

# Technological Innovation for Security in Latin America

Phase 1: Diagnosis in Latin America



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# Contents

## About "Technological Innovation for Security in Latin America"

The following pages present the first part of an investigation focused on safety and its use of technologies in Latin America. It is displayed in three stages. The first stage considers the current situation of public safety in the region. It also describes some innovative projects implemented in Chile, Colombia, Ecuador and Uruguay.

This document also presents a review of the technology used during the FIFA World Cup Brazil 2014, and the use of technology platforms in the case of natural disasters. The next stages of this study will deepen in the issue of technology and natural disasters, as well as innovations in public policy.

# Methodology

## Type of Research:

The nature of this study is qualitative descriptive, as it aims to make a characterization of public security in Latin America, collecting information on this phenomenon from different sources.

It consists of three phases:

- a) Latin American diagnosis.
- b) Natural Disasters.
- c) Innovation in Public Safety Policy in Latin America.

## Research Design:

It is a Theme Narrative Design, describing and identifying emerging issues from the collected data, focusing on the phenomenon of security in Latin America.

## Data Collection Technique:

Review of official documents, gathered from government sites and international recognized institutions, and semistructured interviews.

## Type of Sample:

The sample corresponds to expert interviewed. The interviewed are specialists in different fields of public safety in Latin America, namely: Sálvano Briceño Scientific Committee, Integrated Research on Disaster Risk - IRDR (ICSU / ISSC / UNISDR); Pedro Berrios, CEO National Emergency Network Corporation; Michel De L'Herbe, Consultant in Emergency Management & Business Continuity; Victor Orellana, Deputy National Director of National Emergency Office of the Chilean Ministry of Interior and Public Security, Former Project Coordinator at Japan International Cooperation Agency (JICA); Eduardo Vergara, Coordinator Safe Stadium Plan.

# I. Security in Latin America

## I.1 Security in Latin America

Latin America is a region that has experienced deep changes over the last twenty years. It is observable the presence of positive aspects, such as the development of a more prosperous and integrated regional economy, as well as the existence of more strengthened democracies. However, contradictory elements are also present in this process: Latin America is the most unequal region in the world. In some countries, poverty levels still exceed 40% of the population (CEPAL, 2012). In addition, the region faces the expansion of serious problems, such as violence, crime and insecurity. UNODC (2012) shows an increasing rise in crime rates. For example, between 2000 and 2010, the homicide rate increased by 12%. In fact, Latin America holds 10 out of the 20 countries with the highest homicide rates in the world (UNODC, 2013).

Despite the existence of national differences, the region has high lethal violence, almost epidemic level of homicide rates and a very low perception of safety. Such features are associated with two kinds of offenses of high presence in Latin America. Namely:

A) Crime: which can be subdivided into A.1 Common Crime and A.2 Organized Crime, where both can be committed with or without violence.

The 2013 UNDP report on security, lists the offenses of higher social connotation:

- Street Crime: has poor organization. Security efforts aim at optimizing the search for information, encourage police presence and intervention in the most common identified risk factors; alcohol and drug abuse, lack of lighting or abandonment of public spaces.
- Crime executed by young people: it develops from transitional contexts and unstructured collective dynamics to highly hierarchical criminal gangs. Citizens consider these as serious crimes.

This same report highlights Organized Crime, often understood as transnational, with a highly sophisticated system of organization. Therefore, to confront it, requires larger actions at all points of the criminal chain.

B) Official Crime: this kind of crime is related to B.1) Corruption, and moreover B.2) Specific Violence. The latter can be exercised by institutions towards youth, women, indigenous peoples and minorities. The UNDP report highlights both types of crime:

- Corruption: is the misappropriation of public goods. This kind of crime is widespread in the region, although its measurement is complicated. However, it is estimated that it absorbs 9% of regional GDP, according to the World Bank, thus, delegitimizes the political system.
- Illegal State and Gender Violence: both kinds of violence have certain levels of organization. The answer towards them is the collaboration between the police and community programs that foster social networks and the identification and prevention in risk groups.

It is worth noting that types of crime, -Crime and Official Crime- despite their differences, can overlap and be found in different contexts.

The diagnosis is not homogeneous and each country displays different realities and complexities. Thus, nowadays in Mexico, Brazil and Central America, organized crime is a priority on security, while in the Andean countries, the largest number of offenses respond to everyday crime, whereas that in the Southern Cone, there are low rates of homicide but high levels of property crime (Lagos & Dammert, 2012). However, this report seeks to establish an overview and common axes for analysis.

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Despite the peculiarities Latin America faces concerning crime, the consequences are the same for everyone: insecurity and fear. In general, all countries have high rates of fear. Nowadays, the perception rates of deteriorating regional security, range from 21.6% (Nicaragua) to 64.8% (Dominican Republic), while levels of victimization vary between 6.9% (Panama) and 28.1% (Peru and Ecuador) (UNDP, 2013). Importantly, these data are just a reference, since other regional sources show different situations (Lagos & Dammert, 2012).

The perception or feeling of insecurity is a strong social engine. Latinobarometro 2013 shows that 11 of the 18 countries surveyed, believe that their most important problem is Crime/Public Safety, with percentages ranging from 21% (El Salvador) and 47% (Venezuela). Although perceptions do not necessarily link to crime rates reported, they undoubtedly weigh heavily on the civic agenda.

In addition to a high crime and sense of insecurity in the region, there is the state deficit, especially when dealing with such threats. This deficit is manifested in the difficulty to deliver justice and security, as well as the manifest distrust between the Latin American citizens and the institutions responsible for providing protection against crime.

