High Level Risk Forum

Review of the National System for Civil Protection in Mexico
Executive Summary and Key Conclusions
Draft

Meeting of the High Level Risk Forum

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This document presents the Executive Summary of the OECD country peer review of Mexico’s National System of Civil Protection, and supports discussions to be held in Session 5 of the 2nd OECD High Level Risk Forum.

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Civil protection holds strategic importance for Mexico. First, the national territory is exposed to a high level and wide range of natural and man-made hazards. The country’s geographical and topographical characteristics generate a variety of severe exposures to relatively frequent, extreme natural hazards such as earthquakes, tropical storms and floods. Second, significant disparities amongst the population in wealth, income and education, create the conditions for elevated social vulnerability to these exposures.

Figure 1. Disaster losses in Mexico as equivalent % of GDP

Source: GDP data from the World Bank. Disaster losses data from EM-DAT.

The National System of Civil Protection (SINAPROC) was established to improve Mexico’s civil protection capacities following the devastating Mexico City earthquakes of 1985 (6,000+ casualties, 412 buildings destroyed, 3124 buildings damaged, over 4 billion USD in economic damages-Source: CENAPRED). Mexico is not alone in facing mounting economic consequences of disasters (see Figure 2). The 1985 disaster revealed the same lesson that has driven many countries to initiate structured policy changes, namely – ad hoc coordination efforts for the response and recovery from large scale disasters are inefficient at best and ineffective at worst. This lesson revealed the need for a comprehensive and systematic approach to the coordination of disaster response and recovery.
One sign of SINAPROC progress since 1986 is the reduction in average number of deaths per year due to disasters (Figure 2), despite an increase in the average number of disastrous events per year. This reflects its relative strengths in disaster preparedness, response and recovery, however there has been a rise in resulting economic damages (Figure 3). This trend supports the recognized need among SINAPROC stakeholders to shift focus toward strengthening capacities for disaster prevention and vulnerability reduction in order to contribute to sustained economic growth. Over the past decade economic losses have been largely due to hurricanes from the Gulf and floods (Figure 4).

Figure 2: Number of deaths due to disasters

Source: EM-DAT Note: Mexico: Value for 1985 =6000+; (2) OECD value for 2003 = 2123.
Figure 3: Disaster losses in Mexico and OECD countries (1970-2011)

Source: EM-DAT

Figure 4: Disaster losses and GDP by State

Source: CENAPRED.
Figure 5: Earthquakes, floods and tropical storms in Mexico 1970-2011

(a) Number of Disasters

- Earthquake: 24 (12%)
- Flood: 55 (28%)
- Storm: 75 (38%)
- Other disasters: 45 (22%)

(b) Disaster Losses

- Earthquake: $5,813,000 (17%)
- Flood: $4,540,900 (14%)
- Storm: $21,155,510 (62%)
- Other disasters: $2,400,800 (7%)

(c) Number of Deaths

- Earthquakes: 7259 (53%)
- Storms: 2715 (16%)
- Flood: 2119 (11%)
- Other disasters: 1550 (20%)

SOURCE: EM/DAT.
SINAPROC is meant to coordinate groups of institutions, functional relationships, and programmes that ensure links between the civil protection capacities of the public, private and social sectors. At its core is the aim to achieve a system of integrated risk management, bringing together professionals responsible for, inter alia, emergency coordination and response units, scientific research, early warning systems, and the financing of reconstruction. One of its key challenges is simply to ensure the many federal, state and municipal civil protection services function as a flexible whole together with companies, volunteer organizations and research institutes from different sectors.

SINAPROC’s architecture is well suited to the specific administrative, operational and strategic challenges associated with emergency response and financing. Its flexible institutional framework is supposed to encourage participation from Federal government agencies while at the same time integrate competent bodies from highly autonomous states and municipalities. It has succeeded at integrating diverse emergency response and monitoring capacities from the public sector, especially at Federal level; whereas formal connections with the private sector and volunteer organizations are less developed. A clear function of leadership and coordination is assigned to the General Coordinator for Civil Protection (CGPC), which is crucial to ensure that institutions responsible for a wide range of response capabilities such as the Army, the Navy, CONAGUA and SEDESOL work together in a coherent manner. Close collaborations with the scientific community have enabled civil protection policy decisions to benefit from advances in scientific knowledge and new technological developments in risk mitigation.

