

URBAN RESILIENCE GUIDE

2016



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GLOSSARY

CENAPRED	National Center for Disaster Prevention
CONAPO	National Population Council
CRM	Comprehensive Risk Management
CRPP	The City Resilience Profiling Programme or Urban Resilience Profile
CRPT+	City Resilience Profiling Tool
CWA+	Solvency
FONDEN	National Natural Disaster Fund
GDP	Gross Domestic Product
IMPLAN	Municipal Planning Institute
LGAH	General Human Settlements Law
LGPC	General Civil Protection Law
NGO	Non-Governmental Organizations
OECD	Organization for Economic Cooperation and Development
PND	National Development Program
PNDU	National Urban Development Program
PNPC	National Civil Protection Program
PPR	Risk Protection Program
RAP	Resilience Action Plan
RCN	Resilient Cities Network
ROI	Return on Investment
SAGARPA	Ministry of Agriculture, Livestock, Rural Development, Fishing and Food
SALUD	Ministry of Health
SCT	Ministry of Communication and Transportation
SE	Ministry of the Economy
SEDATU	Ministry of Agrarian, Land and Urban Development
SEDENA	Ministry of National Defense
SEDESOL	Ministry of Social Development
SEGOB	Ministry of the Interior
SEMAR	Ministry of the Navy
SEMARNAT	Ministry of the Environment and Natural Resources
SENER	Ministry of Energy
SEP	Ministry of Public Education
SFP	Ministry of Public Administration
SHCP	Ministry of Finance and Public Credit
SIG	Geographic Data System
SINAPROC	National Civil Protection System
SRE	Ministry of Foreign Relations
STPS	Ministry of Labor and Social Welfare
SUN	National Urban System
UN	United Nations
UN-HABITAT	United Nations Human Settlements Programme
UNAM	National Autonomous University of Mexico
UNISDR	United Nations Office for Disaster Risk Reduction

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FOREWORD

Over the years, Mexico has been making strides in its efforts to anticipate, deal with and overcome the consequences of natural disasters. At times, we have learned through the tragedy and pain caused by such events, but now Mexicans have increasingly been taking on the responsibility of putting skills together so as to foresee and prepare to face such adversity.

The perfect example of this is the National Civil Protection System, which 30 years after its inception, has developed into a truly effective action-based organization nationwide.

A major step in achieving this involved shifting from a predominantly reactive approach to one that focuses on prevention and planning. It was also absolutely essential to improve communication among government institutions and agencies, so as to make more efficient use of resources and be far more effective in achieving the primary objective of saving lives.

And this is why the President of Mexico had a comprehensive strategy designed and a Civil Protection Government Policy implemented. Basic to the policy is citizen-centered Comprehensive Risk Management that merges public and private sector capabilities with those of civil society, around shared goals.

Today, all federal government agencies work jointly to attend to the population and provide the necessary support to each and every community at risk. Moreover, they coordinate efforts with local governments to ensure the availability of precise, timely information before, during and after any such phenomenon.

Thus, Mexico now works with a broader outlook that understands the importance of prevention, communication and education in averting such disasters; facilitates speedy coordinated action when attending to them, and promotes community resilience to ensure governability even at the most difficult times, so as to overcome them quickly.

Tools such as this Guide are part of that outlook and clearly make major contributions to ensuring that urban planning and infrastructure works comply with standards that allow for proper protection and achieving effective recovery in the short run.

Through this instrument and many others that we, SEDATU and other federal agencies are currently developing together, we strive to take care of Mexico's most precious asset: its families.

Miguel Ángel Osorio Chong
Minister of the Interior

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FOREWORD

The Mexican government has set itself the task of improving living conditions for the country's millions of city dwellers, with the help of the Ministry of the Interior and the Ministry of Agrarian, Land and Urban Development, as well as the invaluable support of UN-HABITAT.

In this same context, meeting the international goals set forth in the 2030 Agenda for Sustainable Development, adopted by Mexico in 2015, requires effective public policies to reduce our cities' exposure to risks associated with human activity, natural disasters and climate change.

Safeguarding the lives and property of individuals and families is essential to their wellbeing, ensuring them access to development opportunities and guaranteeing their fundamental rights.

The latter is something on which President Enrique Peña Nieto's administration has placed great emphasis and that has been reflected in its public policies, which are complemented by a responsible federalism that views all three tiers of government as essential to the country's development and the safeguarding of its citizens' fundamental rights.

This Guide takes an inter-sectorial approach and provides a framework to facilitate the drawing up and implementation –mainly by municipal authorities– of risk-management actions to reduce the impact of disasters and help the population recover more quickly from them.

In short, we believe it will prove a useful resource for inter-governmental coordination and the protection of our cities' most valued asset: people.

Rosario Robles Berlanga
Minister of Agrarian, Land and Urban Development

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FOREWORD

All around the world, our large cities face natural and man-made threats of one kind or other: 80% are at risk from earthquakes, 60% from tsunamis, and they all will have to deal with the effects of climate change.

With approximately 50% of the world population currently living in cities – a figure that is expected to increase dramatically in decades to come –, we need new tools to strengthen national and local governments and protect the human, economic and natural resources of our towns and cities. Urban resilience, therefore, is a strategic factor in the overall sustainability of our cities.

To improve the resilience of our cities, UN-HABITAT has designed a City Resilience Profiling Programme (CRPP), which provides national and local governments with the tools they need to gauge and boost resilience to the impact of multiple threats. It employs a broad-based, integrated urban planning and management approach and the drawing up of city resilience profiles.

UN-HABITAT congratulates Mexico on its leadership in this area. This Guide is a groundbreaking publication that most certainly deserves to be included in the portfolio of successful urban experiences discussed at the Habitat III Summit in 2016.

It has been a privilege for UN-HABITAT to work with the Ministry of Agrarian, Land and Urban Development on this Guide: the very first of its kind. We have every confidence it will have far-reaching practical applications, not to mention giving us good reason to closely follow Mexico's efforts in the area of urban resilience.

Erik Vittrup Christensen
Representative of the United Nations Human
Settlements Programme (UN-HABITAT)
for Mexico, Cuba and the Dominican Republic

I

INTRODUCTION

By virtue of its geographical location and physical and social vulnerability, Mexico has historically suffered large-scale disasters that have caused serious financial damage and loss of life. Significantly, most of these disasters have occurred in urban areas.

Given this situation, the Mexican government has strengthened public policies meant to mitigate the risks of disaster. For example, in 2016, the Ministry of Agrarian, Land and Urban Development (SEDATU) included a section in its Risk Prevention Program (PPR, Spanish initials) on the amount of funding required to improve the resilience of our cities.

This **Urban Resilience Guide** is designed to be used by municipal authorities throughout the country. It contains a step-by-step explanation of the methodology used to compile a resilience profile (CRPP) for each region.

The first two of its seven chapters explain the conceptual framework and provide background information on Comprehensive Risk Management, while the third describes the impact of disasters on the country's major cities, underscoring the need for measures that lead to urban resilience. Chapter four establishes the purpose, scope and goals of the Guide and the Urban Resilience Profile, and chapter five looks at the dimensions of resilience in the urban system.

Chapter six goes on to lay out the process and methodology for compiling an Urban Resilience Profile, while chapter seven discusses the Resilient Cities Network (RCN). This initiative, introduced by SEDATU in conjunction with UN-HABITAT and the Ministry of the Interior (SEGOB), is the very first effort by Mexico's Federal Public Administration to establish an across-the-board urban resilience reference framework that will enable the country's various government agencies to maintain urban planning as the guiding principle at the core of their specific programs and projects.

This Guide is a highly valuable methodological precedent that will enable us to better address urban development challenges, both present and future.

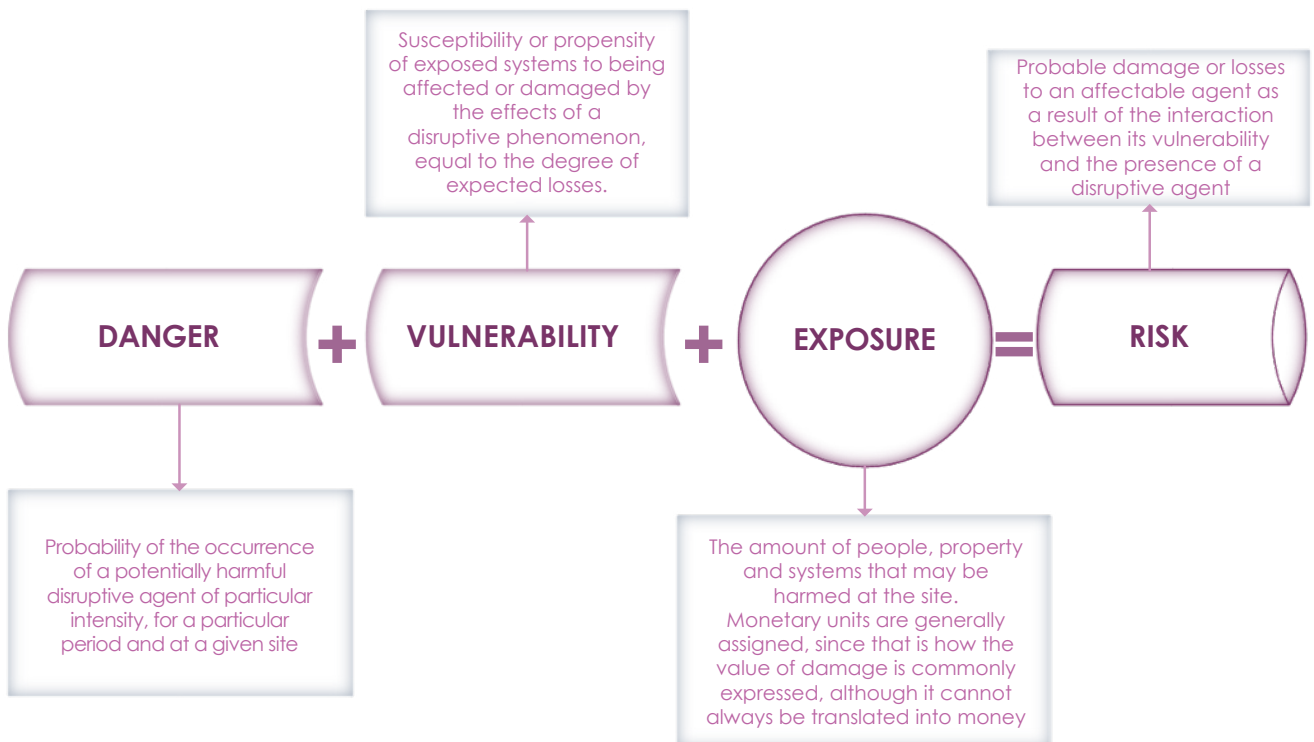
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1. CONCEPTUAL FRAMEWORK

