioned. How can it affect their mobility and autonomy when there are differences in the emergency evacuation itineraries between a competition scenario and the usual one? As a practical case, the sports pools Bernat Picornell and Palau Sant Jordi, of the Montjuic Olympic Ring in Barcelona, are studied and analyzed through technical data, visits, and accessibility audits by means of comparing the solutions adopted in the 1992 Olympic Games, the 1992 Paralympic Games, and the 2013 Swimming World Cup.

As a practical conclusion, it is recommended an accessible evacuation for PCD / PRM and for people using wheelchairs from the stands, either at level or by ramps, coinciding with the same access route to their reserved places. An alternative evacuation itinerary for the general public is also recommended. This will help to improve the requirements of current accessibility regulations based on the creation of "special rescue areas for PCD / PRM", and on protocols to assist their evacuation with the assistance of volunteer personnel and specialized emergency bodies, because it is not possible to use the existing elevators in the facility to evacuate the building in case of fire or another emergency, as they are not sectorized.

Keywords: Accessible emergency evacuation, people with disabilities and / or reduced mobility (PCD / PMR), competition venue, public swimming pools, accessible areas or spaces reserved in the stands for PCD / PMR.

INTRODUCTION

The concept of sustainable development was introduced on the international agenda in 1988, within the framework of the World Commission of Environment and Development -Brundtland Commission-, through the report "Our Common Future"¹. Its integration into the different areas of life involved a reflection on how this concept also affected sports facilities.

The holding of the Olympic Games and the Paralympic Games in Barcelona in 1992 entailed the implementation of new accessibility regulations by the Generalitat of Catalonia. These regulations were published before and after the Games², and later the municipal ordinance of Barcelona included them on fire protection measures^{3 4}. These measures, together with the promotion of accessibility in the practice of sport, have since then been expanded and included in the planning and government strategies of the city through the Municipal Institute for People with Disabilities (IMPD), and the Barcelona Sports Institute (IBE)⁵, making it one of the most accessible cities in Europe today.

1 World Commission on Environment and Development. Brundtland Commission. "Our Common Future". 1988. Madrid: Alliance. ISBN 84-206-9574-2

2 Generalitat of Catalonia. Law 13/2014, of October 30, on accessibility that repeals Law 20/1991 of November 25, on the promotion of accessibility and the removal of architectural barriers; and its regulations remain in force. Decree 135/1995, of March 24, developing Law 20/1991 and approving the Accessibility Code.

3 Barcelona City Council. Municipal ordinance of fire protection conditions. Agreement of the Plenary Council of 27-6-1997. <http://w110.bcn.cat/fitxers/ajuntament/consolidadescast/incendis1997.019.pdf>

4 Barcelona City Council. Municipal ordinance of fire protection conditions (2008). Agreement of the Plenary Council of 29-2-2008. http://www.webaero.net/engineering / especificaciones_y_normas / NB / Municipal / Barcelona / Barcelona / contra% 20incendios.pdf

5 Rovira-Beleta. E. - Barcelona City Council. (2012). Barcelona Sports Institute. Program 'L'Esport Inclou'. Guide to accessibility of material and technical aids for sports centers". <http://www.bcn.cat/lesportinclou/ca/documents.html>

The application of these policies resulted in the improvement of the accessibility conditions throughout Catalonia. This has meant an improvement in the quality of life of all its users and especially of people with disabilities (PWD), given their sporting and economic importance, which has contributed to their inclusion and recognition as consumers⁶. This is relevant since, according to statistical data on the population with disabilities and sports practice prepared by the Spanish Committee of Representatives of People with Disabilities (CERMI), almost one million people with disabilities practice "adapted sports" in their free time; that is to say, approximately a quarter of the population with disabilities.

The aim of this article is to analyze how the emergency evacuation of PCD / PMR in sports facilities is conditioned when an unusual scenario such as a competition is taken into account, how it can affect the autonomous mobility of these users, and the differences in emergency evacuation itineraries between a competition setting and the usual one.

In 2017, the 25th anniversary of the Barcelona Games, internationally considered one of the best in history, was commemorated. Since then, the Olympic / Paralympic sports facilities of the Montjuic Ring have been promoted for the regular use of all citizens and foreign visitors, which leads to its continuous use, both in the practice of recreational sports and in sports competitions.

As a practical case, we have chosen the sports pools of the Montjuic Olympic Ring, Palau Sant Jordi and Bernat Picornell Swimming Pools to carry out the analysis of accessible emergency evacuation in three different competitions: the 1992 Olympic Games, the 1992 Paralympic Games, and the 2013 Swimming World Cup. Thus, it was possible to compare the improvements made during the period of time between these competitions in the two facilities. In all cases, the evacuation from the stands of PCD / PMR that attend these competitions as public has been specially analyzed.

The information presented has been based on the plans and technical data of the facilities, the face-to-face visits made, both during and after the competitions, as well as on the reports and accessibility audits carried out by the Area for the Suppression of Architectural Barriers of the Paralympic Division of the 1992 Barcelona Olympic Organizing Committee, and by the organization of the 2013 Swimming World Cup. The results allow us to identify and compare the alterations made in the access routes to the stands and in the accessible emergency evacuation routes, their signage, and information in each competition scenario, regarding the access route to the stands and the evacuation routes commonly used by the general public, without having to design "rescue areas" as currently required by regulations.

6 Paramio-Salcines JL, Kitchin PJ. "Institutional perspectives on the implementation of disability legislation and services for Spectators with Disabilities in European professional football". *Sport Management Review*. 2013. Vol. 16-3. p. 337-348. DOI: 10.1016 / j.smr.2012.11.002

EMERGENCY EVACUATION FOR PEOPLE WITH DISABILITIES AND / OR REDUCED MOBILITY

Worldwide, the parameters regulated in the accessibility regulations for buildings for public use have had a great evolution over the last decades, thanks to the efforts made by all the institutions, associations and technicians involved in their drafting. In Spain, between 1995 and 2005, the 17 regional accessibility regulations were developed, all presenting similar requirements, but with different levels of demand. For this reason, in order to achieve unique accessibility criteria throughout the State, between 2006 and 2016 different regulations were published at the state level, to regularize measures and concepts, such as the Technical Building Code-CTE⁷, ⁸ and, since then, when works are carried out, the most demanding accessibility requirements between state and regional regulations must be applied. However, all these regulations focus their demands on access and use of facilities, leaving for now in the background the treatment of accessibility in emergency evacuation.⁹

- It is necessary to address the challenge of promoting and facilitating safe, accessible and autonomous evacuation of the public and organizers present in the stands of sports facilities. In this sense, it is useful during the definition of priorities for action in building design to take into account the definition of the evacuation process made by Kobes et al.¹⁰ It distinguishes a sequence of actions formed by a first "pre-movement stage", considered decisive for survival, as it is when the individual is aware of the danger, which is quickly followed by the "movement stage". Therefore, the emergency situation is related to the motor, sensory and cognitive functions of the individual, so it is recommended that the information that is provided by the emergency alarm systems and by the marking of accessible evacuation routes, be reinforced in competition situations both for the unfamiliar users, and for those ones in the installation. Users to whom "special attention" must be paid in the event of an emergency evacuation are people with motor, visual, hearing and / or cognitive disabilities and also, those with temporary difficulties in their movements such as: very old people, pregnant women in the last months of gestation, and people or families who accompany very young children or/in baby carriages... because of that to a greater or lesser extent escape routes need to be as accessible as possible in order to evacuate the facility.

The speed of response required during an emergency situation usually causes the first escape route to coincide with the access route taken by each individual when entering the building. It is recommended that the accessible routes that lead from the access of the building to the squares or areas reserved for PCD / PMR in the stands be as direct as possible. This will facilitate the ability to orient its occupants with respect to the exit, allowing them to act autonomously from the first moment, avoiding overly long routes and passing through areas of massive use intended for the general public. It is especially important to emphasize the signage of the evacuation routes accessible to PCD / PRM, when these do not coincide with the routes intended for the evacuation of the general public.

7 Ministerio de Fomento, Spain. (2010b). SUA Basic Document Safety of Use and Accessibility. http://www.codigotecnico.org/web/galerias/archivos/DB_SUA_19feb2010_comments_2Dec2011.pdf

8 Ministerio de Fomento, Spain. (2010a). Basic Document YES Safety in case of fire http://www.codigotecnico.org/web/galerias/archivos/DBSI_19feb2010_comentarios_16dic2011.pdf

9 Rovira-Beleta E, Cuerva E, Pires de Souza E, Planas C, Alavedra P. "Accessibility of emergency evacuation of persons with disabilities in public swimming pools in Barcelona, Spain: a review of literature and regulations". Architectural Engineering and Design Management. 2015. Vol. 11-6. p. 475-487. DOI: 10.1080 / 17452007.2015.1056720

10 Kobes M, Helsloot I, de Vries B, Post JG, Oberijé N, Groenewegen K. "Way finding during fire evacuation; an analysis of unannounced fire drills in a hotel at night. Building and Environment". 2010. Vol. 45-3. p. 537-548. DOI: 10.1016 / j. buildenv.2009.07.004

DESCRIPTION OF THE CASE STUDY: THE SWIMMING POOLS OF THE MONTJUIC OLYMPIC RING, BARCELONA



1. National Institute of Physical Education of Catalonia
2. Bernat Picornell Pools
3. Montjuic's Olympic Stadium "Lluís Companys".
4. Palau Sant Jordi
5. Calatrava's Tower – Telefonica
6. Real Spanish Federation of Baseball
7. Municipal Sports Center "Pau Negre"
8. Gardens of Joan Maragall
9. National Museum of Art of Catalonia
10. "La Fira Barcelona"
11. Magic Fountain of Montjuic
12. Botanical Garden of Barcelona



Fig. 1. Montjuic Olympic Ring, Barcelona. Facilities, accesses and accessible routes

The Olympic Ring is a sports area that groups together the most emblematic facilities that were used in the 1992 Olympic and Paralympic Games in Barcelona, as well as in the 2013 Swimming World Cup. Our study focuses on the analysis of accessible emergency evacuation in the existing sports pools in said territory: Bernat Picornell and Palau Sant Jordi Pools (Figure 1).

Palau Sant Jordi

Built for the 1992 Games, it was designed as a multifunctional pavilion. The pool is not permanent, but it is installed as ephemeral architecture, for the specific sporting event, and disappears at the end of it.

This equipment is the usual setting for concerts, events and competitions of different kinds on a continuous basis. The evacuation of the public in case of emergency is both by stairs and by ramps that connect the different levels of the stands with the interior and exterior of the building, since the existing elevators cannot be used in these circumstances.

Bernat Picornell Pools

They were built in 1969 for the European Swimming Championships held in Barcelona in 1970, and later they were conditioned for the 1992 Barcelona Olympic Games and Paralympic Games. The Olympic Organizing Committee of the Barcelona Games (COOB'92) allocated several reserved spaces in the stands for PCD / PMR, free of obstacles and with direct access by ramps, which also facilitated vertical movement as an emergency evacuation route for all users. There is also an alternative elevator to the internal stairs, which allows access to the three levels of the building, as well as a ramp for secondary use, which connects the indoor training pool with the outdoor competition pool.

The Bernat Picornell Pools have a daily use, apart from the realization of sporting events. This fact makes its accessible design particularly relevant, since, because it has a sports facility for regular use, it presents permanent accessibility conditions for all its users.

ANALYSIS OF THE EMERGENCY EVACUATION IN SPORTS COMPETITIONS IN THE SWIMMING POOLS OF THE MONTJUIC OLYMPIC RING

1992 Olympic Games and Paralympic Games

The design, construction, and remodeling of these facilities was conditioned by the holding of the Olympic and later Paralympic sports competitions, where there was a large influx of people with disabilities, many of them with reduced mobility. The Organizing Committee had a group of architects specialized in accessibility, responsible for reviewing all projects, works, and fittings for the Games. As a result, the measures to achieve accessibility in these facilities exceeded the requirements of the regulations in force at the time, establishing a new baseline in this matter, according to the report "Architectural and urban accessibility in the Barcelona Olympic and Paralympic Games '92"¹¹.