SINAPROC can only perform as well as its parts are able to work together and according to coherent policies across its different sectors and especially across Mexico’s three levels of government. At the Federal level, General Laws on Civil Protection in 2000 and 2012 established a robust institutional and policy framework, while at the state level progress in harmonization of civil protection legislation has filled gaps of what was a highly divergent patchwork in 1985. The ‘Manual
on Organization and Operation of the National Civil Protection System’ provides some clarity about the roles and responsibilities of various civil protection stakeholders, but it lacks specificity about how they should coordinate. It clearly identifies the primary role of municipalities and state civil protection services when disruptive events occur. If the scale of an event increases beyond the capacity of local services to manage it, however, the Army and Navy may self-mobilize to lend support. As a practical matter many of the nearly 2,500 municipalities lack basic civil protection capabilities, thus support from Federal and state government resources is often relied upon.

**Strengthening strategic orientation and coordination through shared objectives**

Over the past two-and-half decades, SINAPROC has achieved incremental improvements, notably in its planning, response and recovery capacities. Similar to many OECD countries, however, it senses the need to shift focus toward risk prevention capacities. This forward looking approach aims to stop or reduce damages before they occur, and is consistent with placing climate change adaptation at the core of the country’s strategic vision for development. These improvements have enjoyed strong political support at Federal level and buy-in from most SINAPROC stakeholders, which should be continued to foster resilience and to keep pace with increasing vulnerabilities.

Mexico’s Federal and State civil protection laws are milestones in the incremental process to establish a national system of integrated risk system. They provide a legal basis to move beyond the traditional focus of emergency preparedness, response and recovery, calling for disaster risk reduction actions and prevention based on common guidelines for risk assessments. Implementation of the 2012 General Law on Civil Protection provides an opportunity to strengthen cooperation in these respects and fix priorities to better align sub-national programmes with Federal policies. This may be facilitated by including priorities related to civil protection in the next National Development Plan. The 2012 General law may require some monitoring and benchmarking mechanism to follow implementation at state level.

**Summary of recommendations related to coordination:**

- **Seize the opportunity of the 2012 General Law for Civil Protection to set priorities for integrated risk management through multi-level stakeholder consultations.**
- **Follow-up implementation of the 2012 General Law at state level with a dedicated monitoring mechanism.**
- **Design the next National Programme for Civil Protection to leverage momentum created by the 2012 General Law.**
- **Include civil protection as a priority in the National Development Plan.**
- **Maximise synergies between the General Directorates of the CGPC, moving them to a common site in a less earthquake prone area.**
Risk assessment provides a better scientific understanding of hazards and threats, and the vulnerability of exposed populations and valuable assets. It should take account of future projections, incorporate linkages between different phases of the disaster risk management cycle, and be conducted in an open and inclusive manner. SINAPROC has developed several tools to reinforce evidence-based risk management policies, systematically gathering and analyzing data and information on hazards, exposures and vulnerabilities at federal level, and increasingly at state and municipal levels.

The National Centre for Disaster Prevention (CENAPRED) created the National Risk Atlas (NRA), an innovative tool that integrates information on exposure and vulnerability from the three levels of government. The NRA provides a comprehensive national view of all disaster risks, natural or man-made and its GIS architecture provides excellent visualization of the spatial relation between hazards and the population and assets at risk. While it is mostly used to strengthen emergency response planning, the NRA is publicly available on the CENAPRED website, and as its content develops overtime it should increasingly contribute to raising public awareness of risks.

CENAPRED has established highly valuable links to the scientific community which help feed the NRA with robust data about natural hazards, particularly for earthquakes, floods and tropical cyclones- but, improvements are needed to better incorporate tsunami scenarios. Federal institutions provide detailed input to the NRA about population exposure, social vulnerability based on census data, and exposure of federal assets (e.g. petro-chemical facilities, dams, telecommunications and electricity networks, schools, hospitals and roads- see Figure 4). At sub-national levels of government risk atlases are less developed, especially at municipal level due to costs and lack of technical expertise.

The Ministry of the Interior (SEGOB) has developed a coherent strategy to address these gaps. CENAPRED provides guidelines and technical assistance to states and municipalities to ensure their risk atlases are more than just an inventory of hazards; they should also integrate vulnerability analysis and meet standards for data interoperability with the National Risk Atlas. The Prevention Fund for Natural Disasters (FOPREDEN) began co-financing projects related to the elaboration and updating of risk atlases for states and municipalities in 2004. Prior to this only nine of the thirty-two states had developed a risk atlas, but the number has since doubled under this cost sharing program and strong incentives have been put in place for the remaining states to complete theirs.