1.1 WHAT IS RISK?

According to the National Center for Disaster Prevention the notion of risk in terms of disaster prevention has been addressed by various disciplines, each viewing it through a different lens. To clarify, we might begin by asking how risk is linked to human activities (CENAPRED, 2004:19).¹

Figure 1. Definition of Risk Using Basic Concepts



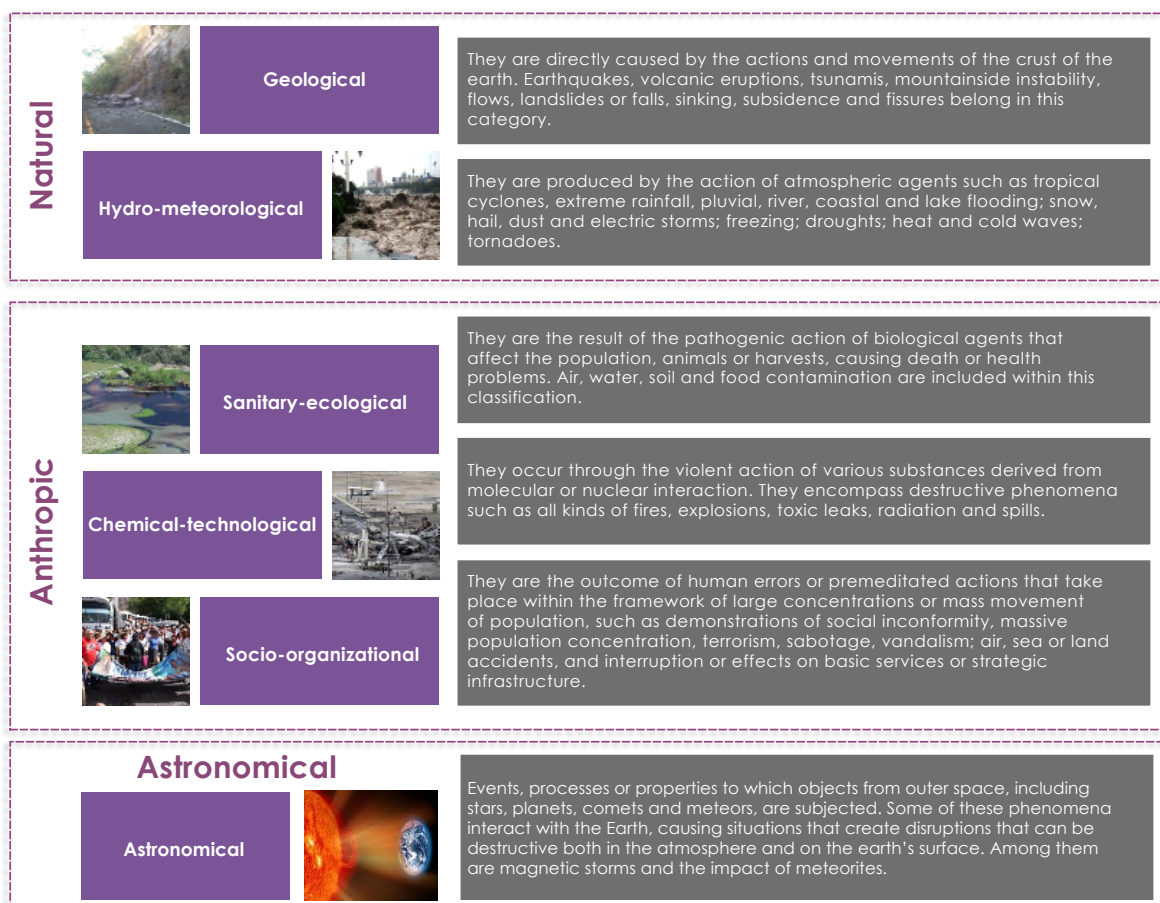
Source: SEDATU, based on the General Civil Protection Law

The existence of risk implies the presence of a disruptive agent (natural or man-made phenomenon) that will likely cause damage to a susceptible system (such as human settlements, infrastructure, production facilities or others) to such a degree that it amounts to a disaster (CENAPRED, 2004: 19).

1.2 PHENOMENA CLASSIFICATION

Mexican territory is subject to various natural and anthropic (produced by human activity) phenomena that can have a significant impact on the population. Most cause serious human and material losses. In Mexico, natural phenomena have been classified by governmental authorities and are described in the General Civil Protection Law.

Figure 2. Disruptive Phenomena Classification



Source: SEDATU, based on the General Civil Protection Law

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1. CONCEPTUAL FRAMEWORK

Table 1. Disruptive Phenomena Classification

Type	Phenomenon
Geological	1. Volcanism
	2. Earthquakes
	3. Tsunamis
	4. Mountainside instability
	5. Flows
	6. Landslides or falls
	7. Sinking
	8. Subsidence
Hydro-meteorological	9. Fissures
	10. Heat and cold waves
	11. Droughts
	12. Freezing
	13. Hailstorms
	14. Snowstorms
	15. Tropical cyclones
	16. Tornadoes
	17. Dust storms
	18. Electrical storms
	19. Extreme rainfall
Chemical-technological	20. Pluvial, river, coastal and lake flooding
	21. Fires
	22. Explosions
Sanitary-ecological	23. Spills and toxic leaks
	24. Radiation
	25. Epidemics
	26. Plagues
	27. Air pollution
	28. Water pollution
Socio-organizational	29. Soil pollution
	30. Mass movements (marches, pilgrimages)
	31. Large concentrations (demonstrations; political, social, cultural events)
	32. Terrorism
	33. Sabotage
	34. Vandalism
	35. Air accidents
	36. Sea accidents
	37. Land accidents

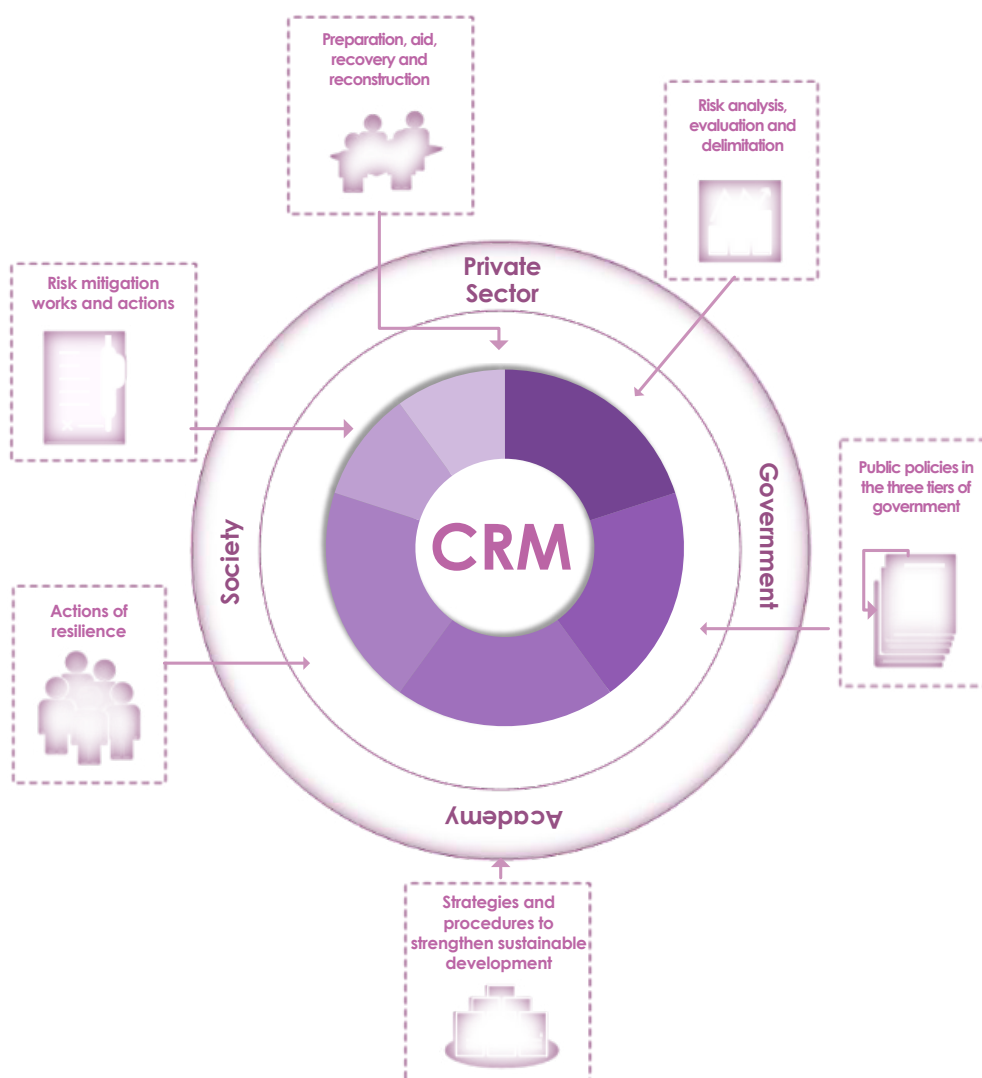
Source: General Civil Protection Law, Art. 2, Fracc. XXII-XXIII / DOF 06-06-2012.

Note: Sinking, subsidence and fissures can also be caused by human activities. This list contains cases of natural processes on the Earth's surface.

1.3 COMPREHENSIVE RISK MANAGEMENT (CRM)

The analysis of disaster and associated prevention and response efforts are highly complex endeavors. Consequently, initiatives for Comprehensive Risk Management (CRM) have been strengthened in Mexico. Some of the more important steps toward this end are detailed below.

Figure 3. Comprehensive Risk



Source: SEDATU, based on the General Civil Protection Law

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1. CONCEPTUAL FRAMEWORK

The General Civil Protection Law (LGPC, Spanish initials) defines Comprehensive Risk Management as:

A set of actions aimed at the identification, analysis, evaluation, control and reduction of risks, which considers the range of factors for their origin, in an ongoing process of formulation that involves the three tiers of government, as well as societal sectors. This facilitates the creation and implementation of public policies, strategies and integrated procedures to achieve guidelines for sustainable development that combat the structural causes of disasters and strengthen society's resilience or endurance capacity. It involves risk identification stages and/or the processes for their formation, as well as predicting, preventing, mitigating and preparing for them and providing aid, recovery and reconstruction.