The complexity of the needs of the Games, with a great profusion of athletes and Paralympic spectators, drove many of the innovative accessibility measures in these facilities. For example, with regard to the emergency evacuation of PCD / PMR, it was decided to raise the possibility that they could evacuate the buildings by their own means, a totally new measure since the regulation on the matter was very little developed.

1. PALAU SANT JORDI.

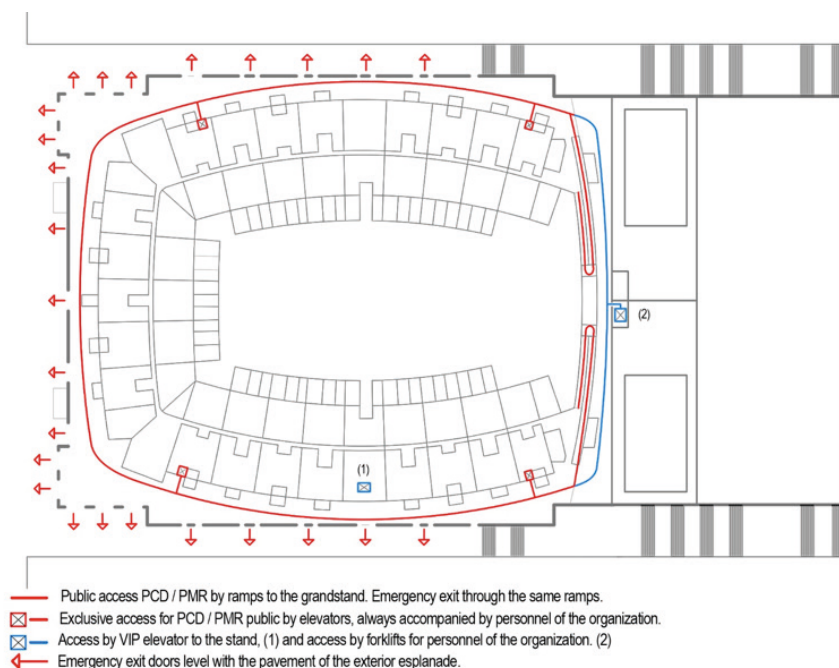


Fig. 2. Palau Sant Jordi, 4th floor. Level access from the esplanade of the Olympic Ring and accessible routes. Olympic Games and Paralympic Games of Barcelona 1992

The public attending the installation accesses directly from the esplanade of the Olympic Ring, through the different existing entrances on that level (Figure 2). Once inside the building, to go to the areas set up in the stands for PCD / PMR and their companions, 4 elevators, which connect the different levels, can be used; from street level to the race track. These lifts are for the exclusive use of the competition organization and facility staff, and can only be used by outsiders if they are accompanied by accredited personnel, who have the key to operate them.

11 Cabezas G. "Architectural and urban accessibility in the Olympic and Paralympic Games of Barcelona 92". Separata of the Bulletin of the Royal Board of Prevention and Care for People with Disabilities, Ministry of Social Affairs. 1993. Vol. 26. p. 7-32.

The building also has two routes through interior ramps of two sections with an accessible intermediate landing, each located next to the stage, to go to the areas set up in the stands for PCD / PMR. They are accessed from the 4th floor, through the wide side corridors of circulation. These ramps end at the intermediate level of the corridor on the second floor of access to the stands, where the eight areas reserved exclusively for PCD / PRM spectators and wheelchair users and their companions are evenly distributed. This corridor is also used as an emergency evacuation route by all spectators. The organization of the Games considered that these ramps did not have to reach the lower level of the competition tracks, in order to prevent the general public from being able to access these specific areas for athletes during the competition.

There are other evacuation routes accessible from the 4th floor of the Palau Sant Jordi, on the outside of the side corridors, which have several emergency exits for all spectators, all at the same level and with direct access to the outside.

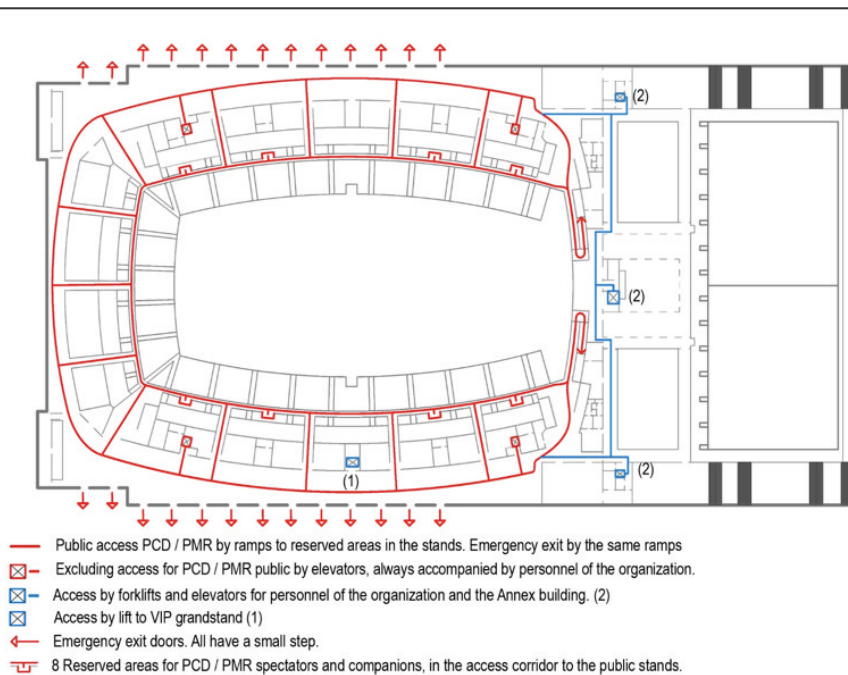


Fig. 3. Palau Sant Jordi, 2nd floor. Circulation through the access corridors to the public stands, and the location of the 8 areas reserved for PCD / PMR. Olympic Games and Paralympic Games of Barcelona 1992.

From the intermediate level of the access corridor to the stands on the 2nd floor, the PCD / PMR can ascend the ramps to the 4th floor and evacuate the building through the different side emergency exits. There are other accessible evacuation routes on the 2nd floor, from the access corridor to the stands and to the areas reserved for PCD / PRM, through the corridors and circulation areas of access to the emergency exits and direct evacuation to the outside of the installation. In the case of PCD / PRM, these outdoor areas become "rescue areas", since the ascending or descending routes are always through the stairs, towards the upper esplanade of the Ring or to the lower floor, where the track is located (Figure 3). The elevator to access the VIP box is not sectorized.

Other accessible emergency evacuation routes on the 2nd floor are through the corridors that communicate horizontally with the Sant Jordi Club annex building, and through its large elevators (2) that can be used in case of evacuation, as they are located in safe areas with sectorized fire doors between the two areas, corresponding to the Palau Sant Jordi and the annexed Sant Jordi Club (Figure 3).

2. BERNAT PICORNELL POOLS.

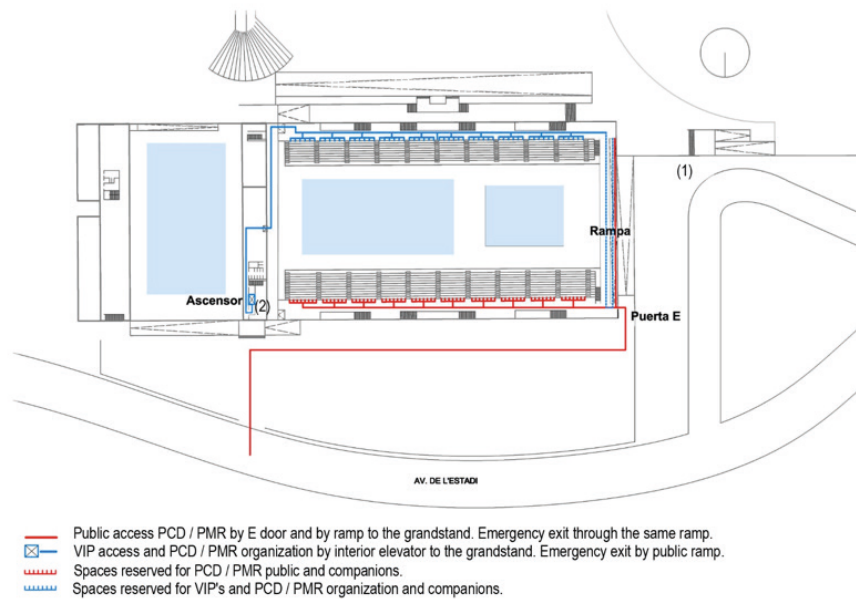


Fig. 4. Bernat Picornell pools. 2nd floor. Accessible accesses and routes to the stands with spaces reserved for PCD/PMR and companions. Barcelona 1992 Paralympic Games.

Swimming competitions are usually held in the outdoor pool, the indoor one being restricted for the athletes' trainings. During the 1992 Games, the public accessed the pool stands directly through the stairway entrances on Avenida de l'Estadi, while the PCD / PMR accessed the same stands through an accessible alternative entrance ("door E"), located on the side façade of the building (Figure 4).

This entrance has a ramp with several sections. One of them gives direct access to the lower level, where the athletes and organizers are located, on the beach around the pools, and two other sections communicate with the lower and upper levels of the stands for the public, the press, the VIP's and the organizers. In them, the different areas reserved for PCD / PRM were located. Many of them were wheelchair users and their companions. These areas were set up mainly in the upper part of the fixed outdoor stand –located next to Avenida de l'Estadi–, the public one, and located opposite the press, VIP's and organizers, next to the authority's box area. Both stands present an evacuation itinerary by exterior ramp coinciding with the access route.

2013 Swimming World Cup

In relation to their original configurations, the swimming pools of the Olympic Ring did not have significant interior renovations to host the 2013 Swimming World Cup competition. A new configuration for public circulation was carried out through the outer area of the Olympic Ring esplanade, with the objective of facilitating accessibility and mobility for all users. This modification was due to the creation of an outdoor recreational area for the public located on the esplanade between the Olympic Stadium, the Palau Sant Jordi and the Bernat Picornell Swimming Pools (Figure 5). In this area, provisional spaces were set up for the sale of tickets, bars and restaurants, as well as a stage for concerts, in addition to other ephemeral facilities designed to provide the public with greater leisure opportunities in the intervals of the competition. With these changes, this entrance space to the Olympic Ring concentrated public access to the event, redistributing external routes through the esplanade to the different facilities used for each competition.