The Ministry of Social Development (SEDESOL) also provides financial support for the development of risk atlases at municipal level, which follow guidelines set-out by CENAPRED. Despite this collaborative effort, the results have not produced municipal risk atlases that are interoperable with the National Risk Atlas, and the vast majority of municipalities still have not completed a risk atlas. Going forward it will be important to coordinate and strengthen financial and technical support for the development of risk atlases at local levels, which would be especially useful in support of risk-based land use planning.
**Figure 6: The National Risk Atlas**

Source: CENAPRED

**FIGURE 7. Mitigation works on Tabasco.**

Source: Integrated Hydric Plan of the State of Tabasco.
FIGURE 8. RISK MAPS BY STATE

<table>
<thead>
<tr>
<th>State</th>
<th>Risk Atlas</th>
<th>Year Of Elaboration</th>
<th>% Of Municipalities included</th>
<th>Type of Risks</th>
<th>Federal Financing</th>
<th>Federal Technical Support</th>
<th>Public access</th>
<th>Updating</th>
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Source: CENAPRED
In addition to risk atlases the federal government has developed cutting-edge risk assessment tools in support of two specific phases of the disaster risk management cycle. CENAPRED developed SAVER, a scenario based emergency planning tool, and FONDEN created R-FONDEN, which inventories public infrastructure assets and models potential disaster damages to them for the purpose of refining risk financing strategies. There is scope to increase linkages between these tools and thereby improve efficiency and comprehensiveness of risk assessment efforts throughout SINAPROC. For example, SAVER hazard scenarios could be useful for R-FONDEN, and the asset inventory of R-FONDEN should contribute to the National Risk Atlas.

Records about past hazardous events may not be representative of what will happen in the future. For example, flood exposure in ports on the Mexican Gulf coast may increase due to sea level rise and changing tropical cyclone patterns. The importance of developing the National Atlas on Climate Change Impact and Vulnerability should therefore be recognized. Further research in forward looking hazard and vulnerability analysis would help to better plan for the future challenges of risk management in Mexico, going beyond retrospective analysis of past events and including future trends such as the effects of climate change and demographic projections.

**Integrate risk assessment across levels of government**

SINAPROC demonstrates strong commitment to evidence-based risk management policies, and especially:

- To gain a better scientific understanding of natural hazards, map the exposure of populations and valuable assets to them and model their vulnerability;
- To inform the public of the risks that confront them;
- To develop appropriate emergency response plans; and
- To model the economic and financial impacts of disasters for the purpose of crafting strategies for disaster financing that are suitable in light of national risk bearing capacity.

Stronger linkages could be established between its innovative tools and disaster risk reduction measures such as land use, urban development plans and risk mitigation infrastructures. This should take top priority as states begin to implement the 2012 General Law for Civil Protection, which requires the development of risk atlases to inform land use plans.

**Summary of recommendations related to risk assessment:**

- Facilitate linkages across risk atlases at all levels, and develop synergies between SAVER and R-FONDEN.
- Harmonize federal support for development of risk atlases at sub-national levels.
- Strengthen financial and technical support of municipal risk atlases.
- Take stronger account of potential tsunamis in risk atlases.
- Develop the National Atlas on Climate Change Impacts and Vulnerability.
- Reinforce engagement of the private sector in risk assessment processes at all levels.
... DISASTER RISK REDUCTION: THE CHALLENGE OF THE FUTURE

The correlation between economic growth and rise in disaster damages has pressed many countries to consider mainstreaming disaster risk reduction into development plans. This entails long-term commitment and action to strengthen the resilience of the national territory to disasters, through more sustainable territorial planning and urban development. This involves a mix of structural and non-structural measures, risk education and the development of early warning systems.

Improper land use and territorial/urban planning contribute heavily to the vulnerability of Mexico’s population, and are considered the most pressing policy challenge for disaster risk reduction. Rapid and continuous urbanization to metropolitan areas has increased informal settlements in hazard prone areas such as river banks or unstable hills. On this key issue SINAPROC faces a governance deficit challenge, because land use policies are within the remit of local councils for more than 60% of Mexico’s territory, and they are designed with very little link to information about risks. As river beds and their surroundings are under the authority of CONAGUA, but land use and urban planning is the responsibility of the municipalities, there is a gap in the legal and institutional frameworks. In some cases neither side takes the initiative to prevent or expel invasive settlements. As a result, illegal housing in flood prone areas tends to resume even after important disasters such as the Monterrey flooding caused by Hurricane Alex in 2010.