With that focus in mind, resilience is defined by the LGPC as:

The capacity of a system, community or society that is exposed to some danger to quickly and efficiently resist, assimilate, adapt to and recover from its effects through the preservation and restoration of its basic functional structures, while ensuring improved protection and risk reduction measures in the future.

In turn, UN-HABITAT defines urban resilience as the capacity of urban systems to recover quickly from any event caused by disruptive natural or anthropic phenomena.

Its purpose is to keep such events from evolving into full-blown disasters.



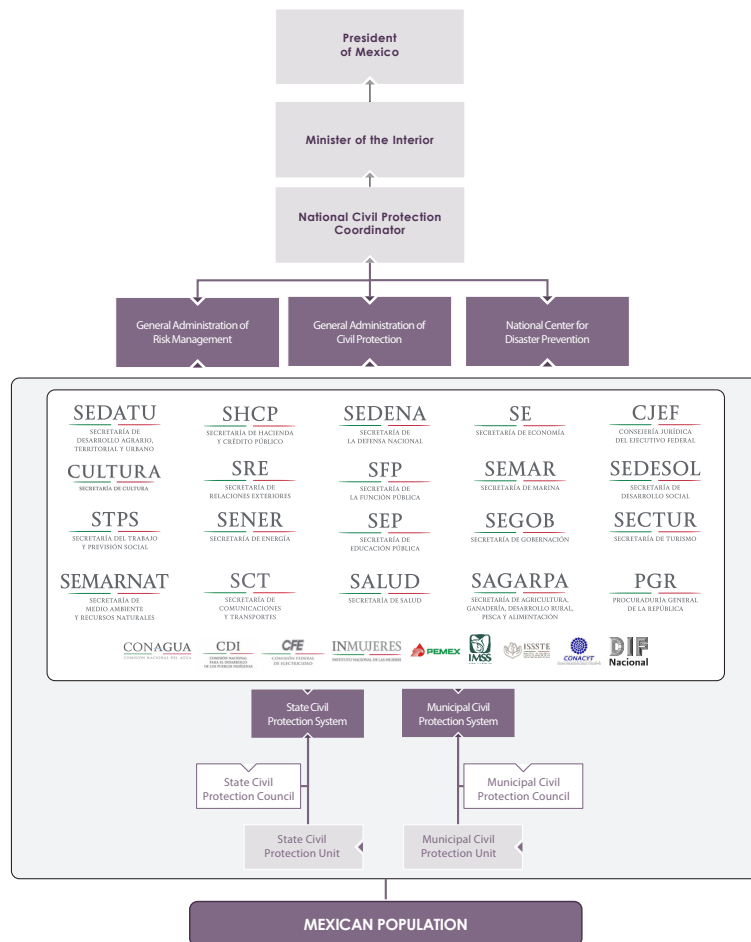
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2. BACKGROUND

2.1 COMPREHENSIVE RISK MANAGEMENT POLICY IN MEXICO

Beginning in the 1980s, the Mexican government promoted civil protection efforts in response to disaster situations the nation had undergone. The first step was taken in 1986, with the creation of the National Civil Protection System (SINAPROC, Spanish initials), whose organization involves all levels of government, in terms of structure, functional relationships, methods and procedures, and encourages private sector participation as well as that of non-governmental organizations and civil society.

Figure 4. National Civil Protection System (SINAPROC)



Source: SEDATU based on FONDEN.²

In accordance with the Organization for Economic Cooperation and Development (OECD, 2013),³ SINAPROC has displayed major advances in disaster preparation, warning and response processes. The key variable considered is the number of deaths caused by such incidents, a figure that has declined since the system's inception.

SINAPROC functioning is based on the ability of its components to work together following consistent policies, particularly within the three tiers of government in Mexico. Furthermore, it enables inter-institutional organization for decision-making on disasters and coordinates federal agencies for comprehensive risk management.

2.2 CRM IN PLANS AND PROGRAMS

The role and scope of SINAPROC are respectively based on and defined by the National Development Plan (PND, Spanish initials) 2013-2018, which, in its first section, "Mexico at Peace", establishes:

[...] a new focus to ensure the government fulfills its commitment to safeguard the population, its property and environment against natural or man-made disasters. The government's efforts must be reoriented toward prevention, so as to reduce human and material losses due to such phenomena, by means of across-the-board policies focusing on comprehensive risk management and including financial coverage in the event of such disasters.

In Objective 1.6, the PND establishes the obligation to "safeguard the population, its property and environment against natural or man-made disasters." To achieve this task, the Federal Government has defined the following strategies:

Strategy 1.6.1 Strategic Policy for Disaster Prevention

Courses of action:

- Support Comprehensive Risk Management as an overriding policy across the three tiers of government, with participation from the private and social sectors.
- Foster a culture of civil protection and self-protection.
- Fortify financial instruments for comprehensive risk management, with an emphasis on prevention, while bolstering emergency/disaster response and reconstruction efforts.
- Promote studies and mechanisms aimed at risk transfer.

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2. BACKGROUND

- Stimulate, develop and promote Official Mexican Regulations for consolidation of the National Civil Protection System.
- Promote the strengthening of existing regulations with regard to human settlements in risk zones, to prevent both human and material damage that could be avoided.

Strategy 1.6.2 Emergency Management and Effective Disaster Response

Courses of action:

- Strengthen the logistical and operational capacity of the National Civil Protection System in terms of emergency and disaster response.
- Strengthen the capacity of the armed forces to lend support to the civil population in the event of a disaster.
- Coordinate efforts by federal, state and municipal governments in the event of an emergency or disaster.

For its part, the 2014-2018 National Civil Protection Program (PNPC, Spanish initials) sets down as Objective 1: “[...] to promote preventive action within Comprehensive Risk Management so as to reduce the effects of disruptive natural phenomena.” It points out that “response to the consequences of disruptive natural phenomena has historically tended toward the assistance phase in cases of emergencies and disasters.” It further notes “the high toll” of ignoring prevention and resilience.

The PNPC has established three strategies to achieve the first objective:

- 1.1 Encourage a preventive focus in activities by members of the National Civil Protection System.
- 1.2 Assess the impact of disasters for more effective decision-making with regard to prevention.
- 1.3 Formulate guidelines for the processes of devising, evaluating and following through on Operational Continuity Plans.

PNPC Objective 5 establishes the need to promote adoption and implementation of innovative technologies as they apply to civil protection. With bigger and better tools for improving processes of disaster planning, resilience and response, SINAPROC technology makes it possible to discover the causes and reduce the effects of disruptive phenomena. To achieve this objective, the following strategies have been set down:

- 5.1 Promote applied research, science and technology for Comprehensive Risk Management.
- 5.2 Constantly update the National Risk Atlases so that they can be a useful tool for development and organization of Mexican territory.

5.3 Reinforce the National Alert System as an administrative informational tool for the National Civil Protection System.

In Objective 6, the PNPC underscores the importance of allotting resources from financial instruments for risk management and points out that the catastrophic events of recent years make it evident that civil protection in Mexico has primarily been based on a model of reactive intervention in which the disaster triggers actions by the authorities. Consequently, considerable resources earmarked for civil protection end up covering damages from natural disasters, without necessarily ensuring efficient use of authorized resources. Thus, to achieve the sixth objective, the PNPC sets down the following strategies:

- 6.1 Promote the optimal allotment of resources to preventive instruments for risk management, to ensure financing for preventive projects.
- 6.2 Encourage access to resources of a preventive nature, to optimize actions that mitigate the impact of disruptive natural phenomena.
- 6.3 Maximize efficiency in resource allotment for emergency and disaster response, to ensure support to the affected population and infrastructure.

It is thus essential to adopt a variety of strategies and courses of action to expand and fortify government intervention, where the disaster remains the focus of procedural steps. Efficient allotment of resources earmarked for civil protection is another requirement. Increased efforts to reduce the risks of disasters and focus on resilience are recommended as well.

Another of the programs under consideration is the 2014-2018 National Urban Development Program (PNDU, Spanish initials). Objective 5 includes the following recommendation:

- Avoid human settlements in risk zones, and reduce vulnerability among urban populations facing natural disasters.

Every year, Mexican territory is subject to numerous natural phenomena that can put populations at risk. Reducing the vulnerability of Mexicans in the face of such disasters is thus the inalienable responsibility of the federal government.

It is therefore essential that SEDATU make every effort to reduce risks to the population and check the expansion of human settlements in areas that are susceptible to natural or anthropic phenomena. To achieve this, the PNDU has formulated four strategies (along with their respective courses of action):

- 5.1 Ensure strict observation of the risk atlases when utilizing instruments for territorial planning, ecological organization and urban development.

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5.2 Strengthen the regulatory and cooperative framework for risk prevention and reduction.

5.3 Reduce vulnerability of urban settlements, to minimize the occurrence of disasters.

5.4 Assist communities affected by natural disasters, and take steps to reduce their vulnerability.

2.3 LEGAL BASES FOR CRM

CRM policies in Mexico have a broad legal base. In efforts to improve resilience, the major laws to be duly considered are:

General Civil Protection Law (LGPC)

Its goal is to establish the bases for coordination between the three tiers of government, in terms of civil protection. Article 3 of the LGPC stipulates that the three tiers of government must constantly strive to support programs and strategies that strengthen the organizational tools and operation of civil protection institutions under the banner of CRM. In addition, Article 4 asserts that public policies regarding civil protection must adhere to the PND and PNPC.

Article 7 of the LGPC details the functions of the Federal Executive branch in civil protection matters, the main ones being:

I. To ensure the proper functioning of the National System and prescribe general guidelines for the coordination of civil protection tasks beneficial to the population, its property and environment, while prompting and guiding the participation of the various groups and sectors of society within the framework of Comprehensive Risk Management.

II. To promote the incorporation of Comprehensive Risk Management in local and regional development, defining strategies and policies based on risk analysis, the ultimate aim being to avoid future risks and intervene to reduce existing risks.

VII. To prescribe general civil protection guidelines that prompt and encourage the principles of Comprehensive Risk Management and Continuity of Operations as public policy values and across-the-board duties. The aim is to ensure the performance of preventive actions, with special emphasis on issues that are directly related to health, education, territorial organization, urban-regional planning, conservation and use of natural resources, governability and safety.

VIII. Watch out for population centers in risk zones, through the appropriate agencies and bodies, in accordance with applicable legal regulations, and in certain cases, instructing competent authorities to proceed with their eviction while ascribing responsibility to those who overlook such improprieties or collude with others involved.