1. BERNAT PICORNELL POOLS

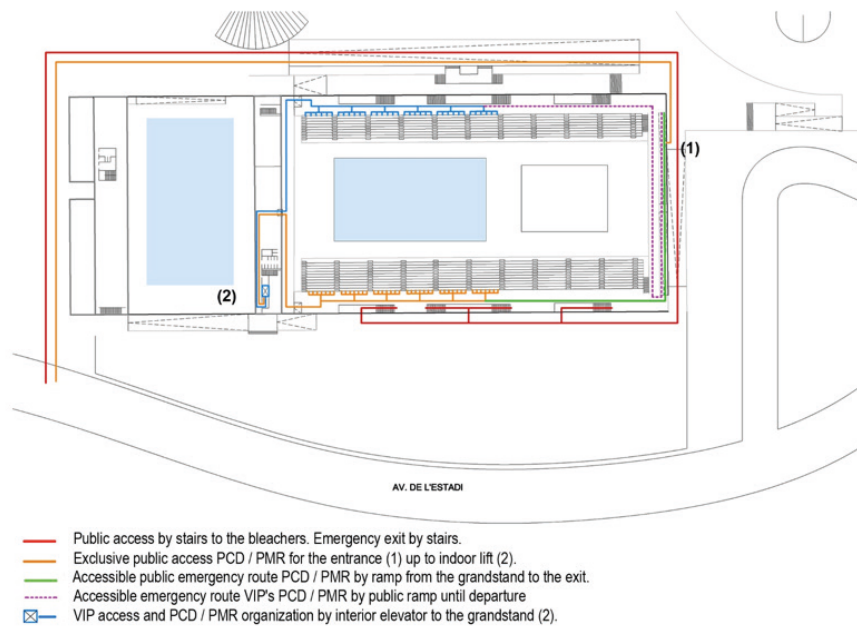


Fig. 5. Bernat Picornell pools. 1st Floor. Accesses and circulations to access the stands. Swimming World Cup 2013

The accesses to the public stands were the same as those used in the 1992 Games, but in the 2013 Swimming World Cup, public access controls were located on the outer esplanade of the Olympic Ring, located at the back of the building. This alteration increased the distance of the routes taken by all the spectators, as they had to go around the installation from the esplanade to the stair accesses to the public stands located on the façade of Avenida de l'Estadi. (Figure 5).

In the case of the PCD / PMR and their companions, after passing the access controls located on the esplanade of the Olympic Ring, the organization of the competition proposed a new interior route accessible to the areas reserved for PCD / PMR, located in the public stand on the upper level, which made it possible to reduce the length of these routes (Figure 6), with exclusive access via the existing ramp at the door (1), located at the level of the pool beach. These routes were restricted, so they had to be made always accompanied by personnel of the organization, and had to be accessed through a route below the public stands until the elevator was reached (2). In order to reach the first level and the cafeteria the outdoor terrace had to be accessed by ramp, and from there also by another ramp to the reserved spaces. This route through the elevator was also used by the organization for the access of personalities PCD / PMR to the reserved area in the box of authorities, in the stands located in front of the stands of the public.

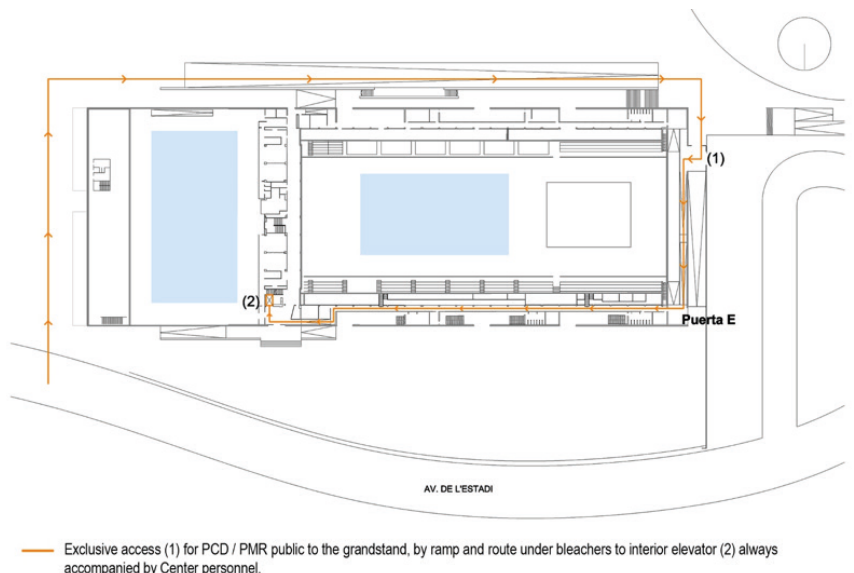


Fig. 6. Bernat Picornell Pools, Ground Floor. Access and accessible route for the public PCD / PMR. Swimming World Cup 2013

2. PALAU SANT JORDI.

During the 2013 Swimming World Cup, the usual accessible entrances and the entrances from the outer level of the Olympic Ring esplanade were maintained, and the routes inside the facility normally used by spectators were not altered. The areas reserved for PCD / PMR wheelchair users and companions were also located in the corridors of the 4th and 2nd floors, connected to each other by the existing ramps located on the sides of the stage and conveniently marked with the ISA - International Symbol of Accessibility, as well as in the personalities box accessible by interior elevator in the stands.

COMPARED RESULTS

The original configuration of accessible emergency evacuation routes in these sports pools was established at the Olympic Games and the Paralympic Games, both in 1992, as the demands of the Paralympic program endowed these buildings with a series of innovative accessible emergency evacuation measures. The need to carry out large-scale reforms to guarantee that the PCD / PMR who attend as spectators can evacuate autonomously is very limited. Despite the fact that the existing situations in the different sports competitions analyzed produced certain modifications and altered the configuration of some routes and elements, no significant changes have been identified in these facilities with respect to the original emergency evacuation systems and itineraries.

It is necessary to emphasize that in these more than 25 years that they have been in use, the conception of the sporting event has changed in an ostensible way. Currently, a competition lasting more than three days is not understood without an environment with complementary activities, which entails an additional challenge in accessibility and emergency routes for PCD / PRM. The exterior esplanade of the Olympic Ring of Barcelona is not an exception, and despite having a very good conceptual base in the original design, the maximum use of the spaces in favor of more areas for the leisure of the spectators caused, during the 2013 Swimming World Cups, an increase in the distances to travel from the access to the evacuation of spectators. However, this did not imply a penalty in the functionality or in the adequacy of these facilities.

CONCLUSIONS

From the analysis of the swimming pools of the Montjuic Olympic Ring, it appears that the emergency evacuation of PCD / PMR who are among the public in a competition setting poses many challenges. When a facility hosts a massive event such as a championship, in addition to the main sporting use, other complementary uses of leisure, entertainment, restoration... are needed. This has to be considered when planning evacuation systems and emergency procedures for PCD / PMR, as they can lead to significant changes in their usual parameters. A basic principle resides in the definition of accessible evacuation routes, because the people who attend these events do not usually know the facilities in advance, so their ability to orient themselves inside the building is linked to the route they have taken to access the space.

For this reason, we propose that an ideal configuration of accessible evacuation is one in which the access routes to the squares or areas reserved for PCD / PRM and their companions in the stands, are the same as those used during their evacuation. These accessible routes should be as direct as possible, on level ground or by ramps, even with a steep slope if the evacuation is in the "downward direction" or through "sectorized elevators", which allow their use when they are

not exposed neither to smoke nor to fire, avoiding too long routes and passing through areas of restricted use. In order to facilitate the orientation of its users regarding the exit, allowing the PCD / PMR who come as a public to act autonomously from the first moment, without needing the help of members of the organization or personnel from specialized bodies to evacuate the building, as they have sufficient visual and / or auditory information on the location of the emergency exits. It is advisable to reinforce said signaling both acoustically and visually, in the event of a competition. Temporary modifications that suggest the use of different routes for access and evacuation are neither desirable nor recommended.

In the case of evacuation accessible for PCD / PMR at the sports pools of the Olympic Ring of Barcelona, when comparing the accessibility in the emergency evacuation itineraries in some facilities that have had a high degree of usability since their construction, it can be affirmed that, having carried out a rational design of the same, beyond what the regulations indicated at the time of its construction, it has allowed to achieve the necessary flexibility conditions for the versatile adaptation of each installation to the different circumstances that they have had to face, especially after proving in the research carried out that there is no synergy between the rules relating to fire protection and the content of scientific publications on the evacuation of people with disabilities, where it was found that the regulations do not take into account the possibility that PCD / PMR may evacuate buildings on their own during emergency situations without having to wait in "rescue areas" to be evacuated by certified personnel.

Therefore, it can be affirmed that, in addition to compliance with regulatory requirements, measures are necessary to promote the enhancement of signage and ease of orientation with respect to emergency exits from within the enclosure, especially in those evacuation routes that are accessible to PCD / PMR, and do not coincide with the evacuation routes of the general public, in order to avoid interference between the different traffic flows and thus facilitate the safety of the evacuation of all the occupants of the installation.

Sharing on Temporary Quarantine and related Facilities in Hong Kong

by the Architectural Services Department, HKSARG. Hong Kong

The Architectural Services Department (ArchSD) of the Hong Kong Special Administrative Region Government is committed to collaborating with our industry partners, user departments and stakeholders in developing and maintaining the public facilities for providing a better service to the general public. It is believed that through collective wisdom, experience and talent, we will be able to bring about continuous improvement on the public works and the quality living environment for the public. We also search for innovative building solutions for constructing a more resilient, sustainable and quality built environment for our city.

In response to COVID-19 which is highly infectious and fast-spreading, the Government has implemented a comprehensive and coordinated approach to protect the health of the community. One of the measures is to make available suitable premises for quarantine. ArchSD had been tasked to build large number of temporary quarantine facilities within the shortest time with a view to obviating risk from the rapid and wide spread of virus in the local community. We needed to study the requirements of this unique quarantine facilities with the healthcare experts; the construction methodologies and materials readily available with the contractors; the safety and hygiene control with all related authorities such as on rescue and waste disposal strategies. To make this impossible mission possible, a great project team of multi-discipline was established to undergo vast volume of liaison work, technical studies, design development, securing of funds, identifying contractors and suppliers, contract management and site supervision, within an extremely tight timeframe. The Government has completed ten projects to date, with more than 4000 quarantine units delivered which adopted the Modular Integrated Construction (MiC) technology.

Apart from the quarantine facilities, with the support of the Central Government, we also set up community treatment facility in the AsiaWorld-Expo (AWE) and are constructing a temporary hospital next to the AWE which is expected to complete in Jan 2021 to enhance the Hospital Authority's capability to provide isolation facilities and treatment for patients so as to help meet the challenges brought by any future changes in the epidemic situation.

OUR JOURNEY ON “FIGHTING THE VIRUS”

On January 25 this year, the HKSAR Government activated the ‘Emergency Response Level’ of the ‘Preparedness and Response Plan for Novel Infectious Disease of Public Health Significance’ to contain the spread of COVID-19, which is highly infectious and fast-spreading. The Government has implemented a comprehensive and coordinated approach to protect the health of the community and adopted the four “must-haves” as suggested by experts for our anti-epidemic measures: Testing, Tracing, Quarantine and Isolation or “TTQI”.

Quarantine

One of the measures is to make available suitable premises for quarantine. The Architectural Services Department (ArchSD) had been tasked to build large number of temporary quarantine facilities within the shortest time with a view to obviating risk from the rapid and wide spread of virus in the local community. We needed to study the requirements of this unique quarantine facilities with the healthcare experts; the construction methodologies and materials readily available with the contractors; the safety and hygiene control with all related authorities such as on rescue and waste disposal strategies. To make this impossible mission possible, a great project team of multi-discipline was established to undergo vast volume of liaison work, technical studies, design development, securing of funds, identifying contractors and suppliers, contract management and site supervision, within an extremely tight timeframe.

Isolation

Apart from the quarantine facilities, with the support of the Central Government, we also set up community treatment facility in the AsiaWorld-Expo (AWE) and to construct a temporary hospital next to the AWE to enhance the Hospital Authority’s capability to provide isolation facilities and treatment for patients so as to help meet the challenges brought by any future changes in the epidemic situation.

Looking ahead, we truly believe that the whole construction industry can come and work again together amid the highly uncertain global pandemic to accept challenges. We also see the love and care from everyone for Hong Kong through the delivering of the facilities. Together, the construction industry build to fight the Virus.

QUARANTINE FACILITIES

As at Oct 2020, 7 projects were completed, with a total of more than 2000 quarantine units delivered, through the collaborative effort of inter-departmental teams and the construction industry stakeholders. It is expected that over 4 000 quarantine units will be available following the completion of the last phase of the purpose-built quarantine facilities at Penny's Bay. The latest status of the newly constructed quarantine facilities at different sites in Hong Kong:



- Upper Lei Yue Mun Park – Basketball Court, with 118 units in single storey high, completed in February 2020 in 26 days.