Earthquake of 20 March 2012

While many emergencies have been declared since 1985, the March 2012 earthquake took place during an OECD mission to Mexico, which offered an opportunity to witness the overall progress in SINAPROC firsthand. A 7.4 earthquake occurred during its fact finding mission on 20 March 2012. No human casualties occurred in Mexico city, and there were only negligible physical damages to buildings. Though a significantly weaker event than 1985, these impressive results nevertheless reflect improvements in the mix of structural measures (e.g. more stringent building codes) and non-structural measures, such as advanced early warning systems, a much more developed safety culture with increased public awareness and preparation, and the benefits of regular drills and massive exercises. The population remained extremely calm, and were observed to execute appropriate protocols for protective measures and evacuation, demonstrating just how strong the safety culture is and positive outcome of continuous training and drills.

Particularly impressive was reception of a precise earthquake warning 40 seconds in advance. A seismic alert system managed by the Center for Seismic Monitoring and Research sends a radio signal to Mexico City and Oaxaca City as an alert in case of an earthquake with its epicentre located on the Guerrero Coast. Since the radio wave travels much faster than the seismic wave, facilities equipped to receive the signal may prepare themselves for arrival of the shock.

Building codes and seismic retrofit are two additional areas of disaster risk prevention policy with scope for stronger uptake. Building codes are in theory defined at the municipal level, however many municipalities do not have sufficient resources to create them, which means construction is unregulated for seismic risks in many areas. Some municipalities have adopted the seismic code for
Mexico City, which is often not appropriate to local soil conditions and other variables that determine the local level of seismic risk. The state of Chiapas provided financial support for seismic micro-zoning, a good practice that could be replicated in other states to inform the development of appropriate building codes. Furthermore, in the municipalities with building codes risk mitigation provisions often focus on earthquake risks, paying insufficient attention to countermeasures for floods, hurricanes and tsunami appropriate to the local level of risk.

**Damage Risk Reduction in Hospitals and Schools**

The 1985 Mexico city earthquake hit the areas of the city with the highest concentration of hospitals. Thirteen hospital buildings of six or more floors were partially or totally destroyed, and one out of every four beds were lost. The Safe Hospital Programme was launched in 2006 to assess, classify and certify hospitals according to safety indicators in case of disaster. Hospital action plans are developed to reduce vulnerability, as well as to ensure that hospitals can carry out evacuation of their patients, maintain critical operations, and provide surge medical capacity to victims in case of a disaster. According to its criteria, 200 hospitals in Mexico have been classified as safe and prepared for a disastrous earthquake. In Mexico’s 246,000 schools two programmes aim at reducing vulnerability to disasters: an internal programme of school safety consisting of such measures as monthly evacuation drills, sign posting, and warnings, and a programme to reduce the structural vulnerability of school buildings. The National Institute of Educational Physical infrastructure (INIFED) conducts approximately 254,000 visits per year to assess the vulnerability of schools.

Early warning systems have demonstrated their effectiveness to save lives and limit damages. In addition to the Seismic Alert System mentioned above, such systems have been developed for tropical cyclones (SIAT-TC). Significant public safety benefits would result from expanding these systems to cover the whole territory at risk and more complete coverage of other hazards including floods and tsunamis. A harmonized system nationwide with the same use of symbols, colour-coding, protocols and dissemination channels at Federal to state and local levels would increase synergies, efficiencies and avoid any confusion of messages from a diversity of sources. The technical agencies that operate early warning services should develop better coordination procedures in this respect. Partnerships with the media could help to ensure early warnings are properly communicated through all available channels especially when there is an imminent threat.
1985 Earthquake: Collapsed building in Mexico City

![Image of collapsed building](image-url)

Source: United States Geological Survey

Figure 9: Early Warning Systems in Mexico

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<th>Hazard</th>
<th>EWS</th>
<th>Institutions (*lead institutions)</th>
<th>Coverage</th>
<th>Main characteristics</th>
<th>Dissemination process</th>
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<td>VHF Radio Blueberries</td>
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<td></td>
<td>SASO</td>
<td>CIRES*</td>
<td>Oaxaca City</td>
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<td>Local radios Public schools</td>
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<td>SEGOB* SEMAR CFE PEMEX</td>
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<td>SEMAR</td>
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<td>To be developed</td>
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</tbody>
</table>