In Article 10, the LGPC details CRM phases prior to a disruptive event:

- I. Knowledge of origin and nature of the risks, as well as the social processes that led to them.
- II. Identification of dangers, vulnerabilities and risks, as well as their settings.
- III. Analysis and evaluation of possible effects.
- IV. Review of controls for impact mitigation.
- V. Actions and mechanisms for risk prevention and mitigation.
- VI. Development of better understanding and awareness of risks.
- VII. Strengthening of societal resilience.

General Law on Human Settlements (LGAH)

This law establishes the concurrence of the three tiers of government on regulating human settlements on Mexican territory, as well as basic planning regulations. It also defines principles for determining provisions, reserves, uses and allocations of the areas and property that regulate ownership in population centers and establishes the bases for social participation with regard to human settlements.

In Article 3, the LGAH mentions that prevention, control and response to risks and environmental contingencies in territorial organization of human settlements and urban development of population centers tend to improve the level and quality of life of urban and rural populations.

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3. WHAT IS URBAN RESILIENCE?

3.1 URBAN CONTEXT

The world is rapidly urbanizing. Currently more than half the world's population lives in urban areas, [and cities] will absorb another three billion people by the year 2050 –70% of the world's population. Most of this growth will take place in developing countries.

Cities are engines of growth and job creation. They contribute to 80% of world GDP. When properly planned, governed and financed, cities can and should drive world national growth. No country has ever achieved median levels of income without adequate urbanization.

*Joan Clos
Executive Director, UN-HABITAT*

Currently, cities are the world's economic engines and consequently the chief attraction for migrant populations in search of better opportunities for employment, education, health and services.

Some Key Facts about Cities

In the world (UN-HABITAT, 215):

- Currently half of humankind –some 3.5 billion people– lives in cities.
- By the year 2030, nearly 60% of the world's population will inhabit urban areas.
- The world's cities occupy just 3% of its surface area but represent between 60% and 80% of its energy consumption, as well as 75% of carbon emissions.
- Approximately 95% of urban expansion in the coming decades will take place in developing countries.
- If rapid urbanization lacks adequate planning, it will take a toll on the world's drinking water supplies and sewage facilities, living conditions and public health.
- Nevertheless, the high density of cities can bring improvements in technological efficiency and innovation while consumption of resources and energy may be reduced.

In Mexico:

- Our country is essentially urban. Of every 10 inhabitants, seven live in towns of 15,000 or more.
- According to the National Council on Population (CONAPO, Spanish initials), in 2010 the National Urban System (SUN, Spanish initials) was made up of 384 cities –59 metropolitan areas, 78 conurbations and 247 urban centers– in which more than 82.6 million people, or 72.3% of the Mexican population, lived (CONAPO, 2014: 109).
- The population of SUN cities will increase by an estimated 16.6 million inhabitants between 2010 and 2030: from 82.6 million to 99.3 million (CONAPO, 2014: 141).
- Furthermore, according to the 2013–2018 PNDU, 87.7 million of the country’s inhabitants live in areas at risk due to their exposure to different types of phenomena. Of them, nearly 70% inhabit urban areas, 9.5% semi-urban and 20.5% rural areas.

3.2 INCREASED RISKS

[...] 2015 differs markedly from the past, with rising technological risks, notably cyber attacks, and new economic realities, which remind us that geopolitical tensions present themselves in a very different world from before. Information flows instantly around the globe and emerging technologies have boosted the influence of new players and new types of warfare. At the same time, past warnings of potential environmental catastrophes have begun to be borne out, yet insufficient progress has been made – as reflected in the high concerns about failure of climate-change adaptation and looming water crises in this year’s report.

These multiple cross-cutting challenges can threaten social stability, perceived to be the issue most interconnected with other risks in 2015, and additionally aggravated by the legacy of the global economic crisis in the form of strained public finances and persistent unemployment. The central theme of profound social instability highlights an important paradox that has been smouldering since the crisis but surfaces prominently in this year’s report. Global risks transcend borders and spheres of influence and require stakeholders to work together, yet these risks also threaten to undermine the trust and collaboration needed to adapt to the challenges of the new global context.

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3. WHAT IS URBAN RESILIENCE?

The world is, however, insufficiently prepared for an increasingly complex risk environment. For the first time, the report provides insights on this at the regional level: social instability features among the three global risks that Europe, Latin America and the Caribbean, and the Middle East and North Africa are least prepared for.

*World Economic Forum
Report on Global Risks 2015*

The world has witnessed an upward trend in disasters in recent decades, both in the number of events and populations affected. Among others, climate change is considered one of the chief culprits for such catastrophes (RIVERA, 2015: 447). Disproportionate exploitation of resources, accumulation of gases in the atmosphere and poor handling of pollutants, to name a few factors, are causing serious modifications to the climate at the global level. In the past two decades, the number of registered disasters has doubled, with nine out of ten being climate related and cities being the main stage for such calamities.

Economic losses are increasing in developing countries, and the high cost of post-disaster restoration proves a setback to economic development. Different researchers have shown that it can take decades for economically deprived populations to recover their material losses from a disaster's impact.

Risks of anthropic origin must also be considered. According to the Report on Global Risks 2015, while urbanization may fuel economic growth and spur technological innovation in cities, the capacity to confront such global risks as climate change, pandemics and cyber threats should also be augmented. Furthermore, the interconnection between geopolitics and economics yields national, cross-border and global commercial treaties, which in the case of a disaster could undermine the logic of global economic cooperation.

3.3 CITIES AT RISK

According to the United Nations (UN, 2012), globally, the principal risk factors in urban areas are related to:

- Growth of urban populations and a progressive increase in population density, which exerts pressure on lands and demand for services, as well as an increase in human settlements in coastal areas, unstable hillsides and other areas unfit for habitation.

- Weak local governance and poor participation by local leaders in urban planning and management.
- Inadequate management of water resources, sewage systems and solid wastes, which may result in public health emergencies, flooding and landslides.
- Decline of ecosystems due to human activities such as highway construction, pollution, invasion of wetlands and unsustainable extraction of resources. This situation endangers the ability to deliver basic services such as regulation of or protection against floods.
- Lack of building regulations for public infrastructure with a high degree of physical vulnerability, as well as an absence of supervisory mechanisms to enforce them.
- Negative effects of climate change, which, depending on regional conditions, will likely push up or down extreme temperatures and precipitation, with repercussions in the frequency, intensity and location of floods, as well as other climate-related disasters.

In Mexico, the disaster that had the greatest impact on the country was the earthquake of 1985, with Mexico City bearing the brunt of the most serious damages. Resources invested in reconstruction came to as much as 2.2% of national Gross Domestic Product (GDP).⁵

Table 2. Amount of Damage Caused by Type of Phenomenon

3. WHAT IS URBAN RESILIENCE?

TOTAL DAMAGE PER YEAR (IN MILLIONS OF PESOS)

Type of Phenomenon	2008	2009	2010	2011	2012	2013	2014
Geological	78.20	72.00	8,821.80	416.60	1,555.30	826.30	2,342.50
Hydro-meteorological	13,890.10	14,041.80	82,540.00	39,543.80	15,265.90	56,021.30	27,932.10
Chemical-technological	241.70	319.90	924.30	1,376.10	370.10	4,132.80	2,566.20
Socio-organizational	79.70	153.80	86.30	74.50	118.10	28.60	152.19
Total	14,289.70	14,587.50	92,372.40	41,411.00	17,309.40	61,009.00	32,992.99

Source: Created with information from newspapers and the annual publications *Características e impacto socioeconómico de los principales desastres ocurridos en la República Mexicana* (Features and Socioeconomic Impact of Major Disasters in Mexico) National Center for Disaster Prevention.

It is worth noting that due to high exposure to natural phenomena, cities like Mexico City, Monterrey, Villahermosa, La Paz, Acapulco, Mérida and others have suffered serious damage. The destruction in these cities has caused untold economic losses, with a direct impact on their inhabitants. It is thus essential that preventive, preparatory and responsive measures to disasters be undertaken, with resilience as the guiding principle.

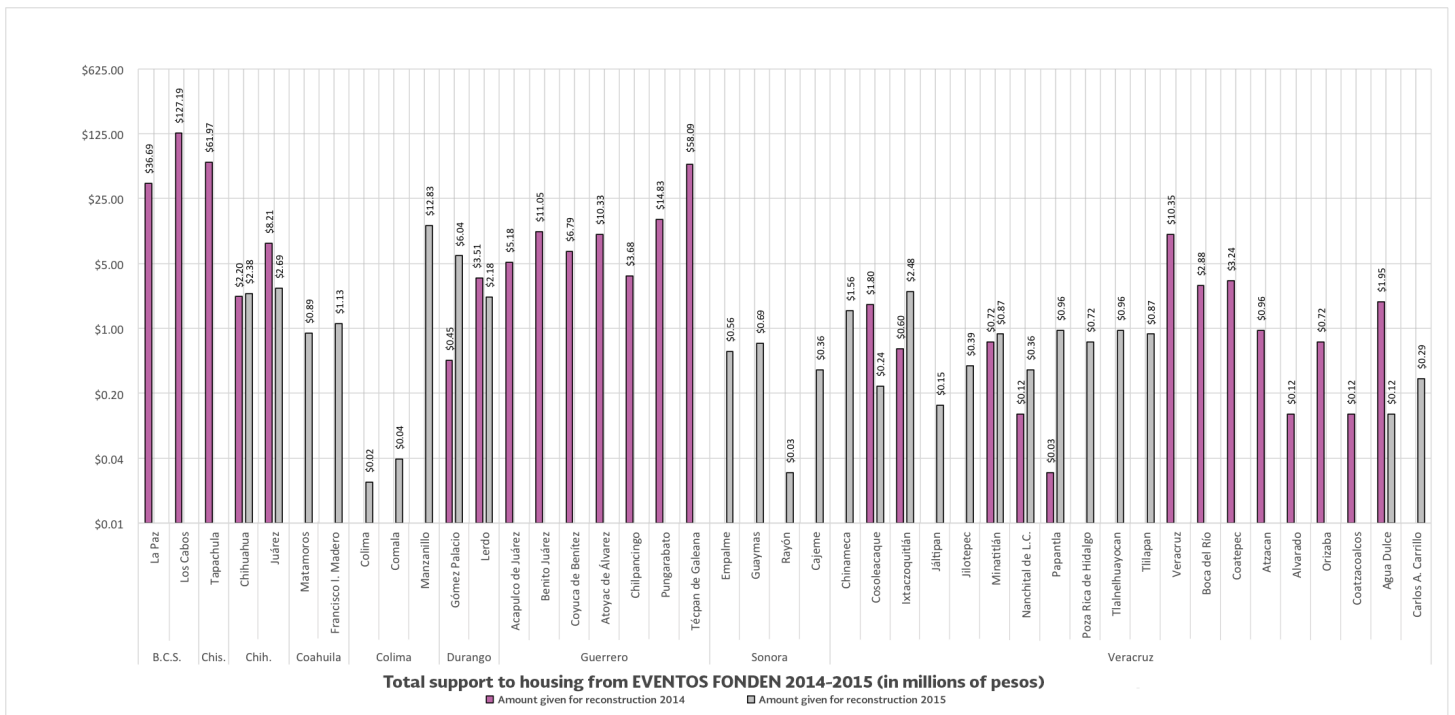
Table 3. Major Disasters That Have Affected Cities in Mexico (1985-2015)