The above mentioned causes citizens the need to demand answers from the State -specially control related answers- as those are the ones with greater visibility. However, they are not necessarily the more effective ones. So, they are applied at the expense of long-term measures, aimed at prevention and rehabilitation.



# I. Security in Latin America

## I.2 New Insecurity

The history of Latin American countries has led to changes in the concept of security. During the past century, security consisted in reducing the state's external threats. With the end of wars, security became a concern focused on domestic order, making violence and organized crime the most important issues. This impacted on the concept of security, turning its most important concern toward its own citizens, considering that they could be the source of destabilization and undermining state security, and no longer on the care of sovereignty (Prince & Jolias, 2011).

Subsequently, this domestic view at security had to adjust its focus to stop circumscribing only to a common or classic crime, such as drug trafficking, murder, crimes against persons, property crimes, among others, to a view on organized crime. Among it, it is necessary to understand that these criminal ways not only develop in traditional forms, but that they now show technological innovations, resulting in new tort dynamics.

In this regard, Prince and Jolias (2011) argue that the development of new technologies enables pursue traditional crimes, which increasingly use new technologies and means to achieve their ends.

The prejudicial nature of technology not only refers to offenses committed within the Cyberspace. The Information and Communications Technologies (ICT) have also allowed traditional crimes to be enhanced through the use of communication networks and applications offered by the web. For example, the high digital dependency that currently have banking agencies, has had as a result, a lesser degree of difficulty in today crimes of fraud and scam, also facilitated by the anonymity delivered by the web. Likewise, the existence of satellite image maps on some sites can ease the location of property theft-prone. Equally, the broad access to smartphones and applications that security agencies offer in order to protect public safety, boost the odds that the information about police presence on the streets may be used by offenders to plan a crime.

On the other hand, there are the crimes that not only use technology as a means, but also affect in technology and digitization. This type would be the computer crimes, related to internet, hackers and digital security, impacting citizenship in a different way.



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The expansion of the use of ICT has transformed the tort habits, leading to the emergence of new forms of crime, that use in their favor the capacity and range of communication offered by the web. Thus, cybercrime -which primary objective is the use of existing information for illegal purposes- has been increasing its action capacity and impact through cyber espionage, counterfeiting or dissemination of highly confidential information and breach of intellectual property.

These events have affected people, systems and organizations, whose information is digitized and established hackerism as a new tort culture -often without presence in the laws of the States (Salom, 2008). A report issued in 2012 by Norton Symantec illustrated that, approximately, 556 million adults worldwide were victims of cybercrime that year, representing 46% of all individuals who are connected to cyberspace (America Economía, 2012).

Another remarkable issue is that the states should consider the over-crowding and offshoring of technologies. Crime has no boundaries, which sets a new scenario in terms of policy control and crime prevention (Bello-Montes, 2012), giving rise to a security paradigm "among" states, generating a "intrastate" safety mode (Prince & Jolias, 2011). This implies the challenge of opening to international cooperation, because of the transnational nature of such criminal figures.

As a result of the insecurity scenario, the region currently lies at a stage where the issues of security are influenced by social trends and processes that generate new structural conditions. These new dynamics inhibit or leave unresponsive security systems, especially the police (Sain, 2009). The feeling that the answers to these new forms of criminality not necessarily keep pace, has generated that citizen security in Latin America occupies a prominent place in both the State's priorities and concerns of the community (Dammert & Valenzuela, 2013). Utterly, the use of technology has made the addressing of traditional models of criminality response more complex for all actors in the system: police, courts and prison. However, the police are the ones that absorb expectations, since they are first in the line of confrontation.

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## I.3 Traditional response approach

In this context of public anxiety, seeming impunity and more complex phenomenon of tort, public policy initiatives have flourished. Additionally, public recognition on the multiple costs of different violent manifestations, have increased interest on policy initiatives at all levels.

The leading role of police on security in Latin America has led to a number of reform initiatives in those institutions. In democratic societies, the police are one of the most important institutions, since they are the first step in the fulfillment of the legal system: preventing and controlling crime. At the same time, they have the option of using force to protect public order and security (Arias & Zuniga, 2008).

The legacy of military governments in Latin American police was the specialization on public security marked by a replica of the militarization of their actions, with a strong bias to protect the state from the internal threat at the expense of the protection and recognition of citizen's rights (Frühling, 2003). Therefore, the end of military regimes in Latin America opened the way for police reforms and, in some cases, the creation of civilian police in countries where none existed (Carranza, 2005).

The causes for conducting police reforms, are both internal and external motivated. On the one hand, they were a way to balance organizational structural crisis and perceptions of corruption within the police (Dammert & Bailey, 2005). Among the external causes, were the exposure of police violence on the media and a more open political system to allegations of police violence, displayed by interest groups (Bonner, 2009).

As for the types of police reforms, given the diversity and uniqueness of each country, it is difficult to establish general guidelines for the region. However, they all share the goal of regulating dependency, hierarchy and organizational structure of the police. Note that in Central America, the reforms are intended in the long-term, aiming at the creation of new structures and the renovation of the police. This, because the changes were designed from the signature of the peace treaties. Therefore, it was necessary to plan having the future on the horizon.



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A very important element for understanding the processes of Latin American police is their dependence and hierarchical character. Most of the police are subject to civil authority, specifically the Ministry of Interior, Security, Government and/or Justice. This impacts the role they play in society. It is observed that the missions of the police and, therefore, the main tasks to which they are devoted: maintaining safety, public order, the prevention and control of crime .

New security threats related to crime in a context of technological development, require adaptations and innovations in terms of public policies to address them. These must be suitable to the new social dynamics, where relationships are more complex and dense, and consider, at the same time, the political-administrative context (Prince & Jolias, 2011).