Mexico has made major efforts to increase risk awareness through public campaigns and the national education system. Local community involvement and empowerment were well illustrated by neighbourhood councils in Mexico City and Chiapas that go door-to-door to inform local residents about risks and effective self-protection measures. The “Ferias de Protection Civil” are also an
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effective programme to promote risk education. The promotion of such a culture of safety may eventually help generate broader public support for disaster risk prevention polices. Continuous efforts toward greater population preparedness, education and risk awareness, specifically for the most vulnerable (children and elderly, isolated communities, tourists) should be further supported.

Building greater capacity for prevention through new partnerships across levels of government

Mexico’s ambition to place disaster risk prevention on a par with emergency response may require adjustments to the institutional structures of SINAPROC. The core issue is to ensure partnerships across levels of governments that actually build greater capacity for prevention at the local level. Greater incentives combined with control and sanction mechanisms for municipalities may be needed to develop their territorial land use policies based on risk assessment. Development of human capital in local civil protection bodies could help address frequent changes in municipal government that result in short-term planning.

Summary of recommendations related to disaster risk prevention:

- Build greater coherence between risk management, territorial planning and urban development and adaptation to climate change;
- Territorial and urban planning should become a national priority supported by an appropriate institutional framework;
- States and municipalities should prepare under their responsibility a disaster risk prevention plan based on a risk atlas indicating structural and non structural measures needed to prevent disaster risk in their jurisdictions;
- Extend Early Warning Systems on the model of the SIAT-TC and the SAT throughout the national territory, particularly for flood and tsunami warnings.
- Invest more in disaster risk prevention following thorough analysis of costs, benefits and effectiveness. A practical measure to facilitate this would be to establish a registry of 4-6 specific building codes at the federal level that municipalities could choose and adapt based on their risk exposure, particularly for earthquakes, floods and tsunamis.
Emergency preparedness and response is an essential function of the State that governments must ensure to keep the public’s trust. Governments need to plan and prepare for civil contingencies with specific responses to minimize suffering and damages, and to ensure business activity can resume in the most efficient, timely and targeted fashion. SINAPROC was established primarily to improve the capacity of civil protection services to coordinate their emergency planning and responses.

While the Army and Navy have long established civil contingency plans (Plan DN-III and Plan Marina) some first responders at the state, and especially at municipal level, continue to lag behind their federal counterparts. The ‘Safe Municipality Programme’ was specifically enacted to strengthen coordination and institutional participation between the three levels of government, the private and social sectors. It promotes a common set of key capacities at municipal level such as: mitigation activities and partnerships across economic sectors and strengthening multi-stakeholder networks. Many state and municipal governments, however, have never heard of this well designed programme, or see no incentive to participate.

The DGPC provides a centralized coordination capacity for government emergency responders and stakeholders from the private sector and volunteer organisations. The 1985 earthquakes generated high capacity in Mexico’s civil society to self organize rescue missions, and volunteer groups such as Los Topos continue to play an operational role in emergency response. While the legitimacy and expertise of these groups is recognized, they are meant to act within the control and coordination of civil protection authorities, which has created challenges related to delivery of resources and access to disaster areas. There is scope to consider how to maximize use of these specialized emergency response groups.
The ‘Strategy for preparedness and response of the Federal Administration for high magnitude earthquake and tsunami’ (the so-called “Plan Sismo”) represents a major attempt to define more clearly what each government agency should do in the case of a major earthquake. Plan Sismo consists of four directives decided by the President instructing and ordering Federal agencies to support the population to preserve the Rule of Law and the governability of the country. The plan foresees procedures that run counter the normal practice, for example the President would order the Army and Navy to activate their respective DN III Plan and Plan Marina. States and municipalities are called to activate their civil protection councils and coordinate with the Federal level. Organized around three response areas (operational, logistics, and administrative), 14 working groups are defined with their coordinating agencies and their members, this plan represents the first comprehensive emergency plan with clear coordination mechanisms, and may prove to be a major forward looking achievement for SINAPROC.