Year	Disaster	Name (hurricanes)	City
1985	Earthquake		Mexico City
1988	Hurricane	Gilbert	Mérida, Cozumel, Cancún, Monterrey and Saltillo
1995	Hurricane	Henriette	Cabo San Lucas
1995	Hurricane	Stan	Tapachula
1997	Hurricane	Paulina	Acapulco and Puerto Escondido
1999	Landslide		Teziutlán
2002	Hurricane	Isidoro	Mérida
2005	Hurricane	Wilma	Cozumel, Playa del Carmen and Cancún
2007	Flood		Villahermosa
2010	Hurricane	Alex	Greater Monterrey and Saltillo
2010	Mudslide		Angangueo
2013	Hurricane	Jova	Manzanillo
2013	Hurricane	Ingrid y Manuel	Chilpancingo
2014	Hurricane	Odile	Cabo San Lucas, San José del Cabo and La Paz
2015	Hurricane	Patricia	Manzanillo

Source: Created with information from newspapers and the annual publications *Características e impacto socioeconómico de los principales desastres ocurridos en la República Mexicana* (Features and Socioeconomic Impact of Major Disasters in Mexico). National Center for Disaster Prevention

3. WHAT IS URBAN RESILIENCE?

Graph 1. Amount of FONDEN Resources Applied to Housing Reconstruction 2014-2015 (figures in millions of pesos)



Source: FONDEN

3.4 URBAN RESILIENCE

The Sendai Framework for Disaster Risk Reduction recognizes the importance of community-level engagement in disaster risk reduction. It also underlines how traditional knowledge can complement scientific knowledge in disaster risk management. Building resilience to disasters is also a key feature of the newly adopted Sustainable Development Goals, the framework that will guide our efforts to end poverty and promote shared prosperity on a healthy planet by 2030.

*Message by the Secretary-General of the United Nations
on International Day for Disaster Reduction,
October 13, 2015*

Urban resilience is a necessity, as is developing strategies for it at the local level. Resilience efforts are on the upswing in the international community, which is why there are now so many definitions and classifications for the term. Descriptions by some of the chief international organizations in the field are listed below.

On resilience in general:

- Ability of people, homes, communities, towns and systems to mitigate, adapt and recover from tensions and crises, so as to reduce their vulnerability and facilitate inclusive growth.
- Ability of homes, communities and states –all the different layers of society– to absorb and recover from crises through positive adaptation and attitudinal reorientation, with the aim of facing up to the long-term, shifting and uncertain impacts of crises.
- Ability of a system, community or society that is exposed to danger to resist, absorb, adapt and recover from the effects of danger promptly and effectively by preserving and restoring its essential structures and functions.

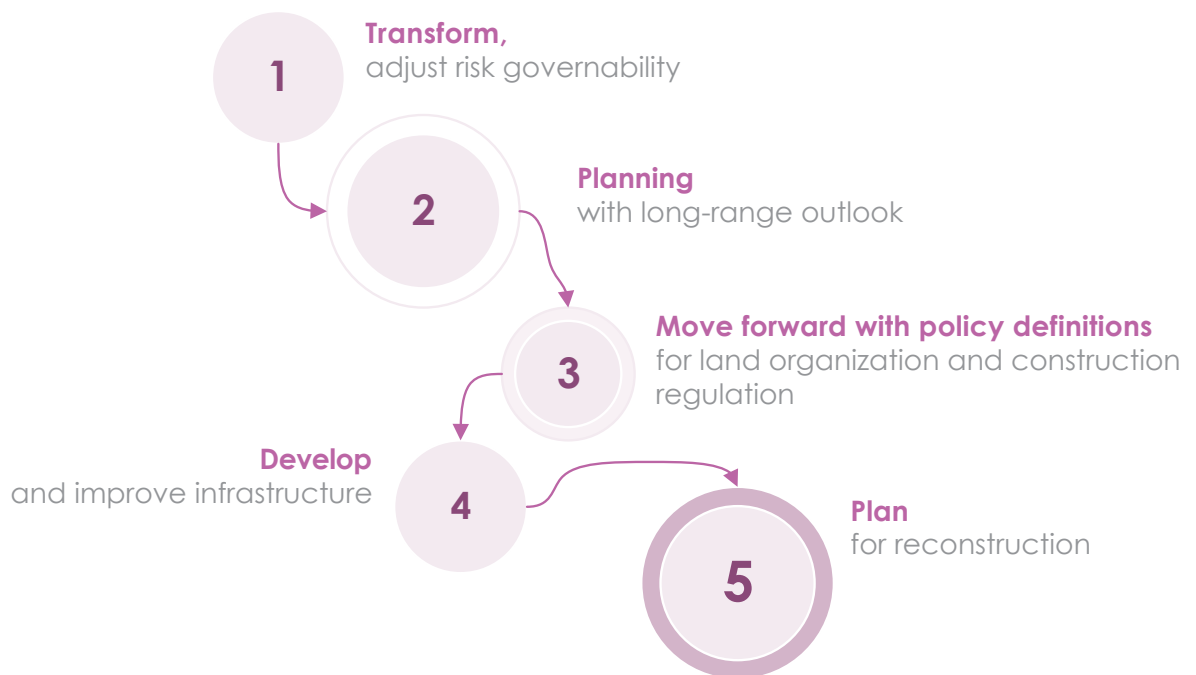
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3. WHAT IS URBAN RESILIENCE?

On urban resilience:

- Capacity of individuals, communities, institutions, companies and systems within a city to survive, adapt and grow, regardless of the kinds of chronic tensions or serious crises they have undergone.
- Demonstrated ability of an urban system to quickly absorb and recover from the impact of tensions or crises and maintain continuity of services.

Figure 5. Urban Resilience



Derived from the definitions provided, the Resilience Profile of a city is a reference evaluation designed to measure its capacity to recover from a disaster. Various methodologies and tools have been developed around the world by international organizations working to build up urban resilience. Key strides made within the UN are:

- The methodology known as The Ten Essentials, developed by the United Nations Office for Disaster Risk Reduction (UNISDR, United Nations International Strategy for Disaster Reduction), along with the associated global campaign Making Cities Resilient, which is meant to get local governments involved and provide them with damage reduction tools for impending disasters.
- The City Resilience Profiling Program (CRPP), launched by UN-HABITAT to help local governments improve resilience through development of comprehensive, integrated urban planning. The goal of the CRPP is to boost the resilience of cities in the face of natural or man-made crises.

The CRPP is implemented in association with local authorities and may involve international agencies, academic and research institutes, the private sector, NGOs and representatives from a number of associated cities worldwide. The implementation period seeks to fulfill four main aims:

1. To conduct research on the operational framework: to investigate current lines of thought on urban planning, mapping of existing risks, mitigation techniques and development of urban systems models that can be adapted to any human settlement.
2. Indexing and profiling: to establish a set of indicators and standards for calibrating the ability of urban networks to withstand crises, as well as a set of resilience profiles for pilot cities.
3. To develop tools/software: to create and perfect an interface for urban management, as well as practices for developing a city's resilience profiles.
4. To develop normative guidance: to establish a set of global standards for urban resilience and a new framework for monitoring urban systems worldwide.

4. AIMS OF THE GUIDE

The basic points of the Urban Resilience Guide are:

Mission

To obtain the urban resilience profile from the country's various cities, based on social, economic, urban and physical variables, with the aim of generating an urban resilience diagnosis and developing an action plan to improve cities' resilience capacities.

Vision

Measuring resilience in Mexico's urban areas has led to cities being better prepared to reduce the impact of disruptive phenomena and have the economic, administrative, social and political capacity to recover from disasters.

Main Objective

To instill the urgent need to transform cities into safe, livable places in local administrations, society and the private sector through incorporation of measures for adaptation to and recovery from the impact of natural and anthropic phenomena.

Specific Objectives of the Guide

- To perform in-depth diagnosis of the problems that have caused human settlements to expand into cities' risk areas.
- To create spaces where information can be exchanged at the local level in order to set concrete measures for urban planning and thus prevent social construction of risk.
- To establish an organizational and coordinating link to local governments for risk reduction. In most cities, such a connection will be made with the Municipal Planning Institutes, which will assume leadership of projects at the local level.
- To generate analytical processes for determining problems related to social construction of risk in each city.
- To make the necessary changes in urban development programs so as to prevent expansion into zones identified in atlases as being at risk from disruptive natural or man-made phenomena.

4.1 SCOPE OF THE GUIDE

The Guide is an essential tool for local authorities who need to know the procedures and methodology for estimating the CRPP Urban Resilience Profile. This instrument enables cities to gauge the situations that might arise in the event of a phenomenon and establish the mechanisms to be implemented for improved adaptation to the effects of natural and anthropic phenomena.

4.2 AIMS

The following aims have been established to carry out the proposed project:

Aim 1

Diagnose cities' state of resilience by means of different planning instruments and available information: risk atlases, urban development programs and land organization programs, among others.

1. Attainment of urban resilience profile in accordance with CRPP on the basis of UN-HABITAT methodology.
2. Prioritization of resilience efforts based on city capacity and the urgency and importance of potential impacts.

Aim 2

Establish follow-up systems and monitor resilience efforts.

1. Periodic CRPP estimation.
2. Ensure that decisions are made on the basis of recent, reliable information.
3. Measure progress and identify new threats.

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5. RESILIENCE DIMENSIONS: THE URBAN SYSTEM MODEL

Analysis of the urban reality is performed using a simplified model of the city as a complex system. To measure resilience, the global vision must be broken down into focal points, or dimensions, that enable a reading or understanding of the impacts on the urban continuum. These dimensions –spatial, organizational, physical and functional– are subjected, as a set, to the most probable threats, to determine each city’s overall behavior through the connections amongst its various components. Added to this static vision is the temporal dimension, which allows the information to be updated and provides access to an updated profile at any time, on the basis of available data.