Note that both, in the region and in developed countries, it has become evident that prevention security is still rooted in the traditional conception of crime (Sain, 2009). In Latin America, this is reflected within the public security policies. It is possible to find a common element to all of them: the expectations that if the operation of the police is improved, it is possible to obtain more security (Dammert & Bailey, 2005). It is for this reason, that the increased police presence is one of the most used measures implemented in the region.

## I.3.1 Insecurity Technologies

Technological progress and the extent of its threats, are catalyser elements for the necessary updating of public safety policies and reformulation of mechanisms to combat crime (Hauck, 2009). A proof of the need for adaptation and flexibility in the presence of new technologies, was the materialization of the Latin American Bill of Electronic Government (eGovernment), where its states the need for technological cooperation among States, in order to advance in the various fields of available application (Criado, 2009). It declares the following:

*"... States should prepare for the effective implementation of e-Government, undertaking the necessary organizational changes, as well as the progressive implementation of systems, equipment and programs in public administration. In this regard, it is recommended that States: a. Recognize the self-developed systems or their adaptations as intangible state capital, generating transfer mechanisms and support systems, for which it is necessary to agree on new regulatory frameworks "(CIGE 2007, paragraph 23).*

Although the primary focus of eGovernment lies in the transparency of public administration, it is clear that its scope can be a contribution to the cooperation between States facing borderless and fostered by technology crimes.

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The scope of these levels will depend on: how the community has incorporated technology into their daily lives; the rapid technological advances that discontinue the progress of crime; the State's ability on regulation, management and technique, to incorporate a diagnosis of the situation, assessing the implications and impact of the application of technology (Prince & Jolias, 2011).

Most governments in Latin America have made significant investments to improve their technological capabilities. Clearly, today's technology offers alternatives and tools that can be run in the service of public safety, substantially optimizing the process of preventing and responding to crime, giving the possibility to change the form of surveillance, prevention and classic crime control. The police, as an institution and as an activity, is forced to incorporate innovative techniques and technologies chord with new trends and contexts.

Currently, both police and citizens, have a variety of technological tools to face security problems and criminal acts, in some cases preventing crimes and in others, as an assistance to the investigation. Some of these tools are rather widespread, both for public and police, while others are more expensive and difficult for the access of general public.

*The incorporation of technology in the police can be found at different levels:*



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**a) Institutional Management:** Certainly, technological innovations can be a contribution for the administrative staff management, unified information system and to increase the operation's transparency to the citizens.

**b) Staff Protection:** an important element to consider, is how technology can help protect staff in their daily work. It has to be considered the constant danger to which they are exposed, minimizing their vulnerabilities. In order to achieve this, it is possible to find:

- Radios: they allow quick and easy communication in any situation or emergency.
- Smart Patrols: they are equipped with multiple technologies that allow, among other things, to obtain details of the background of a subject, of a vehicle, property, etc.
- Hand Held for vetting.
- Drone: unmanned aerial vehicle (UAV). It can be used to monitor hazardous and inaccessible areas.
- Specialized Uniforms: technology incorporates elements that enable the physical protection when facing dangerous situations.

**c) Deterrence:** technology alone can be a good persuasive element, making an offender to desist from committing a criminal act. Within these technologies, the following can be found:

- Global Positioning System (GPS): in addition to being a tool for private research, these items are available in US pass ports, cell phones and cars.
- Traffic cameras: allow the remote recognition and identification of offending and stolen vehicles.
- Computer cameras and microphones: allow the use of "audio fingerprint", which can be incorporated into a matrix of global security.
- Monitoring public sounds: listens to "dangerous whispers" by identifying "key words".
- Lighting: automatic lighting systems.
- Early warning: telcos (mobile, television and radio) broadcast warning messages in emergency situations.

**d) Crime Prevention:** technology provides tools that help prevent crime, either by avoiding it or by preventing its attainment. Among these technologies, the following can be mentioned:

- Geographic Information Systems, GIS: allow the viewing of events on a map, in order to estimate the accumulation of claims in a given area. Alternatively, Hot Spots analysis identifies areas where a concentration of density dots, or more, producing a map. This type of analysis allows the observation of tort territories' next shift.
- Satellites: allow the location of a street through GPS or Google Maps. The daily images' survey are generated by the different types of satellites, and help in the making of decisions. For example, images are used for weather forecasting or for georeferencing a criminal or conflict zone. They also allow voice and data transmission, such as the Internet, weather forecasting, and means used to address homeland security.
- Microchips: its marketing and implementation is currently used as a mean to locate and track abductees. It can also be used in closed circuits, especially microprocessors, computers or cell phones. They allow the monitoring of prevention and fight against crime, since they have a spot in the implementation of security alarms and satellite tracking in cars, shops, closed circuits, on desktops and laptops, or smartphones.

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**e) Control and Investigation:** technology allows to monitor certain situations and cooperate in matters of investigations:

- Internet: the web records all movements of its members. Thus, it enables to determine from where they have surfed, purchases made online, know the IP addresses, traffic analysis, the content of the websites to censor, monitor social networks and real time monitoring technologies.
- Radio Frequency Identification (RFID): allows access to personal information and people's physical access, through credit cards, gym membership cards, proximity and access control. There are even chips for monitoring and control foreign exchange.
- Biometrics: also known as biometric identification system, it is used for access control, access to ATMs and government programs requiring authentication fingerprint, iris recognition, voice or a combination thereof.
- DNA: as fingerprinting, it allows the identification of individuals.
- Facial Recognition: enables to automatically identify a person in a digital image, by comparing facial features from some other source.