- Lower Lei Yue Mun Park – Football Pitch, with 234 units in partially single storey and partially 2 storey high, completed in April 2020 in 56 days.



- Sai Kung Outdoor Recreation Centre, with 99 units in 3 storey high, completed in April 2020 in 77 days.

- Pat Heung Junior Police Call Permanent Activity Centre, with 120 units in 2 storey high, completed in April 2020 in 66 days.



- Penny's Bay Phase 1, with a total of 800 units, completed in July 2020 in 145 days.

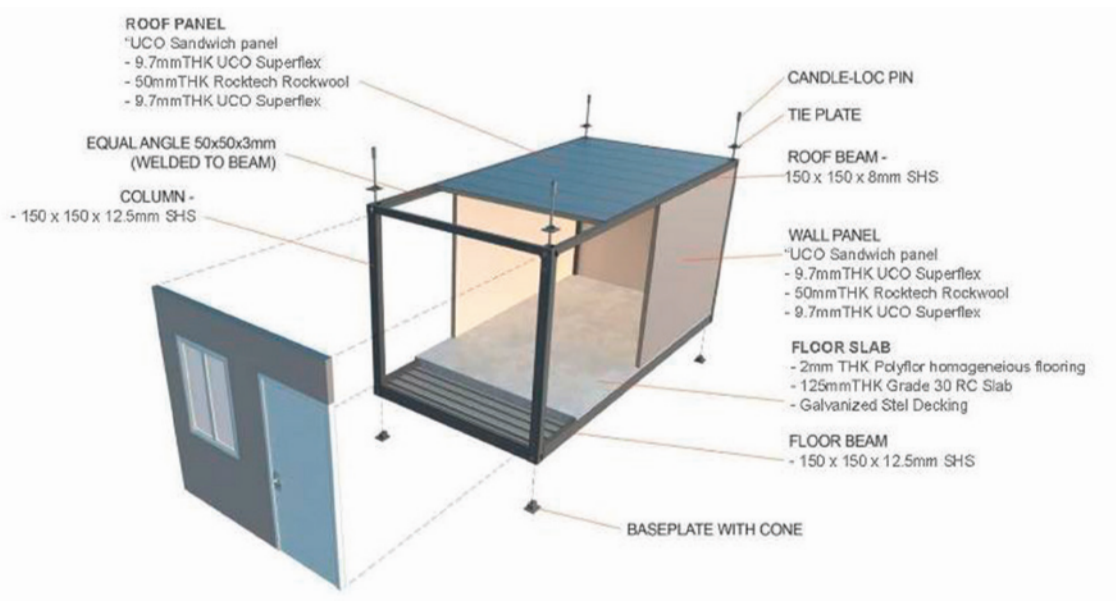
- Penny's Bay Phase 2, with 700 units in 2 storey high, completed in September 2020 in 87 days.



- Penny's Bay Phases 3 and 4, with 2000 units in 2 storey high, are under construction, and target to be completed in the end of this year.

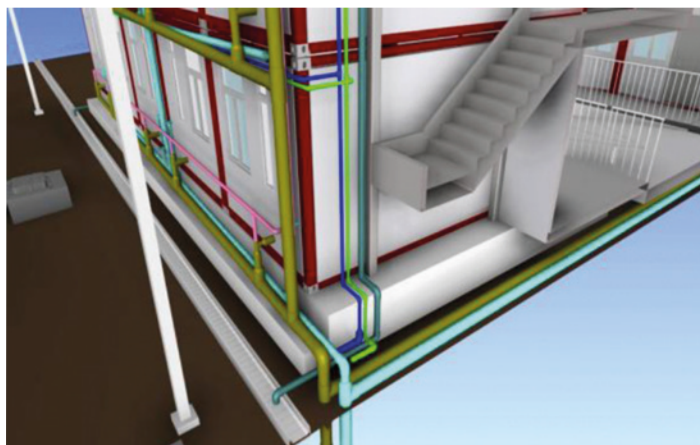
Application of Modular Integrated Construction (MiC)

MiC, an innovative approach in building construction, was adopted for the quarantine facilities under the tight timeframe. MiC adopts the concept of “factory assembly followed by on-site installation”, to transform as far as practicable the conventional on-site construction method in the construction industry into modern industrial production under which the structural frames of buildings, interior fitting-outs, building services installations, etc. are pre-fabricated in factories and delivered to the construction sites for installation. It has the benefits of enhanced efficiency, shortened construction period, improved site safety performance, better building quality, less construction waste, as well as less construction nuisance.



Application of Building Information Modelling (BIM)

BIM technology was also adopted in the quarantine facilities. At early stage of design, the technology was adopted to test the design options and the utilization of the areas such as visualization of the buildings on site, which facilitated the selection of an optimal design solution for the project. Besides, it also enhanced advance planning for the details installation and building services arrangement before commencement of works on site. The illustration of the installation details in BIM allowed the workers to have a better understanding on the design and enhanced the site works.



Transformation Possibility

The quarantine facilities adopted a steel MiC system in which threaded steel bar with couplers were used as the connection system at the top of the module which further enhanced the disassembly and reassembly process. The design of these temporary habitable units is therefore adaptable for other uses in the future if necessary, such as transitional housing, holiday camps or supporting welfare and related community purposes.



Elderly Friendly Design

Elderly-friendly design principles were applied in the interior design of the quarantine facilities to enhance safety and accessibility in the units and public accessible supporting facilities, such as appropriate pictorial pattern was integrated with the floor/wall finishes pattern at major circulation nodes to provide better orientation and wayfinding for identification of different zones.



Interior of quarantine units.



Companionship Unit

Some barrier-free units with accessible toilets and shower facilities were purposefully built to facilitate wheelchair users in quarantine. The units were interconnected with the neighbouring Companionship unit for the convenience of their relatives or caregivers to stay. Besides, the BFA units were located on ground level and in close proximity to the Civil Aid Service command post and medical post for better caring of the occupants in need.



Hygiene Consideration

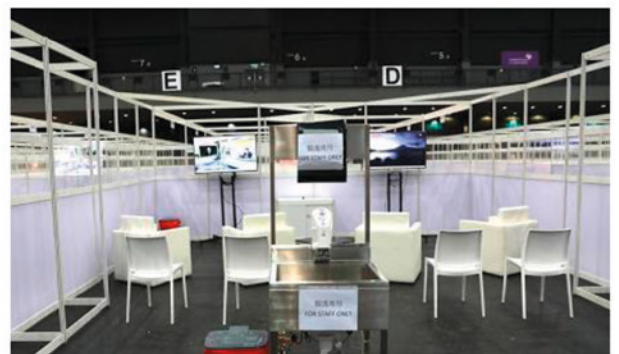
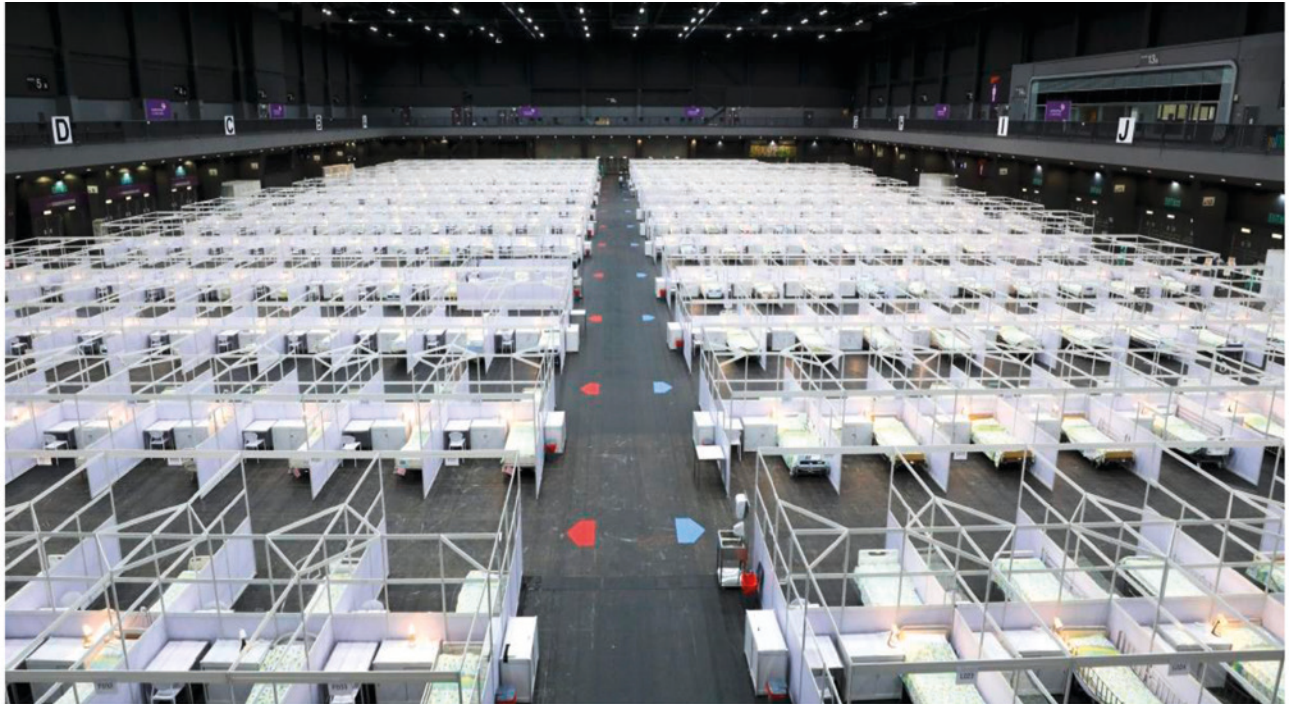
All quarantine units were designed to meet infectious disease control criteria for quarantine use, encompassing unit arrangement, orientation of toilet units, use of building materials, as well as water pipes and drainage systems. Clean zone and dirty zone were well defined in planning the air intake and air discharge of ventilation system. Besides, two pipe drainage system for soil and waste discharges was adopted, and W-trap with refill from wash basin to prevent foul air from entering the indoor space was also used.



COMMUNITY TREATMENT FACILITY

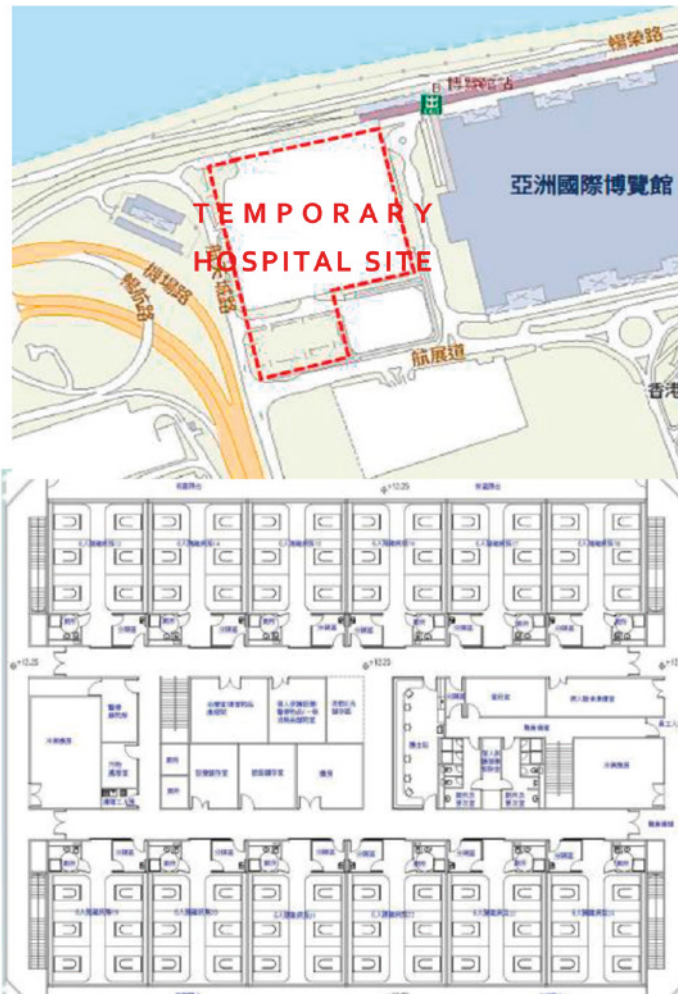
Previously, there were about 900 beds in Hall 1 and Hall 2 of the AWE. The additional community treatment facility, located in Hall 8 to Hall 11, was completed in Oct 2020 providing a total of 1 900 beds.