5.1 THREATS

The National Center for Disaster Prevention (CENAPRED Spanish initials, 2004) defines threat under the heading of risk reduction, as a

[...] potentially destructive physical event, natural or resulting from human activity, that can cause loss of life and injury, material damage, serious disruption of social and economic life and environmental degradation. Threats include latent conditions that may appear in the future. They may have different origins: natural (geological, hydro-meteorological) or anthropogenic (chemical-technological, sanitary-ecological or socio-organizational).

According to the UNISDR, threat refers to those phenomena, substances, human activities or adverse conditions that can cause loss of life, injury or impacts on health, property damage, loss of dwellings or services, social or economic disruption and environmental damage.

In the context of urban resilience, the term disaster refers to any event that can cause, first and foremost, loss of life, or serious impact on the health of the population. It also encompasses anything that can cause physical damage to people’s property or urban systems or seriously or chronically disrupt their operation.

Disasters may have different origins: natural, technological, social or political. They generally set off chain reactions that in certain cases may be more devastating than the initial impact. Therefore, reaction time is a crucial variable. Disasters also have a temporal dimension, whether they cause a momentary impact or spawn long-term losses.

5.2 SPATIAL DIMENSION

When analyzing urban resilience, the first notion to emerge is land configuration. The scale correlation between its geographic definition on the map and its administrative definition must be applied. Information mapping is important to show interdependencies, superimpositions and informational gaps between the different dimensions. This configuration has a bearing on the urban area's ability to react to a potential impact.

The representation of a territory on the map enables detection of conflicts and opportunities on both the physical and organizational levels, and also determines the courses of action that could best benefit the urban area. This dimension is linked to various inter-territorial processes, such as distances, co-occurrences and influences, and can predetermine vulnerability and physical and social risks.

5.3 ORGANIZATIONAL DIMENSION

The organizational dimension takes the map of interconnecting territorial elements into account. Besides all those factors that are assets or liabilities in the various processes for each city, from the local to federal government, there are also various supra-local factors –such as state and metropolitan governments– and sub-local ones –neighborhoods and districts– which are or should be actively and organizationally involved in implementation of initiatives, projects and actions.

Based on the conceptual representation of the players involved and their skills, a set of coordination strategies can be generated, both internal –for local government– and external –for those who hold jurisdiction in particular realms and for those affected by each process. Here again, superimposing the various layers produces a complex map, which combined with the other dimensions, enables formulation of development strategies to make cities safe places where everyone can go about their daily activities.

5.4 PHYSICAL AND FUNCTIONAL DIMENSIONS

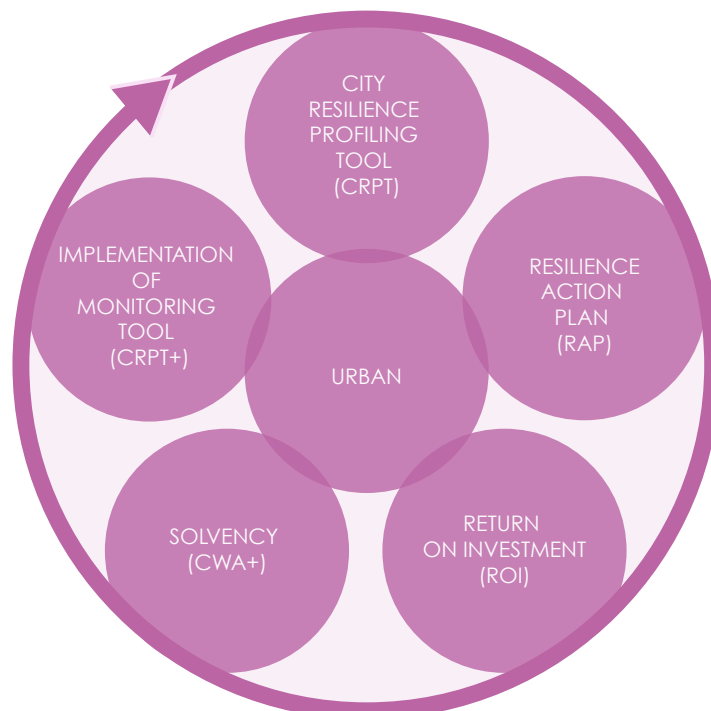
Disconnecting the physical from the functional dimensions is complex, since they generally complement and reciprocally condition each other. For that reason they are evaluated in tandem though they respond to different criteria. The city's physical makeup is governed by such conditions as its infrastructure or the physical presence of services. Functionality is determined by the continuity of service, which is likely to be overtaxed by the impact of a phenomenon.

5. RESILIENCE DIMENSIONS: THE URBAN SYSTEM MODEL

5.5 TIME

The variables used to measure resilience are dynamic and thus play out over time on an initial database. The information is constantly updated to enable uninterrupted evaluation on the Urban Resilience Profile.

Figure 6. Elements for Measuring Resilience





6.1 PROCESS

The process of determining the resilience of urban areas is informed by different phases, as explained below:

Preliminary Phase

According to the conditions spelled out in the Risk Prevention Program Rules of Operation, municipal governments apply to SEDATU to register in the program and thus take part in creating the Urban Resilience Profile.

Once the administrative/economic phase is concluded, a technical representative is designated to join the local planning authorities (Municipal Planning Institute or his/her own technical service), who takes the role of ‘focal point’.

Phase 1. Process for Authorization of Resources to Participate in the SEDATU Risk Prevention Program

Following the designation of focal points in Phase 1:

Initial seminar: project launch

Representatives from the Municipal Planning Institutes (Implanes, Spanish initials), or local officials and land planning technicians (for towns without access to a planning institute) to whom responsibilities are assigned, participate in an intensive training session organized by SEDATU. During it, UN-HABITAT trains attendees in the concept of resilience, its practical application and use of the tool (CRPP), which was designed by the agency to quantify current conditions.

Phase 2. Diagnostics

Building on the training from the previous phase, participants proceed to input data into the urban resilience tool (CRPP), managed by the town to obtain its profile. To that end, the following actions are performed:

1. Information in the municipal risk atlas, developed jointly with SEDATU, and planning instruments (urban development, land organization and ecological) are reviewed by local authorities and specialists to obtain the relevant information for an estimated version of the resilience profile (in cases where no municipal risk atlas is available, the state risk atlas can be used).

2. The local government makes use of its focal point to analyze relevant documents, urban development programs and building regulations in order to verify data that bear on the effectiveness of the measures to be carried out to improve resilience in these areas. Special attention is paid to items that deal with populations located in risk areas, their socio-economic levels and other structural data, including cultural and sociological factors, among others.

During this phase, SEDATU confirms proper performance within the established stages. In addition, UN-HABITAT provides assistance to the cities, and an intermediate face-to-face session is arranged for each of the different areas. The face-to-face sessions take place as agreed in the work plan set by the parties, grouping together four or five geographically compatible towns.

Phase 3. Creating a Resilience Profile

Based on the information provided by the cities, and after the local authorities have been trained to use the CRPP tool, the city's unique Resilience Profile is generated. An analysis of the estimate obtained is also carried out during this phase, with a report of the results attached to the file.

Phase 4. Resilience Actions

Following the presentation and approval of the Resilience Profiles, a final session is convened in each one of the cities. UN-HABITAT and SEDATU present the results, and a practical workshop is conducted for all the local participants from the different diagnostic phases, to prioritize actions in accordance with local abilities and the existing urban development program. During these sessions, a center for monitoring and follow-up on resilience processes is established for each city, and review periods are set for the respective Urban Resilience Profiles.

The conclusions and immediate action proposals are given due consideration in the Local Resilience Plan. In addition, the Municipal Planning Institutes promote public dissemination of the resilience measures.

Phase 5. Resilient Cities Network

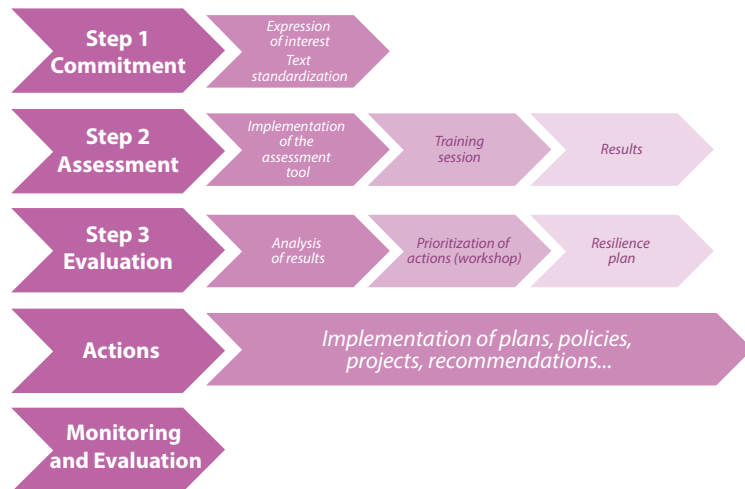
The Resilient Cities Network, developed in this final phase, is meant to establish mechanisms that help cities improve their ability to recover from disasters by means of immediate responses, medium-range projects and incorporating development objectives into existing planning.

6. MEASURING RESILIENCE TO IMPACTS

Together with UN-HABITAT and participating local authorities, SEDATU collects Resilience Profiles from 20 cities. This yields a national database that can serve as the basis for the diagnostic tool to obtain a National Resilience Profile.

The Resilient Cities Network (RCN) prescribes urgent actions and needed projects, which are incorporated into the regulations and national recommendations under a long-term vision. The aim is to improve the territory’s resilience, specifically with regard to urban areas.

Figure 7. Steps and Actions for Resilience Measurement



6.2 METHODOLOGY

The Urban Resilience Profile encompasses the following five dimensions:

- 1. Organizational.** Interaction between the different levels of administrative organization, i.e. federal, state, municipal, local and individual.
- 2. Spatial.** Refers to the territorial dimension, whether at the block, district, town, state or national level.
- 3. Physical.** Includes analysis of the different infrastructure networks –among them hydraulic, sewage, electrical, gas– facilities –health, education, culture, food supply, trade, transportation– and services –commercial, financial, residential.
- 4. Functional.** Covers the various urban plans and programs, emergency response programs, operational plans and annual operational programs, among others.
- 5. Temporal.** Includes analysis at various periods of time.