**f) Identify new criminal types:** the use of technology identifies new threats and related crime patterns.

One must not forget that many law enforcement organizations carry brand new technology, so, by not being up to date on these developments, police institutions might be exceeded and overwhelmed (Arenas, 2013). Therefore, it is necessary to generate adequate technological mechanisms, given the speed of change and the complexity of the social context that comes in all the mentioned areas.



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## I.3.2 Latin American experiences

### Delictual Tactical Analysis System (STAD for its Spanish name, Chile)<sup>2</sup>

Based on the Zero Tolerance program of the New York Police Department, this system was implemented in Chile in 2011, through the Interior and Public Security Ministry and Carabineros de Chile.

The STAD consists of meetings between the heads of police units and their high-rank officers, where they review crime patterns, starting from: Territorial Analysis System Information (TASI), which permits to map crime offenses; Integrated Control Management System, which uses information from the victimization survey; Preventive Security "Plan Cuadrante", which reports the resources available for monitoring. All this information represent the where and why of crimes, in order to deploy effective strategies and tactics in confronting crime locations and accurate times. Thus, optimizing resources and police processes.

The Department of Criminal Analysis Carabineros de Chile (Documento de trabajo del departamento de Buenas Prácticas para el Análisis Delictual en América Latina, 2013) states that the meetings have the following objectives:

- Provide the means for more effective policing strategies, directing resources to where they are needed.
- Motivate and guide the heads of police stations to execute all possible actions to reduce crime, within the scope of its powers.
- Share best practices amongst different units.
- Build and strengthen positive leadership in the organization.
- Enable other actors with responsibility for public safety: Municipalities, National Youth Service (SENAGE), National Service for Prevention and Rehabilitation of Drug and Alcohol (SENDA), private security, education, health, etc., when analyzing the causes, it had been advised the need for intervention.

<sup>2</sup><http://www.seguridadpublica.gov.cl/stad.html>

<sup>3</sup>Program that aims to reduce crime and increase the feeling of security among the inhabitants of urban areas of Chile. It divides the territory into quadrants, in order to allocate demand based on human and logistical resources.

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## Integrated Security Service (ISS) ECU-911<sup>4</sup>

The Ecuadorian government launched the Integrated Security Service early 2013. It seeks to respond immediately and in a comprehensive way various emergencies, coordinating care of various agencies and institutions, such as: National Police; Armed Forces; fire brigades; National Transit Commission; Ministry of Public Health; Ecuadorian Institute of Social Security; National Secretariat for Risk Management; Ecuadorian Red Cross; among others, through the establishment of a freephone unique number: 911.

The technological platform of this program coordinates surveillance services, panic buttons, community alarms, reception and dispatch of emergency response.

The Ecuadorian coordinator of the Security Ministry, Fernando Cordero, expressed satisfaction with this service after a year and a half of its implementation, because it "responded more than three million emergencies in the country and has saved about 7,200 lives" (Cisneros, 2014).



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## Mexico Platform

Mexico is another country that has been making progress in this area. Undoubtedly, the most visible face of this intent is the "Mexico Platform" created by order of the National Council of Public Security in 2007 (Arenas, 2013). In order to prevent and combat crime, and to ensure the citizen's protection, the strategic focus of this initiative is to update the technology infrastructure, strengthening the National Network of the National Telecommunications and Information System, where the Single System Criminal Information highlights.

The foundation of this program, is the importance of information in public security to implement prevention, investigation and intelligence tasks (Villa, 2012), which is integrated and analyzed through information and communication technologies for the decision making process.

The connectivity of telecommunications networks enables to share audio, video, text and biometric records, among others. The Single Criminal Information System integrates biometric databases, driver's licenses, and recovered and stolen vehicles, motorized public record, criminal record, record of the prison population, citizen complaints, weapons' registration and ammunition assigned to public safety institutions. This information is available for authorized officers, depending on their profile and hierarchy (Villa, 2012). At the same time, to optimize the use of stored information, approved systems' applications have been developed appointed with the operational needs of each area: Official Police Report (OPR), Kardex Police, Operational Management System, Case Analysis Module, Engine searches and Criminal Records, among others.

## National Digital Strategy (Mexico)

The National Digital Strategy (2013) of Mexico aims to promote the adoption and development of ICT and to introduce Mexico into the information and knowledge society. This strategy is planned within five years.

The plan has five major objectives. One of them is the Public Safety, where ICT will be used to promote safety and to prevent and mitigate the damage caused by natural disasters. This strategy identifies the broadband network that will be executed at 700 MHz, as a cross-cutting enablers for the achievement of its objectives (Estados Unidos Mexicanos, 2013).

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Table 1: National Digital Strategy Objectives: Public Safety

Secondary objectives	Guidelines
1. Develop citizen complaints tools and applications on multiple platforms.	Develop citizen complaints tools and applications by digital media, through mobile or fixed devices.
2. Develop digital instruments for social prevention of violence	<ul style="list-style-type: none"><li>Develop digital tools to disseminate timely information for social prevention of violence.</li><li>Generate digital mechanisms to address issues of violence in children and teenagers.</li><li>Strengthen measures to prevent addictions through the use of digital tools, from the perspective of public health.</li><li>Provide information through digital media, that allow citizens to develop preventive actions, in order not to become violence victims.</li><li>Identify and intervene early learning problems and behavior through ICT.</li></ul>
3. To promote civic innovation through ICT	<ul style="list-style-type: none"><li>Promote civic innovation and the ability of citizens to participate in public affairs safety.</li><li>Encourage public co-creation of new public services and solutions to public problems, through digital tools.</li></ul>
4. To prevent and mitigate the damage caused by natural disasters through the use of ICT.	<ul style="list-style-type: none"><li>Promote the use of technologies for prevention, early detection and effective response to natural disasters.</li><li>Develop online services and applications that allow population to face the risk of the natural phenomena and make more effective the tasks of civil protection.</li><li>Ensure transparency the use of federal resources in response to natural disasters through digital tools.</li><li>Promote the establishment of prevention and action plans for the use of telecommunication infrastructure, both public and private, in case of contingencies or disasters.</li><li>It will be established the obligation to consider contingency plans by telecommunications' operators.</li></ul>

Source: Estrategia Nacional Digital 2013: 25.