The AWE was not originally designed as a treatment facility and the night-time operation mode of the air-conditioning units cannot support 24-hour air-conditioning. Therefore, it was a challenge for the construction team to figure out how to enhance the air-conditioning system to meet the needs of the additional community treatment facility. It was decided to install eight individual air-cooled chillers, two for each exhibition hall with a capacity of 200 tonnes and 100 tonnes respectively.



THE TEMPORARY HOSPITAL

The temporary hospital to be built next to the AWE will adopt the MiC technology. The construction team already started work in September 2020 and it is expected to complete within four months. Upon completion, the hospital will provide isolation wards with more than 800 beds and medical related facilities. The advance work is now underway at the project site. The contractor is also keeping close communication with the ArchSD, the Hospital Authority and other government departments to ensure that the design and construction works comply with the statutory requirements and safety standards in Hong Kong. The fabrication of the MiC modules in the Mainland factories has already commenced.



THIRD SECTION

INCLUSIVE DESIGN GUIDELINES

Requested to Ar. Tony S.F. Wong, FHKIA,
Director of ARCASIA Emergency Architects Ltd.

“Disaster events occur when the resources needed due to an unexpected impact exceed the capacity of a community or society to respond to that impact. Individuals with disabilities are placed at disproportionate risk in disaster situations, particularly with significant variations in the type and severity of disabilities. It is the vulnerable population we need to focus on. The situation is exacerbated by Urbanization and Climate Change. When disasters hit, multiple aspects of the society are impacted, and good coordination among all of them is challenging but critical to success”.

*“DISASTERS Versus the Disabled and the Built Environment”
Hong Kong. Tony S.F. Wong / WHO 2008*

I. BACKGROUND

1. The “Inclusive Design Guidelines for Architecture and Urban Design in response to Disaster Risk Reduction” (The “Guidelines”) is based on the UNDRR Sendai Framework 2015-2030, which took a holistic approach towards reducing the impact of disasters. And being holistic is the only way to address the problem successfully. [UNDRR The Sendai Framework]
2. The Guidelines are only a subset of the holistic strategy under the Sendai Framework with specific focus on both the design of the built environment and the process of creating such design. It aims to demonstrate how design of the built environment can contribute to mitigating the disaster risks by supporting all aspects of Disaster Reduction, such as protection of people and property, continuous operation of essential services, build back better, etc.
3. The framework of the Guideline follows the structure of the Sendai Framework. It intends to interpret and translate the 4 Priorities and 7 Targets of the Sendai Framework into attributes of the design and the process of creation of the design, so that it can make direct contribution to support building professionals, policy makers, and community champions to achieve the sustainable goals of the Sendai Framework.
4. The Guidelines attempts to include basic concept of Inclusive Design and Disaster Risk Reduction which are essential but not necessarily directly related to architectural and urban design. However, successful design cannot be done without a good understanding of both. In general terms, a user-centric for ALL users applying good design principle should already suffice to satisfy the needs of Inclusive Design for Disaster Risk Reduction.

II. KEY MESSAGES

1. A disaster event occurs when the resources needed due to an unexpected impact exceed the capacity. A disaster is a sudden, calamitous event that seriously disrupts the functioning of a community or society and causes human, material, and economic or environmental losses that exceed the community’s or society’s ability to cope using its own resources. [IFRC What is a Disaster]
2. Each disaster affects multiple aspects of our built environment, and requires a holistic approach involving cooperation from multiple authorities.
3. Increasing Urbanization intensifies disasters as they occur in a dense and highly complex (physical and non-physical) environment that has often been adapted informally to absorb large populations and a range of economic activities, thus resulting in an increased likelihood for compound and complex disasters. [Sanderson, Clarke & Campbell] Urban environment is also more fragile for basic survival, as essential supplies rely on communal sources whose disruption may cause significant humanity crises.
4. Changes in climate risk in particular imply that urban areas may hazard in the future, something that is outside of their past experience. Sanderson Clarke & Campbell.
5. The built environment caters for the “majority” and “anticipated risks”, which places individuals with disabilities at disproportionate risk in disaster situations, especially with less known risks such as COVID19.

6. People with disabilities are not the insignificant minorities. The World Health Organization estimates that about 15% of the world's population lives with some form of disability, of whom 2-4% experience significant difficulties in functioning. This global estimate for disability is on the rise due to population ageing and the rapid spread of chronic diseases, as well as improvements in the methodologies used to measure disability. [WHO 2011]
7. Inclusive Design is not only essential for people with disabilities, it is good design for people without disabilities, because it facilitates responses to disasters for everyone.
8. Survival after disaster is critical, but continuing to survive is equally important, so is addressing psychological and socio-cultural needs when the impact of disaster occurs.
9. Disaster Reduction can only be successful if we take a holistic approach.

III. THE CHALLENGES OF THE VULNERABLE MINORITY

1. Inclusive Disaster Risk Reduction shares the same principles of General Disaster Risk Reduction, but it does so in a more challenging way due to the deviation from the norm, and the lack of understanding and investment.
2. Disability disproportionately affects the vulnerable population; thus, it is higher among women, the elderly, and those who live in poverty. It also occurs at higher rates in poorer nations [WHO 2011].
3. Disasters disproportionately affect vulnerable populations, which are more likely to be adversely affected by disasters than others. [Note 1]
4. The adoption of Inclusive Design in urban environment is grossly inadequate, and situations may deteriorate as urbanization continues, especially in the form of unregulated migrations.

IV. GLOSSARY

The following definitions are retrieved from UNDRR website

Disaster: A serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability, and capacity, leading to one or more of the following: human, material, economic, and environmental losses and impacts. This is usually caused by natural or manmade triggers, and may impose multiple risks.

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

Disaster Risk Reduction: Aimed at preventing new and reducing existing disaster risk and managing residual risk, all of which contribute to strengthening resilience and, therefore, to the achievement of sustainable development.

Hazard: A process, phenomenon or human activity that may cause loss of life, injury or other health impacts, property damage, social and economic disruption or environmental degradation.

Exposure: The situation of people, infrastructure, housing, production capacities and other tangible human assets located in hazard-prone areas.

Vulnerability: The conditions determined by physical, social, economic and environmental factors or processes which increase the susceptibility of an individual, a community, the assets or systems to the impacts of hazards.

Resilience: The ability of a system, community, or society exposed to hazards to resist, absorb, accommodate, adapt to, transform, and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions through risk management. Inclusive Design should aim at increasing the resilience of the community in consideration.

Capacity: The combination of all the strengths, attributes and resources available within an organization, community or society to manage and reduce disaster risks and strengthen resilience.

Build Back Better: The use of the recovery, rehabilitation and reconstruction phases after a disaster to increase the resilience of nations and communities through integrating disaster risk reduction measures into the restoration of physical infrastructure and societal systems, and into the revitalization of livelihoods, economies and the environment.

THE DESIGN GUIDELINES

1. The UNDRR Sendai Framework 2015 (Sendai Framework)

Inclusive Design of the built environment should be based on and support the implementation of the Sendai Framework, the United Nations Disaster Risk Reduction programme which transcend beyond the built environment. Design should be based on its 4 Priorities and 7 Targets.

1.1 The Four Priorities:

Priority 1 - Understand Better: Understanding disaster risk;

Priority 2 - Manage Better: Strengthening disaster risk governance to manage disaster risk;

Priority 3 - Invest Better: Investing in disaster risk reduction for resilience;

Priority 4 - Prepare, Respond and Build Back Better: Enhancing disaster preparedness for effective response, and to "Build Back Better" in recovery, rehabilitation and reconstruction.

1.2 The Seven Targets:

1. Saving Lives: Substantially reduce global mortality;

2. Containing Impact: Substantially reduce the number of affected people globally;

3. Reducing Loss: Reduce direct disaster economic loss in relation to GDP;

4. Protecting Infrastructure and Minimizing Service Disruption: Substantially reduce disaster damage to critical infrastructure and disruption of basic services, among them health and education facilities, including through developing their resilience;
5. Enhancing Ability to Response: Substantially increase the number of countries with national and local disaster risk reduction strategies;
6. Enhancing International Collaboration: Substantially enhance international cooperation to developing countries through adequate and sustainable support to complement their national actions for implementation of this framework; and
7. Detecting and Communicating Early: Substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessment to people.

2. Understand Better

Inclusive Design to cope with Disaster Risk Reduction needs to be based on an understanding of disaster risk in all its dimensions of hazard characteristics, vulnerability, exposure of persons and assets, capacity/resilience, and the environment.

2.1 Understanding Disaster Risk

1. Disaster Risk can be understood as the interaction of Hazards, Vulnerability and Exposure. This relationship can be expressed better with the formula below:

$$(\text{HAZARD} \times \text{VULNERABILITY} \times \text{EXPOSURE}) / \text{RESILIENCE or COPING CAPACITY} = \text{DISASTER RISK}$$

[UNDRR How to make cities more resilient 2012]

Some would also express it as:

$$\text{DISASTER} = \text{HAZARD} + \text{VULNERABILITY} - \text{CAPACITY}$$
 [Chaterjee], or

$$(\text{VULNERABILITY} + \text{HAZARD}) / \text{CAPACITY} = \text{DISASTER}$$
 [IFRC What is a Disaster]
2. Key consideration of Hazard should be focus on its magnitude, i.e., how big and how often;
3. Key consideration of Exposure is on what elements, i.e., people, properties, infrastructure, services etc. are at risk;
4. Key consideration of Vulnerability depends on how does each exposed element responds to the level of hazard, i.e., the kinds of disabilities and what their shortfall are in response.
5. Key consideration of Resilience and Capacity is whether they are commensurate with the characteristics of Hazard, Vulnerability and Exposure of the community. Inclusive Design needs to consider and plan for capacity in accordance with data about the vulnerable population within the community under consideration. The Capacity to handle a Disaster needs to be able to match the condition of Exposure to the risk under consideration. The higher the Exposure, the higher the required Capacity.
6. Due consideration and mitigation of all dimensions of the elements contributing to a disaster is required, and a successful resolution lies in deploying multiple dimensions for a cost and effort effective solution.

2.2 Understanding the types of Disasters [Physio-pedia] and [International Federation of Red Cross and Red Crescent Societies].

Disasters can be natural or man-made, but some are more complex.