Development of the Urban Resilience Profile is a four-stage process:

Figure 8. Resilience Diagnostics



6. MEASURING RESILIENCE TO IMPACTS

Step 1. Identification of the City

A synthetic description of the city’s situation is prepared, including analysis of such aspects as location, physical factors of the territory, demographic and socio-economic features, governmental factors and public policies, economics, general situation of buildings, civil associations and public relations.

Figure 9. Topics and Topic Divisions for Securing CRPP (Step 1)

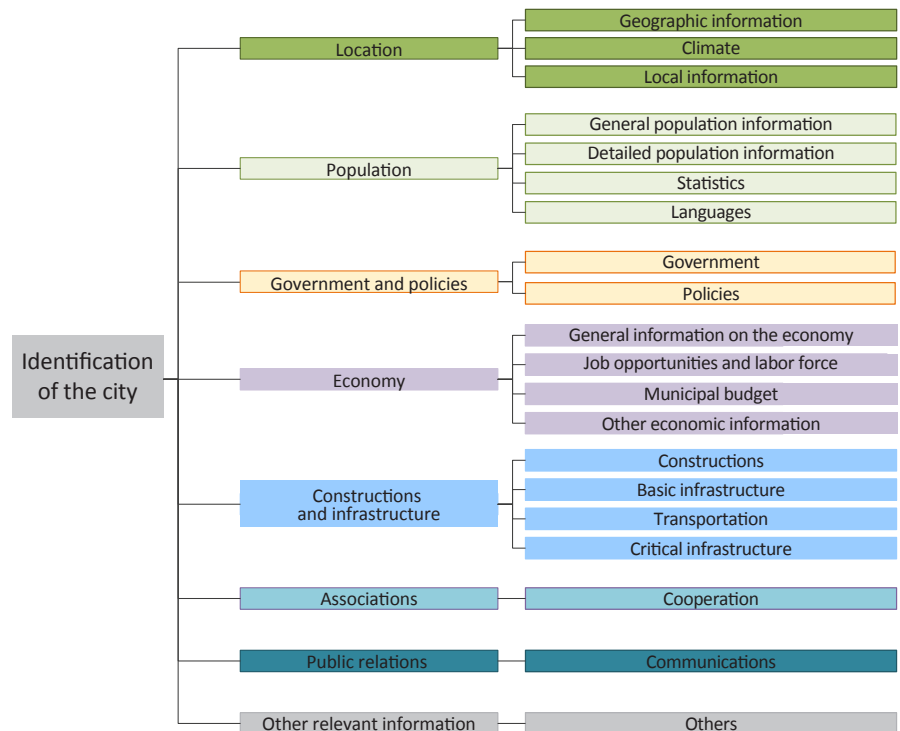
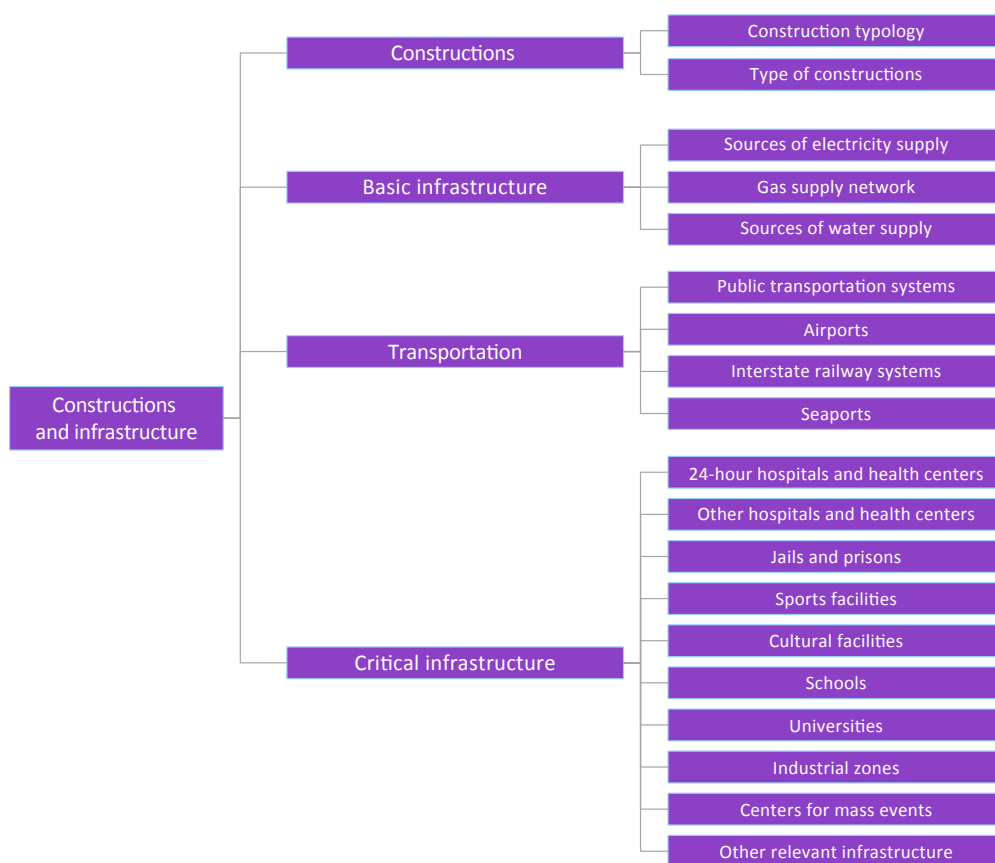


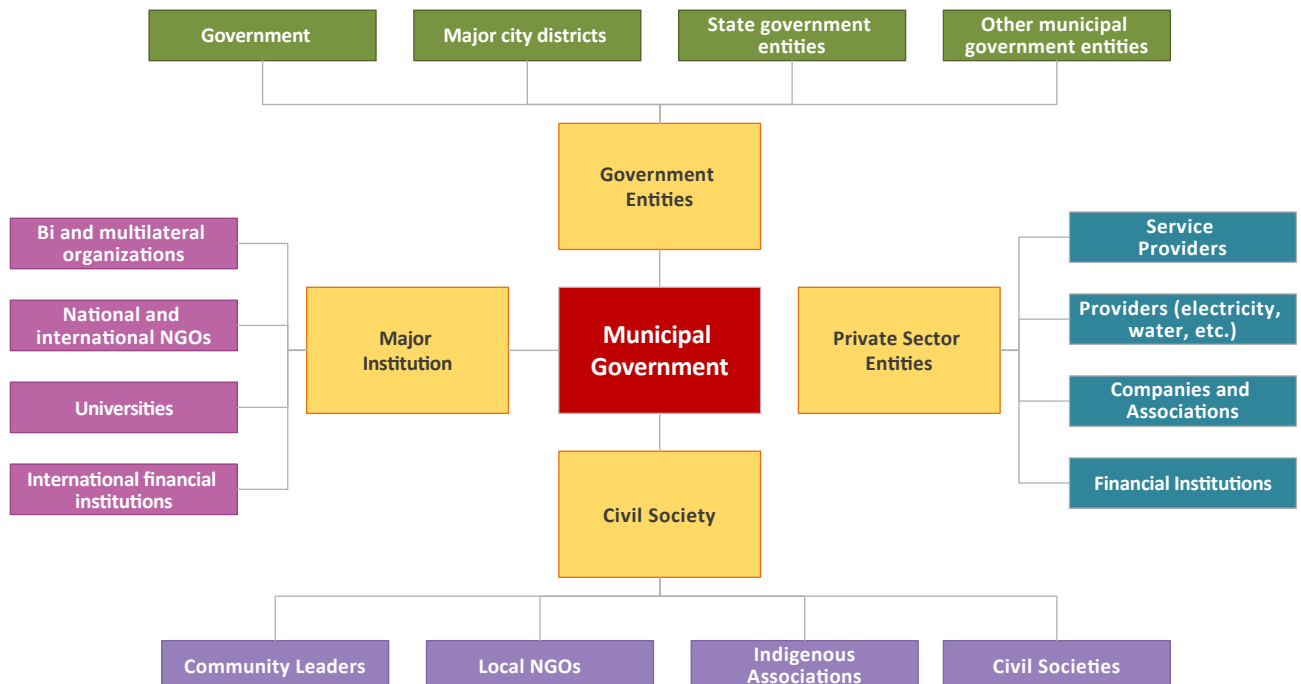
Figure 10. Topic Divisions and Indicators for Securing CRPP (Step 1)



Step 2. Actors

At this stage, studies are conducted to assess the ability of the different agents involved in the recovery of the affected areas to respond, as well as to prevent or deal with natural phenomena.

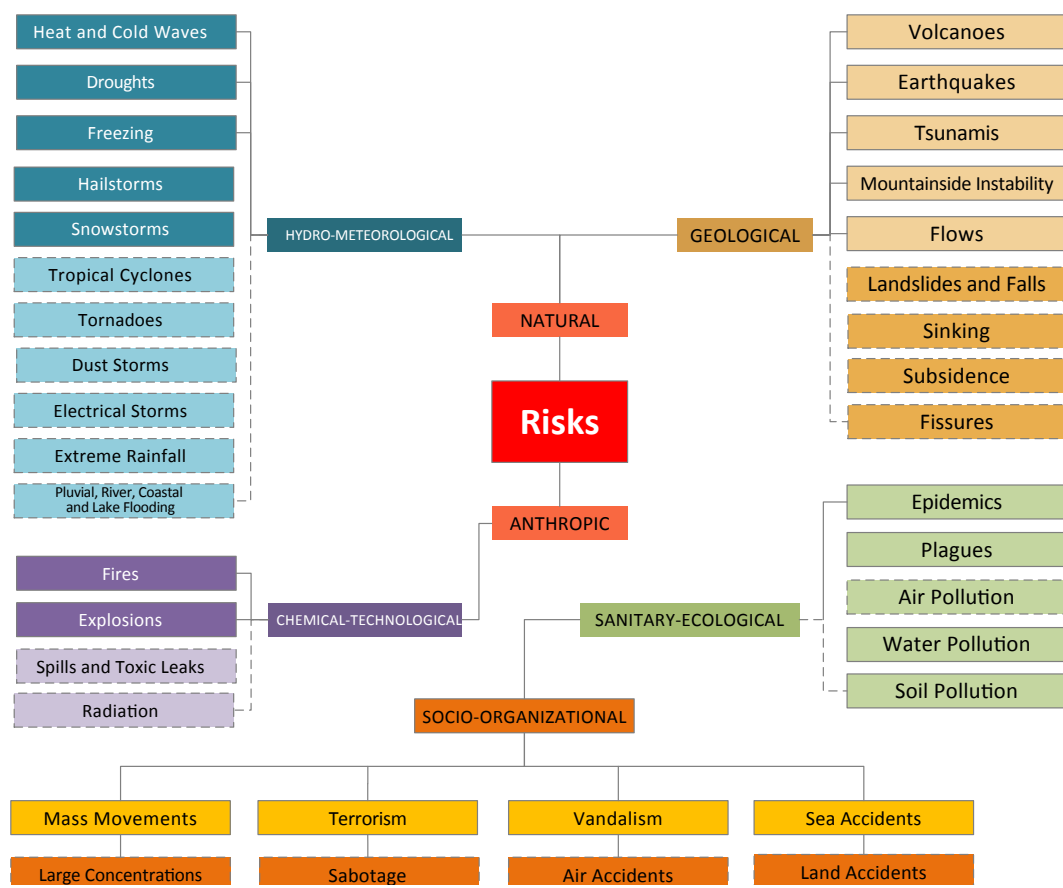
Figure 11. Topic Divisions and Indicators for Securing CRPP (Step 2)