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## Uruguay (New technologies for the prevention of crime, 2011)

Starting in 2012, the Uruguayan Interior Ministry began a consolidation process of various programs. Developed through technological tools, this process was designed to increase the efficiency of police actions, improve prevention actions, and to optimize human and material resources.

The programs are the following:

- Vehicle Control System (Sisconve): attends the centralization of information on the vehicular fleet of the Interior Ministry, through a system that will set an online record of the vehicles' location, the fuel load and consumption, by the installation of a chip antenna, set at the pit of the fuel tank, enabling minute-to-minute computer control on the vehicle.
- High Technology Project in Public Safety: it installed over 108 closed circuit television (CCTV) cameras in 44 spots and squares of Montevideo, with wide tourist influx; 15 cameras in Maldonado-Punta del Este and another 214 in prisons. Also, it is running the installation of 14 cameras in Colonia and others in Salto and Rivera.
- Tetra Communication System Safety Reviews: it establishes a system of secure, encrypted communication between the Command Center and patrolmen, monitoring all communications, coordinating and improving police response to reported events.
- Management System of Public Safety (MSPS): it allows registration and computerization of all events in which Police take action (murders, thefts and traffic accidents, etc.). Thus, forming a "color map" with the more troubled areas, both national and departmental. The MSPS also allows immediate access to a database, detailing all of people's backgrounds. The program also has a mechanism to interface with MERCOSUR's security agencies, which enables detection of stolen vehicles outside borders and the presence of required people or weapons.

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## School of Telematics and Electronics (ESTEL) of the National Police of Colombia

According to Intendent Jhon Camacho (2012), Head to the Scientific and Technological Training Group, ESTEL, the National Police of Colombia has been making efforts since 2006 to incorporate technology innovations for the optimization of police service, initiative that was established through the institutional system of science and technology, during the same year through resolution No. 3504.

Starting from the identification of needs in the different services, the School of Telematics and Electronics conducts research projects to meet those needs through technological innovations, built on the adaptation of existing technologies.

Namely:

- Lightbar emergency structure and electrical and electronic devices for motor vehicles' safety and emergency.
- Photovoltaic Portable Briefcase.
- Portable solar lighting Cone for Road Signs.
- Electromechanical Prototype for Coca Plant Extraction.
- Mobile Classroom with Electronic Shooting Simulator.

During the X Regional Conference of Police Chiefs 2012, ESTEL showed its international peers their research projects, oriented to police service in the operational and educational environment:

- Integrated Defense System and Riots Recording. This is a prototype of a riot shield, which includes technologies to collect evidence and electronic stun devices.
- Wireless Aerial platform. It is a prototype that seeks to develop similar characteristics to "drones".
- Photovoltaic system for power electronics, solar energy production photovoltaic system.
- Multifunctional prototype vest for police service assisted by canines. It is a technology support for tracking procedures, observation, detection of narcotics and explosives performing dog handlers. Therefore, it allows the online transmission of information to dog handler on scenarios that evidenced by the dog.
- Photovoltaic Renewable Energy Generator System for Electronic Devices Phase II.
- A prototype's design and construction for the automatic counting and record of 5.56 mm and 9 mm caliber ammunition. This prototype accelerates the counting system.
- Electronic device to prevent loss of handguns in the National Police.
- Optimizing robotic exploration platform phase IV, disruptor cannon automation and robotic arm that allows Explosive Ordnance Disposal by electronic control.
- Design and implementation of a remote controlled air dirigible prototype the National Police of Colombia's service.

It is worth noting that, in many cases, these devices' patents are still pending.

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Table 2: Technological innovation in public safety in South America

## Colombia



The School of Telematics and Electronics of the National Police of Colombia has undertaken various initiatives:

- Lightbar emergency structure and electrical and electronic devices for motor vehicle's safety and emergency.
- Photovoltaic Portable Briefcase.
- Portable solar lighting Cone for Road Signs.
- Electromechanical Prototype for Coca Plant Extraction.
- Mobile Classroom with Electronic Shooting Simulator.
- Integrated Defense System and Riots Recording.
- Wireless Aerial platform.
- Photovoltaic system for power electronics.
- Multifunctional prototype vest for police service assisted by canines.
- A prototype's design and construction for the automatic counting and record of 5.56 mm and 9 mm caliber ammunition.
- Electronic device to prevent loss of handguns.
- Optimizing robotic exploration platform phase IV.

## Uruguay



- Vehicle Control System (Sisconve): it establishes an online record of the vehicles' location, the fuel load and consumption through the installation of a chip antenna, set at the pit of the fuel tank, enabling minute-to-minute computer control on the vehicle.
- Installation of 108 surveillance cameras in 44 large influx spots.
- Tetra Communication System Safety Reviews: it establishes a system of secure, encrypted communication between the Command Center and patrolmen, monitoring all communications, coordinating and improving police response to reported events.
- Management System of Public Safety (MSPS): it allows registration and computerization of all events in which Police take action (murders, thefts and traffic accidents, etc.). Thus, forming a "color map" with the more troubled areas, both national and departmental.