SINAPROC is premised on a significant degree of institutional autonomy. Coordinated decision making among federal stakeholders takes place through a multi-stakeholder National Emergency Committee, and similar instances are in place at state and municipal levels. These coordination mechanisms have shown to be active in managing responses to major, slow-onset events such as hurricanes, but they have never been tested under conditions equivalent to those of the 1985-86 earthquakes. Confidence in the ability to perform under extreme conditions could be improved by developing Standard Operating Procedures (SOPs) and defining how the various SINAPROC components are supposed to interact in case of a large scale event.

Earthquake of 20 March 2012

“The first casualty of war is the truth - the first casualty of any major incident is communications”. An operational communications network in the aftermath of a large scale event is a basic civil protection capacity. It enables first responders to communicate needs, to receive and transmit orders, and when possible to deliver advance warnings (tsunami alerts after an earthquake for instance). Moreover they serve to inform and calm the population, to provide instructions about what steps to follow to ensure personal safety. When a sudden on-set event occurs, one of the first reactions nowadays are massive, simultaneous attempts to make contact with loved ones through cell phones. Typically this may result in congestion of the mobile telecommunications network. As a result, policy in many countries is to block access to during the immediate aftermath to avoid a network crash, and reserve access to dedicated numbers.

When the telecommunications network became congested on 20 March 2012, high level civil protection officials turned to Blackberry messenger to CNO such priority numbers are given to civil protection officials, though the highest level officials are equipped with satellite based communication devices. Priority access to the mobile network should be addressed, not only for telephones, but also to transmit data (internet, email) via satellite.

Tsunami risks are not well linked to earthquake monitoring in Mexico, nor are prevention and preparation for tsunami as advanced as earthquake preparations. Structural and non structural measures related to tsunami could be better incorporated into the earthquake risk prevention
programmes of many Pacific coast communities. Efforts to raise public awareness about the risk of tsunamis should be reinforced by providing information about what to do and where to go in case of an event. This could also include clear identification of exposed zones and safety zones, and the harmonization of signs throughout the Pacific coast leading to evacuation routes and safety zones. Support is needed to develop modelling for tsunamis that could affect principle cities along the Pacific coast built on probable scenarios of activity along particular earthquake faults. Jalisco state demonstrated its lead in this respect with the implementation of a warning system, the development of emergency preparedness measures and the organisation of a simulation exercise with all residents and businesses for a 10 meter high event in the city of Puerto Vallarta.

Feedback mechanisms after disasters give structure to the process of drawing lessons, which helps to improve policies throughout the entire disaster risk management cycle. In the immediate aftermath of an event, there is usually a short window of opportunity to leverage public awareness and appreciation of risks to undertake policy reforms, which otherwise are unpopular. In this respect, feedback mechanisms could be instituted yearly and after each major disaster. At state level many good practices have been collected throughout the years that should be brought to the attention of different states through biannual civil protection meetings, however the objectives of these meetings should be altered to use such exchanges of information to lead to policy changes.
Strengthen the efficiency of emergency response through planning, coordination and communication mechanisms

SINAPROC was initially created with a strong focus on emergency response. Since 1985, a large number of sectoral emergency plans have been developed by federal institutions to address emergency response. Inter-institutional, scenario-based plans with Standard Operating Procedures should be developed, however, to describe how different actors in the system are supposed to coordinate.

Institutional coordination is supposed to result through meetings of the SINAPROC system, to which every stakeholder participates at the level of government adapted to the scale of the crisis. This flexible approach entails significant autonomy in the decision-making of the various stakeholders engaged and appears to be effective to deal with certain emergencies, however it relies on willingness to co-operate, strong leadership in the crisis room and personal relationships.

Common emergency information system and incident control system should be established to better link emergency responders from local to federal level, sharing information and establishing a clear chain of command among all SINAPROC stakeholders during emergency. The location of the regional emergency response centres of different federal agencies should be planned in joint consultation to maximize coverage of emergency services to rural areas.

Efforts to strengthen crisis communication capacities at the Federal level should be pursued, including through developing priority access to telecommunication networks for emergency responders, strengthening the National Communication Centres and networking the State Crisis Centres (Ci4s).