Step 3. Risks

At this stage, the different phenomena that can impact on cities are analyzed, as well as their frequency, intensity, levels of damage and the cities' degree of vulnerability. Both natural and anthropic phenomena are considered to obtain the CRPP, as shown on the following chart:

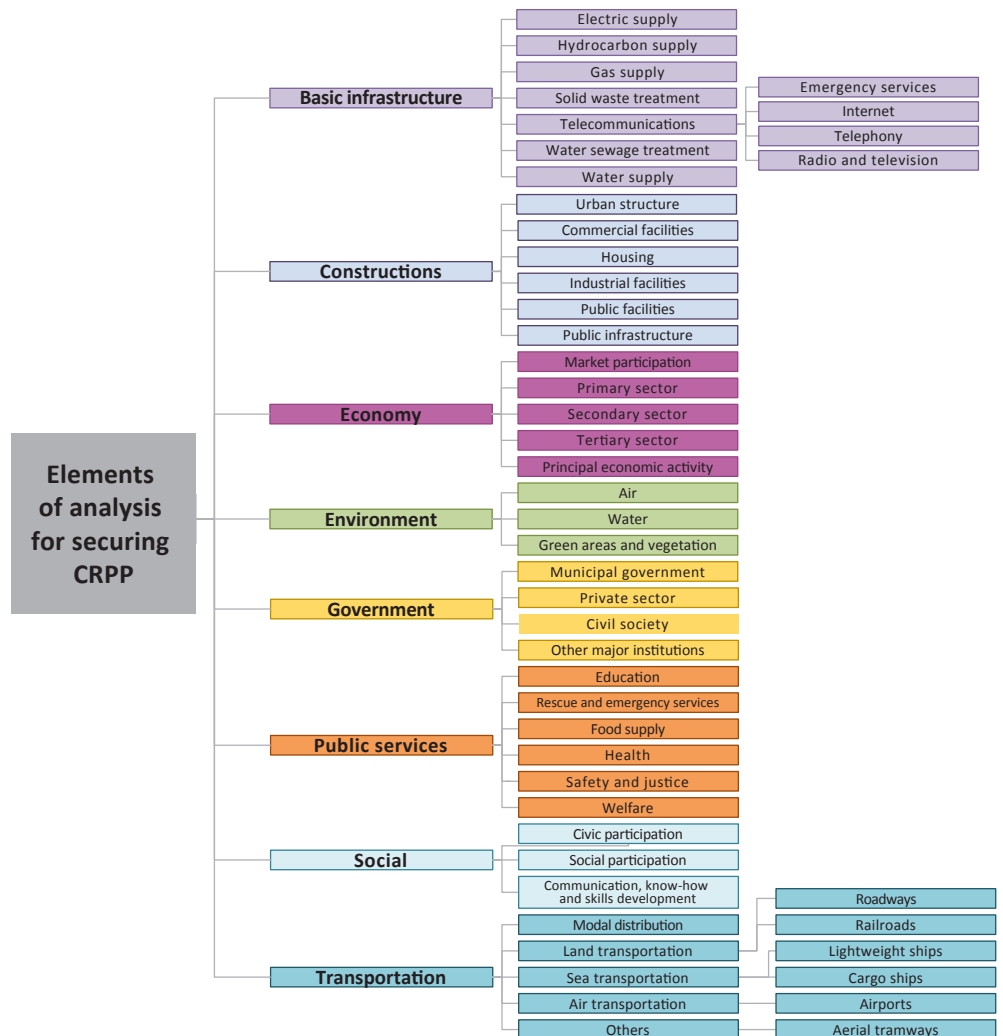
Figure 12. Phenomena and Indicators for Securing CRPP (Step 3)



Step 4. Elements

This stage examines both the elements that make up the city and their ability to recover from the impact of natural phenomena and restore infrastructure, facilities, the economy and services, to name a few.

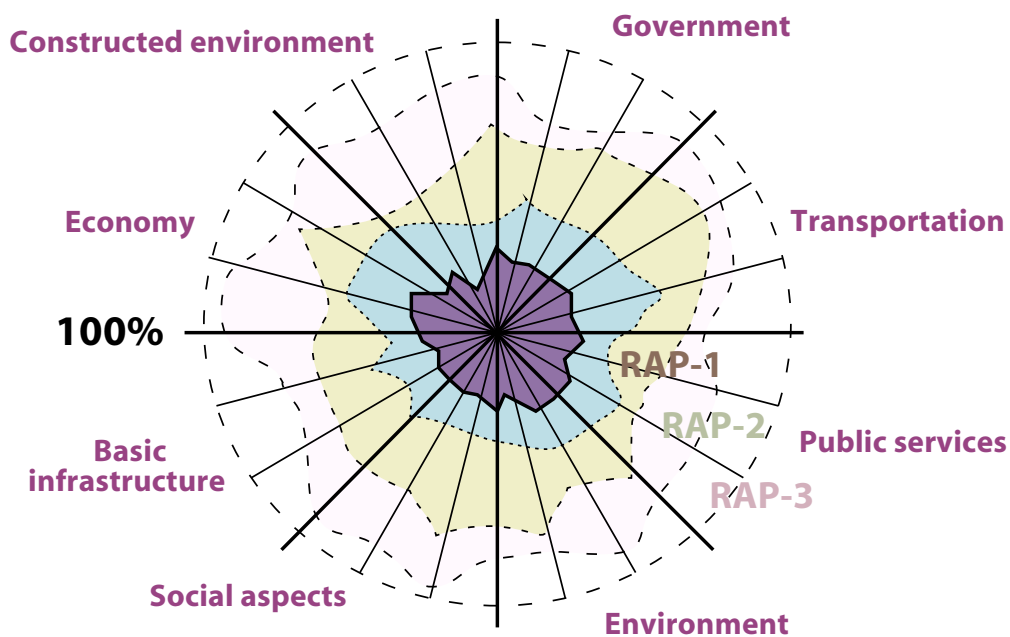
Figure 13. Analysis Elements for Securing CRPP (Step 4)



Urban Resilience Profile

The Urban Resilience Profile considers the aforementioned indicators to determine how the city should respond to and recover from the impact of natural phenomena. This methodology enables verification of the factors that are farthest from optimal resilience levels.

Figure 14. Urban Resilience Profile



Urban Resilience Profile

6.3 RESILIENCE PLAN: LOCAL ACTION

Mission

To give acquired knowledge real value through protecting people and their property, as well as ensuring continuity of operations.

Vision

To guide cities through the process of improving their resilience, in a quest for safer conditions. It helps to set comprehensive development objectives when planning, with the aim of improving resilience capacity and measuring its progress.

Values

1. Multi-threat / multi-sectorial / multiple actors
2. Planning objectives: a vision of future development
3. Measurable and verifiable
4. Sustainable
5. Proactive
6. Flexible
7. Equitable
8. Improving knowledge and learning

Main Objective

To drive development of cities toward safer living and working conditions, while providing support to urban managers in implementing specific strategic planning and including concrete programs on resilience indicators in catastrophic situations.

Objectives of the Resilience Plan

To produce short-term actions, medium-range projects and long-range plans that facilitate objective and measurable improvements to the Resilience Profile.

The Urban Resilience Plan

The Urban Resilience Plan, product of diagnostic study, shows the state of the city at a particular point in time. The information is impartial, objective and verifiable and provides the city with a basis for making sound decisions with regard to its profile and the capacity to improve resilience. Strategic goals and immediate courses of action may be determined by the latter objective.

The Municipal Resilience Commission is responsible for proposing adjustments to the municipal budget. Referring to the results of the Resilience Profile, it examines prioritization, inter-institutional connections and maintenance and investment plans, as well as resilience-oriented adaptations. It also sets criteria for follow-up and evaluation of the progress-verification process, which are recorded in the Resilience Profile.

RCN 7. RESILIENT CITIES NETWORK

SEDATU promotes the 2016 Resilient Cities Network by financing 20 of the National Urban System cities to create Urban Resilience Profiles using UN-HABITAT methodology (CRPP), with support and participation of civil organizations.

Once the Resilience Profiles are part of the Resilient Cities Network, analysis of the situation in Mexico and capacity of the federal government is carried out. This is an inter-institutional effort spearheaded by SEDATU and UN-HABITAT, to improve urban resilience nationally.

The RCN is a case where territorial efforts reinforce the development of cities' resilience, with the participation of state and municipal institutions and a commitment by the federal government, all of which helps set guidelines for coordinated action. The goal is to apply a verifiable methodology to boost the resilience of cities and to establish suitable urban development to the exclusion of socially induced risks

In applying locally obtained results to a nationwide process, the chief goals guiding courses of action include but are not limited to optimization of efforts, improvement of areas of common interest and prioritization of personal and environmental safety.

The following criteria were used to select the 20 cities to put this Guide into practice:

1. Level of exposure to dangers from natural or anthropic phenomena, according to the global risk index compiled by the National Autonomous University of Mexico.
2. Degree of marginalization.
3. Presence of Municipal Planning Institutes or similar bodies, which become the main local contacts to support the measures being implemented.
4. Availability of risk atlases on a municipal or city scale, as well as urban development and/or land reorganization programs.
5. Inclusion of each city on the SEDATU priority chart.
6. Degree to which the city is representative of a variety of natural, anthropic and social phenomena, as well as its ranking in ability to respond.

The objective of the Resilient Cities Network is to set up mechanisms that help raise cities' levels of adaptation to the effects of natural and anthropic phenomena, through better urban management based on inclusive and sustainable urban planning.

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