## Argentina

- Within the comprehensive program to protect citizens, there is a systematic surveillance network implemented in the municipalities of San Miguel de Tucuman and Yerba Buena, in order to control large areas of congestion and detect potentially dangerous situations. The collected information is transported by fiber optic networks to the Centers for Control and Monitoring.
- Provincial Emergency Response System (Santa Fe): telephone exchanges equipped with monitors, that allow the mapping the received telephone call, by a tracking system for vehicles (patrol cars, fire trucks and ambulances), aiming to reduce response times.

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## Brazil

- LTE Networks: in 2011 in Brasilia, Motorola implemented broadband network, that secured 700 Mhz for the optimization of institutions focused on public safety, in order to streamline efficiency and responsiveness.
- CISCO Innovation Center Installation in Rio de Janeiro (2013): the company introduced a technological innovation project on public safety that would create a convergence of all of the country's safety systems through the development of a common platform, that included: sensor systems, videos, integrated telephony and radio.



## Chile

Delictual Tactical Analysis System (STAD): a review of crime patterns from the Analysis System Land Information (ASLI), that maps crime offenses; Integrated Control Management System, which uses information from the victimization survey; and "Plan Cuadrante".



## Peru

- National Police acknowledges the use of breathalyzers, radar guns on roads and GPS location and vehicle monitoring.
- Datapol: Requisitories system (for person's intervention) that allows the DNI (National Identity Document) to be scanned, in order to give information and verify if the person has any pending arrest warrant. Such information may be consulted at any police station, since they are interconnected.



## Ecuador

The Ecuadorian government launched this service early 2013, which seeks to respond immediately and in a comprehensive way various emergencies, coordinating care of various agencies and institutions, such as: National Police; Armed Forces; fire brigades; National Transit Commission; Ministry of Public Health; Ecuadorian Institute of Social Security; National Secretariat for Risk Management; Ecuadorian Red Cross; among others, through the establishment of a freephone unique number: 911. The technological platform of this program coordinates surveillance services, panic buttons, community alarms, reception and dispatch of emergency response.

Source: prepared by research team.

# I. Security in Latin America

Table 3: Technological innovation in public security in Mexico and Central America



## Mexico

- Platform Mexico: its foundation is the importance of information in public security to implement prevention, investigation and intelligence tasks. The connectivity of telecommunications networks enables to share audio, video, text and biometric records, among others. The Single Criminal Information System integrates biometric databases, driver's licenses, and recovered and stolen vehicles, motorized public record, criminal record, record of the prison population, citizen complaints, weapons' registration and ammunition assigned to public safety institutions. This information is available for authorized officers, depending on their profile and hierarchy.



## Panama

-Systems of facial identification at airports, implementation of 19 radars along the territory, presence of video surveillance cameras (564 to 2007).  
- I24 / 7 Interpol Network: Panama is a member of this network, that allows global police communications, including access to digital databases.  
- Astro25: Telecommunications network between ground, air and sea forces, with GPS technology, data encryption and integration of analog and digital networks (implemented by Motorola in 2013).



## Guatemala

-Security For Our Community (Municipality of Villa Nueva): implementing an accusation management system (2012), that includes a network of street surveillance (50 cameras distributed throughout the city). The operations center receives accusations (anonymously) via sms, phone calls or social networks. Also, the system maps the location of the crimes, generating a response time of 1 to 3 minutes.  
-Platform Alertos: Pilot project (2010) sponsored by the business area, which involves the installation of approximately 70 surveillance cameras in the country's capital, located at 25 specific spots. Its information comes to the Single Incident Management Center. Thanks to this system, the estimated response time is 5 minutes.

Source: prepared by research team.

# I. Security in Latin America

## I.4 Challenges in Security and Technology

The massification of technology has impacted different areas of civic duty and security aspects have been no strangers to them. Crime has evolved, arrogating the benefits of using these innovations, the resistance to changing traditional police strategies to respond to crimes, and has taken advantage of the existing loophole -which results from ignorance or inapplicability of the existing figures- of crimes with the use of technology.

In this regard, technological innovations pose multiple challenges to security in the institutions responsible for keeping it, information management and its applicability to prevention and control:

### Institutions

- The incorporation of new technologies in government institutions, impacts on organizational culture of any institution, changing procedures, incorporating new knowledge, redesigning solutions, etc. This implies that their incorporation should be accompanied by training processes, that enable the understanding of the new institutional dynamics.
- Many of the technologies developed and implemented in security institutions require specific knowledge, which should lead to an institutions' opening to work with people or organizations that do not necessarily belong to the security area, such as universities, research centers, software providers, among others.
- The use of technology in crime prevention and control involves certain privileges, regarding access and use of information that should be supervised by a superior body, in order to ensure proper use of this power.
- Due to the emergence of crimes using technology, offshoring and its rapid evolution, it is necessary to examine and update the laws, in order to enable them to embrace as many possible situations as possible. Since 2011, European countries along with Canada, Japan, United States and South Africa, are part of the Convention on Crime or Budapest Convention. So far, the only Latin American member is Dominican Republic. Only in May of the current year, Argentina, Guatemala, Nicaragua, Peru and Uruguay signed the Iberoamerican Cooperation Agreement on Research, Assurance and Cybercrime Test Atteinment.
- Technological innovations should also be used to educate and involve citizens in crime prevention.

### Information Management

- Balance development between the use of technologies for the prevention and control of crime and the "collateral damage" that this may cause, regarding unrestricted monitoring and protection of individual rights.
- Technology allows infringing privacy easily. However, this feature must be regulated and supported by transparent procedures, that establish that the information catch is within the margins of the law.