Summary of recommendations related to emergency planning and response:

- Further develop scenario-based emergency response planning.
- Establish a common emergency information and incident control system among SINAPROC’s stakeholders.
- Strengthen crisis communication capacities of SINAPROC’s stakeholders.
- Strengthen coordination mechanisms with volunteer organisations and NGOs.
- Broaden business continuity planning efforts in the public and private sectors, particularly for SMEs.
- Reinforce feedback mechanisms and the sharing of good practices and lessons learnt.
The longer a community takes to recover from a major disaster, the more unlikely the local economy will recover its productive capacity. This creates a strong economic argument for accelerated financing in support of business continuity, early-recovery, reconstruction, and stimulating local consumption. A key quality of SINAPROC is the Federal government’s innovative and integrated disaster risk financing strategy, including such instruments as the Federal financing scheme to provide fast recovery/reconstruction’ (FONDEN) and the Federal Prevention Fund (FOPREDE). These instruments are particularly suited to Mexico’s level of economic development and high level of exposure to catastrophic risk, and could serve as a model for different countries facing a similar profile of risks and fiscal capacity.

FONDEN is the main financial instrument for disaster risk financing. Funded through the annual federal budget, it is used to finance the cost of reconstruction and repairs to public infrastructures and low-income households. A specific trust fund was established to receive and hold federal budget allocation for reconstruction. Transparency, efficiency and accountability have been further improved through regular changes of the FONDEN’s rules of operations, reflecting its capacity to take into account feedback and continuously improve. FONDEN resources are covered by two specific insurance mechanisms that cover a certain level of public funding: (i) an excess of loss scheme and (ii) a parametric catastrophe bond. In 2010 major disasters impacted 18 out of 31 States and 850 out of 2500 Municipalities, leaving FONDEN without sufficient resources to cover all the funding requests. According to the Federal Budgetary Law, in such exceptional cases, the Ministry of Finance intervenes, providing new resources from budget surplus income.

The world’s first government catastrophe bonds
In 2006, FONDEN issued the world’s first government catastrophe bond, Cat Mex, which provided coverage against earthquakes in three specific zones in the national territory. The USD $160 million “CAT bond” was part of a USD $450 million catastrophe risk transfer strategy. Under the terms of the cat bond, a payout is triggered if two conditions are met: (i) an official state of emergency or disaster declaration is issued by SEGOB, and (ii) an earthquake with a specified magnitude, depth, and epicentre within the three pre-defined zones is registered. This cat-bond was renewed in 2010 and converted to a multi-risk instrument covering both earthquakes and tropical cyclones.

The establishment of the prevention fund FOPREDE demonstrates the commitment of the Federal Government to taking a comprehensive approach to risk management. It stands out amongst OECD countries as one of only a few known central government funds expressly set-up to co-finance disaster prevention. The FOPREDE budget and magnitude of the projects are still quite modest compared to recovery and reconstruction expenditures through FONDEN, as well as to major investments in structural measures of other federal agencies such as CONAGUA. Prioritization of investments in prevention and mitigation should be performed based on the national risk atlas, and with a wide consultation and coordination of the policies among key federal agencies, including CONAGUA, SEDESOL, SEGOB, CFE, SEMARNAT, the states and the municipalities to prioritize and channel prevention funding accordingly. Authorities should compare major investments in structural measures to reduce risk exposure and infrastructures to non-structural measures through appropriate cost-benefit analysis.

Despite the many risks facing Mexico’s territory, the level of private insurance penetration is persistently low. While strong incentives have been set-up by FONDEN to make local states and cities move towards greater risk awareness, prevention measures and insurance coverage, there is still insufficient uptake of insurance amongst households and SMEs. Some stakeholders see insurance regulations as creating barriers for the insurance industry to extend penetration of
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property and casualty insurance coverage. Regulatory reforms to enlarge household insurance coverage could be put in place, e.g. through some form of compulsory household insurance, or model contracts for individual insurance through a standard basket. Public authorities should help to promote the development of insurance at the state level and in the federal agencies. For such a mandatory scheme to work, a clear mandate established by law and accompanied by a well established sanction scheme would need to be put in place as in the case of mandatory insurance with civil liability coverage for automobiles.

**Figure 10: Exposed zones covered by 2010 CAT Bond**

![Exposed zones covered by 2010 CAT Bond](image)


Given the potential impacts of climate change, and the extensive damages related to hydro meteorological phenomena over the last 10 years, whether FONDEN will have sufficient annual resources is an issue. One challenge for the Ministry of Finance and FONDEN is to better coordinate - and influence - non-disaster related investments in infrastructure in Mexico by public and private actors to make sure they comply with and promote safety, building codes and other preventive measures. The establishment of the disaster risk prevention fund (FOPREDEN) demonstrates the commitment of the Federal Government to taking a comprehensive approach to risk management. It stands out amongst OECD countries as one of only a few known central government funds expressly set up to co-finance disaster prevention.