1. **Natural Disasters:** Are naturally occurring physical phenomena caused by either rapid or slow onset events that have immediate impacts on human health and secondary impacts that may cause further death and suffering. These disasters can be: Geophysical (e.g., Earthquakes, Landslides, Tsunamis, and Volcanic Activity)
Hydrological (e.g., Avalanches and Floods)
Climatological (e.g., Extreme Temperatures, Droughts, and Wildfires)
Meteorological (e.g., Cyclones and Storms/Wave Surges)
Biological (e.g., Disease Epidemics and Insect/Animal Plagues)
2. **Man-Made Disasters:** As viewed by the International Federation of Red Cross & Red Crescent Societies, these are events that are caused by humans, and which occur in or close to human settlements, often as a result of Environmental or Technological Emergencies. This can include Environmental Degradation
Pollution
Accidents (e.g., Industrial, Technological and Transport usually involving the production, use or transport of hazardous materials)
3. **Complex Emergencies:** Some disasters can result from multiple hazards or, more often, from a complex combination of both natural and man-made causes, which involve a breakdown of authority, looting and attacks on strategic installations, including conflict situations and war. These can include Food Insecurity.
Epidemics
Armed Conflicts
Displaced Populations
According to ICRC these Complex Emergencies are typically characterized by:
Extensive Violence
Displacements of Populations
Loss of Life
Widespread Damage to both Societies and Economies
Need for Large-scale Humanitarian Assistance across Multiple Agencies
Political and Military Constraints which impact or prevent Humanitarian Assistance
Increased Security Risks for Humanitarian Relief Workers
4. **Pandemic Emergencies:** A pandemic is an epidemic of infectious disease that has spread across a large region, which can occur to the human or animal population and that may affect health and disrupt services leading to economic and social costs. It may be an unusual or unexpected increase in the number of cases of an infectious disease which already exists in a certain region or population, or it can also refer to the appearance of a significant number of cases of an infectious disease in a region or population that is usually free from that disease. Pandemic Emergencies may occur as a consequence of natural or man-made disasters. These have included the following epidemics: [WCPT] and [Wikipedia. Pandemics.]
Ebola, Zika, Avian Flu, Cholera, Dengue Fever, Malaria, Yellow Fever, Coronavirus Disease (COVID-19)
5. The United Nations Office for Disaster Risk Reduction characterises Natural Disasters in relation to their magnitude or intensity, speed of onset, duration, and area of extent e.g., earthquakes are of short duration and usually affect a relatively small region, whereas droughts are slow to develop and fade away, and often affect large regions [UNDRR Terminology]

2.3 Understand the types of Vulnerable communities. Inclusive Design focuses on the vulnerable communities. We need to understand the different types and number of vulnerable populations are in the community under consideration, and their ability to respond to hazard incidents. In general terms, this should include people with disabilities and can be more specifically categorized as follows. Note that there are significant variations in the type and severity of disabilities which affect both everyday experience and the experience of disaster.

1. **Mobility.** This refers to the reduced ability to move or overcome physical barriers such as steps. It primarily affects the speed of evacuation from the site of hazard incident, so people with mobility problems might require assistance to be rescued. Application of universal inclusive design principle should address this issue. The current challenge is that this is not prevalent particularly in developing countries.
2. **Auditory.** This refers to the reduced ability to receive auditory warnings and compromise the timely evacuation. Compensation should focus on visual warnings. Visual signs or vibrational signals are examples of warning signs that can be used. People with speech disabilities might also have difficulties in communicating and reporting their situation during hazard events, so alternative means of communication (such as panic button on mobile device) must be provided.
3. **Visual.** This refers to the reduced capability to receive visual signals, so the ability to receive visual signals and mobility during evacuation will be affected. Audio warning is essential, and pre-drilling of evacuation route with tactile signs and features can aid ease the evacuation.
4. **Other people with Cognitive, Psychiatric, Psychological, or Emotional problems.** This refers to the reduced ability to understand the situation and/or know how to respond to hazard incidents. Their response to hazard incidents might also be harder to understand or predict. As such their needs are very often not catered to. This requires further understanding in order to address their needs.
5. **Physically Disadvantaged groups** such as infants, the elderly, or people with temporary impairment (people suffering from an injury or sickness).

The needs for the elderly and infants usually encompass one or more of the previously mentioned vulnerabilities. We also very often forget that the majority of the population will from time to time suffer from temporary impairment due to injuries or sickness. Generally speaking, good inclusive design should cover their needs in dealing with hazard incidents.

6. **Socially Disadvantaged people**, such as poor people, women in developing countries, illiterate people, etc.

This refers to people of lower social or economic status who are more vulnerable due to higher exposure and to reduced resources to handle. For example, slums are of high density, and do not have proper warning systems, and lack structural protection and proper evacuation route. Another example are migrant workers in foreign country where they are not familiar with the local languages and practices of handling hazard situation.

Inclusive Design should focus on solving issues with the socially disadvantaged groups in order to reduce mortality and to contain the number of people affected.

2.4 Understanding and applying relevant guidelines with respect to Disability or Disasters. Examples are Asia Development Bank's Disaster Risk Management and Country Partnership Strategies (A Practical Guide), DEDURBD Urban Resilient Design Guide, UNDRR's How to Make Cities More Resilient, and ARCASIA's 13 ACGs (COVID-19 Guidelines).

3. Manage Better

Inclusive Design to cope with Disaster Risk Reduction needs to focus on governance at the national, regional, and global levels in order to support the management of risk reduction in all sectors and to ensure the coherence of national and local framework of laws, regulations, and public policies that, by defining roles and responsibilities, guide, encourage, and incentivize the public and private sectors to take action and address disaster risk. Understanding better the principles of Emergency Management Framework and applying them in design to organize, invest, prepare, response and build back better.

3.1 Design should support the various stages/phases of Emergency Management. There are many ways to describing the stages/phases. Generally speaking, it can be conceptualized as the Contingency Planning Stage and the Emergency Response Stage, and further split into 4 stages as follows. [T. Wong, 2021]

1. Contingency Planning Stage
 - A. Mitigation Phase
 - Identification of Hazard and warning signals
 - Assessment and Prioritization of Risks
 - Development of Mitigation / Prevention Strategy
 - B. Preparedness Phase
 - Development and maintenance of Contingency Plan
 - Education/Training/Drills of Communities
 - Monitoring of Early Warning Signals
2. Emergency Response Stage
 - C. Response Phase
 - Rescue those impacted
 - Assessment of Damage
 - Containment of Risk
 - D. Recovery Phase
 - Bring life back to Normalcy
 - Incorporate Lesson Learnt to Mitigation Plan
 - Reconstruction

3.2 International Standard for Disaster Risk Management in Organizations: The ISO 31000:2009 Framework, which is non-certifiable yet, sets out a set of principles, a framework, and a process for managing risks that are applicable to any type of organization in the public or private sector. It does not mandate a “one size fit all” approach, but rather emphasises the fact that the management of risks must be tailored to the specific needs and structure of the particular organisation. [ISO 31000]

3.3 Inclusive Design for Disaster Risk Reduction needs to be considered at multiple levels

1. Policy needs to be driven at multiple levels at National, Regional as well as Global levels. Inclusive Design for Disaster Risk Reduction needs to be considered at national, regional, and global levels. There are many disasters which occur in different places (floods, earthquakes...etc.) in the world and yet share similar characteristics; thus, experience and lessons learnt can be shared. There are also many disasters which will have an effect beyond

the borders of the countries in which they take place (in 2011 the tsunami that occurred in South Asia was caused by an earthquake in Indonesia), so disaster information, mitigation, and recovery are needed to resolve the crisis.

The disruption of the global supply chain during the recent COVID19 pandemic also illustrates how connected we are globally and how international collaboration is essential in mitigating disaster risks. There are also intrinsic differences in economical, climatic, geological, social, cultural, and political conditions in each jurisdiction that require a different approach to achieve the universal humanity design solution. The review of potential design options at all levels is essential in the continuous development of better solutions. The performance of the final design should be monitored to contribute to further improvement in future designs.

2. Design needs to be considered from macro (City Planning) to medium (Urban Design) and micro (Architecture and Interiors) levels. The impacts of disasters usually go beyond multiple buildings and more often to districts, cities, and even across country borders. The creation of open space between buildings usually serves as effective fire breaks and avoid the domino effect during earthquakes.

3.4 Inclusive Design for Disaster Risk Reduction needs to be considered across the priorities of different sectors and disciplines, and require full collaboration among all stakeholders as priorities are usually conflicting. It should transcend Public Vs Private, Policy Makers Vs Citizens, Community Vs Individuals, and should involve the participation of multiple categories of stakeholders, of different interests and types of vulnerabilities. Involvement of the vulnerable members of the population is essential.

3.5 No one would understand the experience during disaster better than those with disabilities themselves. Their involvement in the design process is essential for any successful Inclusive Design. Their social capital is generally lower, which results in their needs not being addressed appropriately.

4. Invest Better

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. These can be drivers of innovation, growth, and job creation. Such measures are cost-effective and instrumental to save lives, prevent and reduce losses, and ensure effective recover and rehabilitation.

4.1 Prevention and Protection is more economical and effective than Post Disaster Recovery. Analyses of our built environment on their resilience to various disasters and the cost of recovery should be done to identify and prioritized on where we should invest in to mitigate the economic loss should disaster happens. Design priorities should be based on such analysis. For example, the cost of making a building may increase the cost of the structure by 1-5%, but the savings of rebuilding the majority of a city are huge. A small seismic isolator (US\$250) could avoid the economic loss of power if an electric generator is damaged.

4.2 The current built environment is far from inclusive. This poses difficulties during normal days, and exhibits critical risks during disasters. Building regulations in cities and building designs need to be reviewed in light of developing an understanding of disasters. Investment should aim at improving inclusivity to the existing environment as an ongoing effort, as well as building back better whenever disasters damage the current environment.

4.3 Design should focus on the protection of critical facilities and building components that can protect lives, contain impact, increase capacity (to deal with emergencies), reduce loss (economic and cultural), and safeguard essential services.

4.4 Design should focus on flexibility in the conversion and change of use should disaster arise to mitigate short term need to protect lives and temporary relief before long term solutions are identified. Such considerations should be made at the planning and design stage when projects are just being conceived. A typical example is using public facilities such as schools and exhibition space as temporary refuge for disaster refugees. Inclusive design in such facilities needs to be design with this in mind as increased capacity and proportion of disability would be significantly increased during disaster.

4.5 Design should focus on sites with historical, cultural heritage, and religious interest which are not replaceable if they are destroyed. Such sites are usually located in areas that are more resilience to disasters and should be prioritized for adaptive reused to mitigate disaster risks.

4.6 Rural development should not be neglected, in particular to the impact of climatic change that adversely impacts on the sustainable development of rural communities. While rural environments might not be as efficient as urban areas to support the growth of the economy, its environment is usually more resilient. Ecosystems serve as protective buffers against natural hazards. They increase the resilience of communities by strengthening livelihoods and the availability and quality of drinking water, food supplies and other natural resources. Urbanization of watersheds can modify hydrological regimes and destabilizes slopes, increasing hazards such as flood and landslides.

4.7 A major obstacle to inclusive design is inequality, mostly in economic terms. In social agenda terms, this is the biased towards economical differentiations, which need to be mitigated by the eradication of poverty. In design terms, this is the due consideration application of the basic standard of Inclusivity with universal design in mind.

4.8 Investment should focus on the vulnerable populations, with different needs under different disaster scenarios as they constitute a material proportion of any population, and they are disproportionally affected.

4.9 Design should be in compliance with the Sustainable Development Goals as issued by the United Nations, which promotes equality, safety, and wellbeing. While all 17 goals are relevant in some ways, of particular importance to disaster reduction is Goal 11: Make cities and home settlement inclusive, safe, resilient and sustainable.

5. Prepare, Response and Build Back Better

Experience indicates that disaster preparedness needs to be strengthened for more effective response and ensure capacities are in place for effective recovery. Disasters have also demonstrated that the recovery, rehabilitation, and reconstruction phase, which need to be prepared ahead of the disaster, are an opportunity to “Build Back Better” through integrating disaster risk reduction measure. Women and persons with disabilities should publicly lead and promote gender-equitable and universally accessible approaches during the response and reconstruction phase.

5.1 Design should anticipate disaster scenarios, and prioritize and provide mitigation solutions. Design should consider the identification of Hazard and warning signals, assessment and prioritization of risks and development of mitigation / prevention strategy. Reference is made to clause 3.1.1.A Mitigation Phase of this Guidelines.

5.2 Design should cater for an early warning mechanism, as well as a subsequent dissemination of such warning to those affected. Reference is made to clause 3.1.1.B3 Monitoring Early Signals of this Guidelines.