### Applicability

- At its different usage levels, the incorporation of technology must be accompanied by assessments that allow to establish their performance and whether they meet the purpose for which they were implemented.
- It's a growing imperative that the State develops policies and security strategies to be constantly updated and, thus, counterbalance the exponential growth of new tort technologies.
- The technology helps to constantly develop new criminal types, so it is necessary to be attentive to the evolution and potential applicability of the benefits of innovation, which are subject to malicious use.

# I. Security in Latin America

## I.5 Conclusions

- Currently, Latin America has a high level of crime, with different shades, depending on the country where problems are concentrated: drugs, organized crime, homicide, among others. In addition, there is an even higher perception of insecurity, generating an adverse scenario. This represents a double challenge: first, confronting crime and second, restrain the citizen's sense of fear and insecurity.
- Technological advances have had an impact beyond their immediate scope. They have also allowed the emergence of new tort dynamics, forcing institutions to adapt and incorporate innovative strategies to be one step ahead of the criminal actors: preventing, controlling and responding. Therefore, today it is inconceivable for security responsible institutions to confront the tort phenomenon without the use of technological tools.
- The security responsible institutions could not only make use of technological tools internally, but could also use them to involve citizens in crime prevention.

## II. Safety During the 2014 FIFA World Cup

Undoubtedly, when it comes to security issues, the organization of mass events represents a big challenge. The attention of thousands of people -in a context of excitement and crowd behavior- tests any security system. Moreover, it is a challenge for the possible presence of groups that commit acts of global magnitude. This year, Brazil welcomed the 2014 FIFA World Cup, which involved challenges that go beyond sports. The organization of mega sporting events is shared –generally- by government agencies at national and local level, and sports associations and federations of national and international scope.

Brazil is the world's seventh largest economy and a member of BRIC. However, it is one of the most unequal countries in the world in the most unequal region in the world. It has more than 30 million people under the poverty line and has epidemic levels of violence (more than 10 homicides per 100,000 inhabitants) (CEPAL, 2013).

Major construction and infrastructure creation or rehabilitation of stadiums were completed for the preparation of the World Cup 2014. However, they were overshadowed by questions about the benefits and costs of holding the event in a network of cities branded by high levels of social inequality (Valente, 2013). After a great display of public and private resources in the organization of the Cup and all eyes and TV cameras placed in Brazil, citizens had been expressing for months their unease with it.

Protests following the organization of mass sporting events are mainly based on the high cost they mean for the country, which is considered an unnecessary expense, taking into account the high levels of poverty (Mizrahi, 2014). A survey by Pew Research in early June showed that 60% of Brazilians considered that organizing the Cup in Brazil will be "bad", while 72% manifested "dissatisfaction" with the country's direction (Mizrahi, 2014). The citizen's demands are mainly: better public services, a firm hand on corruption and a rejection at the millionaire investments for soccer tournaments (both, the Confederations Cup [2013] as the World Cup [2014]) (Agencia AFP, 2014).



## II. Safety During the 2014 FIFA World Cup

While during the FIFA Confederations Cup Brazil prepared itself for a terrorist attack, organized and hooligans crime, it had to face more than one million citizens protesting because of expensive and inefficient public services. In a context of political corruption, demonstrations often ended in violent acts (Agencia AFP, 2013). In addition, there was a crime increase and strikes by private security guards and officials of public transport, occurred in Brazil during the previous days of the opening of the World Cup.

Still, the FIFA World Cup is considered an event 30 times bigger than the Confederations Cup, so there is no space for random events. For 2014, Brazil had to prepare for the possibility of terrorist attacks and organized crime actions. Likewise, protests reached a higher level of violence -given the magnitude of the event- damaging the country's image.

At the same time, it is socially accepted that certain types of events carry a number of inherent risks. Logic suggests that, if the offense is a figure that has always existed, the agglomeration of people in certain areas favours the appearance of offenses (Jennings and Lodge, 2009 (Alvarez de la Torre & Rodríguez-Toubes, 2013)). The tourist figure is more vulnerable and prone to undergo certain adverse events, becoming an easy prey for common and organized crime (Bras and Rodrigues, 2010; Leep and Gibson, 2003; Stangeland, Díez and Duran, 1998 (Alvarez Tower & Rodríguez-Toubes, 2013)).



## II. Safety During the 2014 FIFA World Cup

Moreover, the insecurity image is a negative stereotype of Brazil. So it was considered by the tourism planning in the period 2010-2014, which recognized it as a weakness to overcome, especially in neighborhoods belonging to host cities (Alvarez de la Torre & Rodríguez-Toubes, 2013).

To avoid disturbances in demonstrations -whose precedents occurred during the Confederations Cup (more than one million people marched)- and other kind of offenses, Brazil formed an elite force of 10,000 police and -solely in Rio de Janeiro-the streets were patrolled by over 20,000 agents (Jiménez, 2014).

Parallel, the FIFA World Cup was exposed to the threat of a cyber attack. Since early June, the website of the Ministry of Foreign Affairs of Brazil was attacked by "Anonymous" hackers, through "phishing" method (theft of information through "plug-ins" installed in emails), disclosing operational security documents relating to the FIFA World Cup and threatened to promote "cyberterror" during the event (DPA, 2014).



## II. Safety During the 2014 FIFA World Cup

### II.1 Security Background in mega-sporting events

Perhaps the most traumatic memory on sporting events, is the assault on the Munich Olympic Village during the 1972 Olympics, which ended with 17 dead. This event revealed the need to protect -aside from the sport venues- the Olympic Village and to reorganize transportation, in order to protect the athletes' movement. García (2012) suggests that, this and subsequent Olympic Games, have left other lessons, such as:

- Set security perimeters around key locations, for any incident is related to the Olympics and security measures are unable to guarantee the safety of the event;
- Joint actions of the different government agencies involved in protecting the activity and the general coordination of the locally performed event;
- Set all safety responsible agencies under a common direction at risk assessment;
- Leadership in the police command and control coordination -as well as other services- running the primacy at their respective areas of responsibility;
- Establish specific structures on protection against cyber attacks.