**Figure 11: The relative weight of prevention vs. reconstruction**

![The relative weight of prevention vs. reconstruction](image)

The FOPREDEN budget and magnitude of its projects are still quite modest compared to recovery and reconstruction expenditures through FONDEN, as well as to major investments in structural measures of other federal agencies such as CONAGUA. Prioritization of investments in prevention and mitigation should be based on a comparison of cost effectiveness, the capacity of a project to reduce vulnerability, and decided through a wide consultation and coordination of the policies among key federal agencies, the states and municipalities to prioritize. A dedicated programme could be established to evaluate the costs and effectiveness of disaster risk prevention in Mexico to better define the risk prevention strategy. Authorities should also compare major investments in structural measures to reduce risk exposure and infrastructures to non-structural measures through appropriate cost-benefit analysis.

### Moving toward as a more balanced disaster risk finance strategy

The Federal government promotes business continuity planning at all levels through ‘Internal Civil Protection Programmes’ in each facility. FONDEN has proven its effectiveness in balancing the need to ensure fast recovery/reconstruction funds with the need to ensure accountability. FONDEN has been a driving force in encouraging States to insure their assets, going so far as to condition repeated costs related to reconstruction of infrastructure upon their purchasing insurance for the repaired asset.

### Summary of recommendations related to recovery, reconstruction and disaster risk financing:

- Broaden business continuity planning efforts in the public and private sectors, particularly for SMEs.
- Periodically review FONDEN to ensure its efficiency as a cornerstone of the national risk financing strategy.
- Sustain FONDEN resources through a clear and accountable disaster risk financing instrument.
- Further integrate FONDEN and FOPREDEN financial instruments to allow investing more in prevention especially the years when disaster’s losses are not too high.
- Promote the development of the insurance culture through incentives or regulatory changes to enlarge household insurance coverage.
Disasters can have cross border impacts, direct and indirect, which makes international cooperation a key capacity for civil protection systems. The conclusion and implementation of bilateral and multilateral agreements with neighbouring and regional countries enables sharing of best practices and reliable partnerships that can be turned to in times of need. SINAPROC benefits from Mexico’s involvement in many international fora related to disaster risk management policy and capacity building, such as: the UN Hyogo Framework for Action and the World Bank’s Global Facility for Disaster Reduction and Recovery and the United Nations Development Programme. Cross border cooperation in hazard monitoring for tropical cyclones and training of meteorologists is well-established with the United States National Hurricane Centre and National Oceanic and Atmospheric Administration.

Mexico has concluded several cooperation agreements with the United States to respond to disasters that occur along their shared border, especially in the domain of cross-border incidents of environmental pollution. The Mexico- United States‘ Joint Contingencies and Emergencies Plan for Preparedness and Response to Events Associated with Chemical Hazardous Substances in the Inland Border Area’ provides a mechanism for preparedness cooperation and response coordination in relation to major incidents of environmental pollution. The 1983 La Paz agreement established joint working-groups that deal with key cross-border environmental issues affecting the border area “100 kilometres on either side of the inland and maritime boundaries”.

**Figure 12: Co-operation Mexico – United States Sister Cities in the Border Region**


Mexico has become increasingly involved in the arena of international humanitarian assistance by providing disaster relief missions abroad, and especially throughout Latin America. The Mexican Army

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and the Navy have been particularly active in providing humanitarian assistance in the form of transport, building materials, food and medicine.

Figure 13. SEDENA and SEMAR international humanitarian assistance

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<th>COUNTRY</th>
<th>EVENT</th>
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<td>2004</td>
<td>SEMAR</td>
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<td>2005</td>
<td>SEMAR</td>
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<td>2010</td>
<td>SEDENA</td>
<td>COLOMBIA</td>
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Summary of recommendations related to international cooperation:

- Foster the establishment bi-national or regional cooperation agreements along the south borders with Belize and Guatemala to formalize emergency response cooperation and establish well defined protocols, procedures and roles.
- Further develop partnerships between the cooperation agency AMEXCID and SINAPROC stakeholders to share international good practices and develop capacity-building programmes with other countries focused not only on risk management, but also knowledge sharing.
- Clarify regulatory framework for NGCs delivering humanitarian assistance.