5.3 Design should cater for facilities to stockpile supplies for rescue and relief before permanent solutions can be identified and implemented. Reference is made to clause 3.1.2.C3 Containment of Risk of this Guidelines.

5.4 Design should focus on maintaining the operation of essential services. Significant fatalities in disasters are caused due to disruption of essential services, and the vulnerable population suffers more. Reference is made to clause 3.1.2.C3 Containment of Risk of this Guidelines.

5.5 Design needs to cater for facilities where drilling of response to emergencies can take place. Reference is made to clause 3.1.1 B2 Education/Training/Drills of Communities of this Guidelines.

5.6 Design needs to be holistic and consider the entire built environment instead of just individual buildings. It should also focus on urban components shared services (such as water supplies and drainage in high rise buildings or grouped housing), access route (for evacuation, rescue, and supplies), and density (increased risk and pressure to support rescue and sustenance post-disaster).

5.7 Review of current standards which were developed for the majority instead of the vulnerable populations. As urban environment, human activities, climate change, and technology change, constant reviews to improve the ability to cope with disaster in particular to the vulnerable population is prudent.

5.8 Design should involve the participation of the vulnerable communities so that their needs during disasters can be better understood and addressed. This has been specifically mentioned in the Sendai Framework.

6. Saving Lives

This involves the protection, evacuation, and continue sustaining of the impacted population. Design Standard in one type of calamities usually provides similar protection to a few others (e.g., structural code to tackle typhoon provides some earthquake protection).

6.1 Protection. The sector that will be affected the most with the highest mortality rate. Protecting the vulnerable will reduce the mortality rate more effectively. Other than protection in buildings, some other considerations should be made in urban design aspects: how closely buildings are grouped and whether there are any breaks in between (e.g., Fire Breaks to stop bushfire in Australia), and whether there is any space for social distancing (e.g. in COVID19) are key. This is particularly acute in the case of slums, where even the most fundamental protections are absent.

6.2 Temporary Relief Identification of location and facilities for emergency assembly, and distribution of relief supplies, and temporary shelter). The location and facilities should cater for the calamities as well as for vulnerable people. Flexibility in use of buildings enable re-purposing to support temporary needs. Such multiple usages need to be identified before disasters occur, and while new buildings are being designed.

6.3 Enablement of Design Recovery and Evacuation –Guidelines 6.1 & 6.2– is meaningless unless there is a safe passage way from the affected to the relief point, which is essential. Equally important is that disaster Recovery Services and Relief Services require passage way to tackle the calamities. This passage has to be designed as an inclusive one. Improved access not only benefit the vulnerable populations, but also the general population.

7. Containing Impact

Containing the impact of the disaster is critical, as disaster is all about the ability of the society (capacity/resilience) to handle the impact (hazard + vulnerability + exposure). Containing the impact reduces the pressure on capacity and improves resiliency. Furthermore, the impact of many disasters will grow and further deteriorate the situation. Good examples are pandemic (COVID-19) and earthquake impacted buildings. Strategies need to be developed to prevent a further growth of the disaster and the deterioration of the situation.

7.1 Certain disasters, such as fires, flooding, pandemics, etc., can spread rather easily, and an effective way to contain their impact is by segregation with compartmentation with effective barriers. Fire resistant partitions in buildings, fire breaks in urban designs, quarantine centres, etc., are good examples of structures and facilities that help to contain the impact. Design should be mindful of not creating unnecessary barriers for the vulnerable populations.

7.2 Density Control – one major contribution to the increasing impact of disasters is urbanization and the increase in density of the human population. Reducing the density of concentration of human settlements is a good way to reduce the impact of disasters. While this provides a better living environment, it also increases the distance of support for the vulnerable populations.

7.3 Evacuation – very common in fires, earthquakes, and flooding. The key to success is the ability to construct replacement facilities. One good example occurred during the recent COVID19 pandemic, with the ability to apply modular design technologies to build new quarantine and isolation facilities as a way of containing the risk.

8. Reducing Loss

Disasters usually incur economic losses and affect the livelihood of those affected. This is particularly important for the vulnerable population, such as poor communities and people with disabilities whose ability to make a living is further compromised. The mitigation strategy should focus on protecting and continue to sustain economic activities of the grassroots population.

8.1 Enabling work for grassroots to continue, including considering transferable work types. (e. g. virtual work types during pandemic, deploying grassroots workers for disaster recovery and reconstruction).

8.2 Enabling transportation and access of workers to their places of work. Temporary relief facilities should focus on facilitating economic recovery of the masses).

8.3 Strengthen resilience of facilities that protect the basic economic activities that support the livelihood of the vulnerable population.

9. Protecting Infrastructure and Minimizing Service Disruption

Protecting essential services is equally important as saving life, as it ensures sustainability of the impacted population. In many situations, the impact of disasters is due to the loss of such services, for example, medical facilities to deal with injured populations during earthquakes.

9.1 Critical facilities that provide shelter, supply water, food, and power, and waste disposal are essential for basic human survival.

9.2 Certain facilities might need to increase their capacity to cope with increased demands due to the disaster. A good example of this are medical facilities during many disasters that cause physical injury, or pandemic when more people require medical attention.

9.3 The vulnerable populations will be more affected. They are subject to enhanced support during normal circumstances, and during disasters these services will be disproportionately affected. Disruption of medical supplies to chronic patients might become detrimental should they not be prioritized. Post disaster trauma may also be more severe for people with psychological or psychiatric disorders. Increased demand in psychological, cultural, or religious support need to be given priority.

9.4 The prioritization of various services needs to be reviewed and conducted continuously and holistically, so that the responses are timely and flexible as the situation of disaster develops.

10. Enhancing Ability to Response

The capability to deal with disasters includes the ability to respond timely in rescuing lives and evacuating affected populations. This requires each country to have a comprehensive risk reduction strategy, of which inclusive design should be a part.

10.1 Time is of essence, and speed is key. The ability to respond quickly reduces the damages, saves lives, contains risks, and helps for a better and quicker recovery. This includes not only anticipation of future risks, development of mitigation strategy, and drills of response operations, but also adaptation of existing strategies to meet similar unanticipated types and skills of the risk.

10.2 Adequate planning will enable us to prepare for the right measures of mitigation and capacity in advance of time, and hence respond timely. Reference is made to clause 3.1.1. A Mitigation Phase of hazards and early warning signals of this Guidelines.

10.3 Training, Communicating and Drilling. Practice makes perfect. Japan has a long tradition of preparing for earthquakes where training is given from kindergarten age, and drills are regular events. The long-time investment saved many lives in the March 2011 Grand East Japan Earthquake and Tsunami. Reference is made to clause 3.1.1.B Preparedness Phase of Risk of this Guidelines. Other good practices to enhance awareness and readiness such as dedicating an annual memorial day for major incidents, erecting a memorial for the incident, creating artwork or songs of such events...etc. Encouraging community participations, such as Emergency Reaction team of building professionals for relief and reconstruction, has had good results in many disasters, such as the Sichuan Earthquake in China, both in instant relief and subsequent reconstruction.

10.4 Better Coordination. Any disaster management operations involve multiple experts and rescue resources. And there are multiple activities that need to take place, which is not day to day operations. Certain prioritisation on the focus of work, and standard of such has to be made quickly and then communicated. Reference is made to clause 3.1.2.C Response Phase of this Guidelines.

11. Enhancing International Collaboration

International collaboration is essential not only because disaster is a humanity crisis which touches on Universal Value, but many disasters transcend beyond borders. A good example is the COVID19, which is a global pandemic. Other examples include the 2011 Indonesia Earthquake which triggered a tsunami in South Asia, and the 2012 Japan Tsunami and the Fukushima nuclear crisis whose nuclear active waste water remains an unresolved global issue. Such collaboration will speed up relief efforts and help find solutions, especially with new found hazards.

11.1 Improve understanding of international design standards, especially on the development of inclusive design provisions.

11.2 Increase exchange in research and cooperation in disaster relief effort, in particular the provision of relief, and essential service provisions, with an aim to provide immediate support as well as longer term knowledge transfer to mitigate future crisis.

11.3 While respecting local geographical, economical and socio-cultural particularities, long term goals to develop international standards in Inclusive Design, in particular with respect to Disaster Resiliency, Response, and Recovery should be set. International standard will lower the barrier of cross border support and leverage international resources to support developing countries which require help the most.

12. Detecting, Assessing and Communicating Early

Special Consideration of all kind of disabilities (the vulnerable), all kinds of anticipated disasters, and response to unanticipated disasters.

12.1 Early detection. The choice of signs, and their potential impact, needs to be considered for the vulnerable population and their particular needs. Response time planning has to consider the response time required by different types of vulnerable populations. Data should also include signal changes as the disaster develops. The CityZen application in Jerusalem, Israel is a social service connecting between citizens and the local authorities to create a safer environment.

12.2 The develop the ability to analyse the early warning signals, as well as subsequent conditions as the disaster develops, including responses from the affected communities. Such analysis should also differentiate the requirement of different kind of disabilities. Analysis like these will help the authority to adjust their mitigation plans timely as situations and social sentiments change. The use of social media in Beijing, China has successfully tackled various communication issues during their rainstorm in July 2012.

12.3 Timely dissemination of accurate messages for appropriate and timely response. Special consideration should be given to manage the spread of mis-information, so early detection of such mis-information and prompt address of such is critical to avoid mass paranoia. One good example is the Hope Spot in Jerusalem, Israel, which was essentially a helium balloon sign used as a mark in the sky pointing survivors of disasters to the place where they can get help.

12.4 Leverage on multiple channels of communications including physical and virtual. On top of traditional media such as TV, Newspaper, Radio, and physical signs and notices at location, latest developing media such as social media platforms and specially designed apps should be considered (such as CityZen and CityTalk in Jerusalem, Israel). Care must be put in place to limit the spread of unofficial and sometimes malicious, fake or unverified information, which might create fear among those affected.

13. Holistic Approach

Design needs to be holistic, covering macro to micro and in between aspects of our built environment. This includes from Metropolis, City, Districts, Complexes, Building to Interiors, and involves disciplines of City Planning, Urban Design, Architecture and Interior Design. It also involves multiple building professions and stakeholders such as various Engineering disciplines, Technology, Contracting, Building Materials, etc. The participation and support from Policy Makers in the government is key to success, and, in order to success seamless cooperation and identification of communication gaps is important.

13.1 Macro to micro dimension of the built environment needs to be considered. Inclusive design cannot be achieved by looking at individual buildings. Mobility between buildings, shared facilities within communities, and security of essential services, all contribute to resilience towards disasters. And those provisions for the vulnerable population are often more demanding and yet overlooked. Holistic designs like thinking beyond just buildings have to be put in place.

13.2 Multiple discipline collaboration is essential as successful design will need to have input from experts in fields of architectural, urban design, city planning, engineering, as well as other non-building professionals such as emergency managers, psychologists, and medical experts. The design process should be structured so that these knowledge can be considered collectively to arrive at the right solution.

13.3 Multiple stake-holders involvement is key as design serves not only the vulnerable population, but society as a whole. In each development, there are different stakeholders, including those who fund it, manage it, and use it, and much of the space and services are shared. It is of particular importance that the vulnerable population is actively involved in this process, and carries a vote on the design decisions as they are in the best position to share their experience of the challenges they might face during a disaster. Of the most importance are policy makers who could add incentives or regulations (such as tax relief, building code changes, or land use assignments) and make meaningful changes.

13.4 Urban Vs Rural solutions should be considered in parallel, in particular to resilience. Urbanization needs to be conducted in a controlled manner, with special focus to avoid unregulated migration which usually result in sub-standard provisions which compromise on inclusivity. This poses significant risk to cities and the safety of its citizens, in particular those who are vulnerable.

13.5 Holistic wellbeing goes beyond just physical survival, but also delves into psychological, socio-cultural, and economical considerations. Post-disaster trauma is very common and it particularly affects those with weaker physical and psychological strength. Cultural and religious activities are an essential part of peoples' lives and give moral support when physical provisions are limited. This applies to every human being, and should continue with precautionary measures and sensitivity towards maintaining its identity and symbolism.

13.6 Disaster Risk Reduction Management is a highly extensive and complex exercise. Space design is only one of the many aspects to mitigate the issues, and Inclusive Design requirements will add to its complexity. Special attention needs to be paid to such complexity.

14. Multi-Hazard Approach

Hazards are never simple nor singular, but very often have multiple implications, as one hazard usually results in another. Disaster Reduction can only be effective if we take a multi-hazard approach where we inspect all hazards, understand their interrelationship, as well as the different implications to different types of vulnerabilities.

14.1 Definition: Multi-Hard approach is still fairly new and there is no official definition; it was mentioned in multiple areas within the Sendai Framework with different applications. A suggested definition of Multi-Hazard Approach could be: An approach that considers more than one hazard in a given place (ideally progressing to consider all known hazards) and the interrelations between these hazards, including their simultaneous or cumulative occurrence and their potential interactions. [Gill, Duncan & Budimir] A good example illustrating the potential issue could be the Tsunami that occurred in Japan in 2011, which resulted in a nuclear crisis that has been extremely long term and has had global implications.

14.2 Application: The SFDRR refers to multi-hazard in contexts other than early warning systems, for instance 'multi-hazard management of disaster risk' and 'decision-making to be inclusive and risk-informed while using a multi-hazard approach'. There are growing studies in multi-hazard risk assessment and decision-making models, and continued research and application of such tools in Inclusive Design is important to effectively mitigate risks to the vulnerable population.

14.3 While hazards may come in multiple ways, many of them share similar characteristics and impact to human beings, and can be mitigated using similar solutions. For example, structural design standards mitigate not only earthquakes, but also typhoons/hurricanes). A comprehensive review of all potential risk with a unified approach towards mitigation solution would be most efficient and effective.

15. Leverage Technology

Technological improvement in recent years has been phenomenal and much progress has been made in tools that can benefit not only the vulnerable populations directly, but also help authorities to manage disaster better, as well as professional to incorporate Inclusive Design and construct better.

15.1 Understanding the technologies that can assist the vulnerable populations and actively incorporating them into the design of facilities, will improve the tools to assist mobility, overcoming level differences, enhancing ability to receive warnings or seek rescue.

15.2 Understand the technologies that can monitor early warning signals, collect and analyse data on conditions of hazard events and its impact on vulnerable populations, disseminate warning signals and enable the community to discuss and comment. Actively incorporating them into the design of facilities. An example is the DesUrbs Security Products in Jerusalem, Israel, where multiple tools (CityZen, HopeSpot, and CityTalk) are used to collect GIS data and to connect the citizens with authorities, bridging urban planners and the community, and hence improving resiliency [DESURBS 2014]. Micro-blogging in Beijing also proved that social network can be leveraged to enable authorities to disseminate information and collect feedback much more efficiently, and to manage fake news effectively. [Xi & Zhen 2013]

15.3 Improve the process of design and construction through the active application of technology. This includes the capability to collaborate and design remotely so that more participation of experts and stakeholders can be included, application of new design and construction technologies such as BIM, VR, etc., to achieve all-round consideration of design, wider application of automation to improve the quality and availability of facilities which incorporate Inclusive Design elements. [13 ACGs]

FOURTH SECTION

CONCLUSIONS

People with Disabilities: centuries of countless unanswered questions, with infinite silences, with incomprehension, always accompanied by anxiety, frequently ignored by our societies, other times invisible, in the search for a minimum personal autonomy, functional independence, for the sole purpose of making possible seeing, walking, hearing or thinking to freely transmit feelings with a high degree of difficulty, often insurmountable.

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This research entitled “Responding to Natural Disasters & Emergencies: Proposed Inclusive Design Guidelines for Architecture and Urban Planning” will be presented in the “Architecture for All” Seminar that will take place in Rio de Janeiro during the celebration of the next World Congress of Architects that will take place in the month of July of this year 2021. The participation of architects specializing in the subject has been from multiple regions, Asia-Pacific, Africa, Europe and America, and geographic environments of great diversity such as Hong Kong, Libya, Italy, Holland, Spain, Chile or Canada.

1. In the first section, the INTRODUCTION, we summarize our position in the discussion section. In particular, it stresses that the institutions of the People with Disabilities require active and effective participation in the decision making.
2. In the second section, the CASE STUDIES, where we summarize each of them, indicating the most contributions.
3. The third section is dedicated to the INCLUSIVE DESIGN GUIDELINES. For us, this is the most relevant part of our research. From a methodology point of view, they develop applicable strategies ready to be deployed in advance of a natural disaster or emergency.
4. In the fourth section, CONCLUSIONS, we are reminded of the imperative need to anticipate risks, consistently plan responsibly, always from a preventive perspective, and consistent with each complex reality.

1.- INTRODUCTION

People with Disabilities: centuries of countless unanswered questions, with infinite silences, with incomprehension, always accompanied by anxiety, frequently ignored by our societies, other times invisible, in the search for a minimum personal autonomy, functional independence, for the sole purpose of making possible seeing, walking, hearing or thinking to freely transmit feelings with a high degree of difficulty, often insurmountable.

1. A natural disaster or an emergency can and should be a new and urgent opportunity for the institutions of People with Disabilities to have a voice and vote in a binding manner. In such a way that, if applicable, with adequate international cooperation, every national, regional or local government has the option and the capacity to incorporate the most vulnerable people with equal rights. If so, we must modify the current paradigm so that, during decision-making at the level of action, we better grasp the understanding of these complex wholes in a holistic, not atomistic way.
2. On the positive side, significant changes are coming that tend to reverse this situation. Gradually, new laws in building and land planning are betting on respectful and hopeful strategies for the future. Despite many efforts to move forward, the harsh reality forces us to be objective. In April 2021, the world has over 150 million infected and over 3 million deaths due to the Covid-19 pandemic. This is a truly global tragedy, an immense disaster, not only a health emergency, which continues even today to produce incalculable damage at all levels.
3. Hence the need for a deep reflection on how to deal with the requirements of People with Disabilities, those who suffer high rates of poverty, the most vulnerable, from the first sketch, in the face of any disaster, emergency, or catastrophe of any kind. In any disaster or emergency, the instruments available to anyone whose abilities are limited, such as people with special needs, the elderly, pregnant women, or children, among others, must be taken into account. Therefore, technical aids (wheelchair, cane, crutches, etc.), ergonomics (inclusive design of chairs, telephones, computers, etc. adapted to people), the signage (font size so that everyone can read it, with contrast, etc.), or the accessibility chain (the user’s movement from the origin

to the destination must be accessible), among others, must be taken into account.

4. This work consists of seven Case Studies, some Inclusive Design Guidelines, some Conclusions and a Bibliography. There were two main selection criteria. First, to cover the maximum geographic diversity to study different circumstances. And second, to include as many catastrophes, emergencies, and disasters as possible. Therefore, themes from regions of the International Union of Architects of Asia-Pacific, Africa, Europe, and America are present. This allows us to affirm that multiple and diverse samples are present, including the theoretical framework as well as a wide range of disasters. We only emphasize that all the drafters of these issues have been “Ad Honorem.”

2.- CASE STUDIES

1. “DISASTERS Versus the Disabled and the Built Environment”, Hong Kong, in an Asia-Pacific environment. The great interest that this article gives off lies in its expert and comprehensive vision of a highly complex, difficult to tackle globally.
2. “Area of Rescue Assistance application. Case Study of Libya” is interesting because it describes the situation in which People with Disabilities find themselves in that region, which is not sufficiently understood when using a building. In regards to the concept of Universal Design and the ISO, “The purpose of this International Standard is to define how the built environment should be designed.”
3. “Good Practices Emergencies Relief for Disabled People” in Italy is innovative and, according to it, “it is a reference point for planning the management of emergency situations in which people with disabilities may be found, both as a result of disasters and as a result of human events, providing for the management of emergencies.
4. “Natural Disasters and Emergencies in Chile Actions in Urbanism and Architecture for people with disabilities”, those who assume the development of this research are 5 members of the Universal Accessibility Committee of the Chilean Association of Architects. Their high level of production and synthesis allows them to face both the general situation of all disasters as well as to detail in a monographic way several of their typologies, such as Earthquakes, Tsunamis, Landslides, Volcanic Eruptions, and Wildfires. Due to the great commitment of this Committee, the result is highly satisfactory, which will benefit not only the Latin American countries.
5. “On Thin Ice”, which geographically encompasses Northern Canada, is currently experiencing massive transformation, which results in a highly different and unique Case Study, where the climatic situation derived from snow marks a path that determines all design inclusive in the event of any disaster or emergency. Its content is clarifying to us because it assumes the keys to the situation. “Fires, floods, infrastructure failures, food shortages, oil spills, and epidemics all represent real, immediate, and serious threats to Northern communities”. To conclude that “The objective of ON THIN ICE was to protect lives and improve the security, well-being, and inclusion of people with disabilities (physical, cognitive and sensory) and other vulnerable populations in the Arctic”.
6. “Description of the Case Study: The Swimming Pools of the Montjuic Olympic Ring”, we understand that its contribution is really broad when stopping to analyze the evacuation of large sports buildings “in an emergency from the point of view of people with mobility reduced in general and people with special needs in particular. We find it a well-exposed and developed research that provides valuable knowledge.

7. "Sharing on Temporary Quarantine and related Facilities in Hong Kong" has the great virtue of exposing an excellent and current experience as a result of the Covid-19 Pandemic. The way in which the problem is organized, the massive participation and collaboration of absolutely all institutions, public and private, of universities, of professionals, of the joint effort knowing that unity is strength, is a clear example we should tend towards. The entire population, including those infected, has been channeled to new or renovated buildings. An Elderly Friendly Design is also conceived. Different types of hygienic considerations are included as well as the design of temporary hospitals. All this is used to investigate, such as the integrated modules of construction or application of new technologies.

3.- INCLUSIVE DESIGN GUIDELINES

1. The research on the Inclusive Design Guidelines has drawn the initial goals, highlighted the problems that affect People with Disabilities in the event of a disaster, approaching the best way forward in a clear, concrete, and didactic manner.
2. In regards to the methodological structure, we pose as a challenge the different types of disadvantages that the most vulnerable people suffer, showcasing multiple scenarios in which a wide variety of pathologies are opened, both physically and psychologically, cognitive and/or sensory.
3. By incorporating the background and key messages, as well as illustrating the precedents to Sendai (2015-2030), Yokohama and Hyogo, the research encompassed the last decades, a dynamic process led by the UN Office for Disaster Risk Reduction (UNDRR), specifying the priorities in each strategy. When analyzing a definition of terms such as Disaster Risk, Disaster Risk Reduction, and Hazard, it brings clarity and color, as well as exposing other terms such as Vulnerability, Resilience, Capacity, or Build Back Better.
4. The description of the 4 Priorities and the 7 Targets serve to clarify what is specified in Sendai.
 - The 15 subtitles: from 1. The UNDRR Sendai Framework 2015, (Sendai Framework), to 15.
 - Leverage Technology structure a concrete, understandable application methodology in this complex issue.
 - Each subscript, from 1 to 15, brings in a comprehensive program of the measures to be followed, which includes numerous basic concepts such as the need for International Cooperation, Resilience or Hazard, as well as the Understand the types of Vulnerable Communities.

In short, it is a right structured and exposed experience, with an abundant bibliography, at the service of all those interested in this subject.

4.- BIBLIOGRAPHY

The bibliographic relation is located at the end of this research. The reference listings have been provided by their authors.

FIFTH SECTION

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