The 2010 FIFA World Cup South Africa and its safety devices shed lights on the 2014 FIFA World Cup Brazil. Despite South Africa reduced its crime rates, between March 2007 and 2008, about 50 people died daily as a result of murder; between January and September 2009, 36,190 women declared to have been raped; 118,312 cases of armed robberies were registered (March & Ospina-Valencia, 2010), i.e., a challenge for security agencies ahead of the World Cup. A special safety committee developed several programs to ensure the welfare of tourists and competitors. The South African government recruited 55,000 new agents in the previous years to the FIFA World Cup and added 41,000 more before the beginning of the event. Parallel, specific equipment was acquired. Namely: 6 helicopters, 10 mobile command vehicles, 100 high performance vehicles, drones, armored suits and water cannons, among others (Mundial Sudáfrica 2010, nd). More than 100,000 police were deployed amid the host cities.

Moreover, South Africa received European aid to coach staff to prevent and/or face terrorist attacks. Trained by the National French Gendarmerie (experienced due the 1998 World Cup), the special security forces in South Africa were supported by Tactical Response Teams, whose preparation allowed them to face more serious problems, such as chemical, biological and radioactive attacks, kidnapping, holding hostages and disasters, both natural or committed by terrorist groups (Mundial Sudáfrica 2010, nd.).

Video surveillance was expanded in all major cities and cooperation between the armed forces of the State was yielded (March & Ospina-Valencia, 2010). Security forces specially equipped and trained FIFA World Cup was in charge of border control, road, urban and stadia safety and handling crowds during the tournament (Mundial Sudáfrica 2010, nd.). In the particular case of borders, it also had the support of Interpol and its "Dangerous and Disruptive Persons, DDP" database, both in the control and authentication of passports, and in the identification of Dangerous and Disruptive People (Mundial Sudáfrica 2010, nd.).

## II. Safety During the 2014 FIFA World Cup

Note that the South African Police worked with the security forces of all countries ranked for the 2010 FIFA World Cup. The latest mega sporting event, the 2012 London Olympic Games, also enables to take lessons for the organization and security of the 2014 FIFA World Cup Brazil. London is a city with eight million inhabitants. For the Olympic Games, it is estimated that there were eighty thousand people belonging to the "Olympic family", more than two million visitors to the Olympic park, strong presence of the international press and the intervention of sports delegations from different countries, groups and/or high international authorities, all of whom could have been potential targets of terrorist groups (De Miguel García, 2012).

To prevent such events, the organization of the Olympic Games arranged certain security measures, among which (De Miguel García, 2012):

- Design a great entity structure. Safekeeping must protect not only the sports facilities.
- Participation of different organizations and institutions -public and private- focused on security. 42,000 people assigned to police forces, armed forces and private companies.
- Requirement to conceive security from an extensive perspective (relationship with firefighters, emergency services, etc.).
- Establish procedures for joint and multidisciplinary performance.
- Requirement of international cooperation.

Regarding security and in the absence of major incidents, the 2012 London Olympics have been listed as successful. However, De Miguel García states that there was a lack of coordination and planning, which should be considered when planning another mega-event. In London 2012, there was a poor budget forecast. The estimates indicated that the initial budget on security for the event reached 400 million euros. Nevertheless, the actual spending exceeded one billion euros.

It should be taken into account, that a major sporting event requires suitably sized organizational structures to be responsible for its coordination and planning. Such structures are developed by solid government structures, responsible for protecting rights and freedoms. These structures must be closely linked with the organisms responsible for the event's organization. For the 2012 Olympic Games, the Olympic Security Department was created. It was ascribed to the Office for Security and Counter-terrorism -whose role was to analyze existing threats, their evolution and updating documents and draft guidelines on specific and concrete strategy for the event's security. Planning should avoid security breaches, so it should have joint actions and avoid the existence of two separate systems: one focused on the safety of the event and another for the protection of the rest of the city.

The security approach of London 2012 aimed to ensure security in the whole of the UK and not focus particularly to the areas closest to the sport venues. Moreover, there were multiple bodies -public and private- involved in the London 2012 security. It is necessary to stress that each actor must be able to perform the tasks assigned to them. At the same time, the used tools must be combined successfully with the preservation of a sense of normalcy for the people. However, London 2012 opted for a high visibility: aircraft carrier anchored in the Thames, missile batteries on the rooftops of London buildings, long-range acoustic device along the Thames, installation of hundreds of television cameras and isolation of the Olympic ring through an electric fence (De Miguel García, 2012).

## II. Safety During the 2014 FIFA World Cup

### II.2 Use of technology in Brazil 2014<sup>5</sup>

The Brazilian government created the Special Secretariat for Large Events Security, which was responsible for Brazilians and tourists' safety of Brazilians during the World Cup. The technological integration of all police and security agencies was the greatest innovation of this secretariat enabling an exclusive network of high-capacity communication, allowing connection of headquarters, stadiums, customs, patrols and Interpol. (Datos y Agencias, 2012). At the same time, the databases of the Brazilian security forces were integrated into Interpol. Moreover, the Brazilian government sent documents to USA, Germany, England, Holland, South Africa, Poland, Argentina, among others, requesting data on terrorists, "troublemakers" and hooligans (Datos and Agencias, 2012).

One of Brazil's great challenges for the 2014 FIFA World Cup, was the renewal of its telecommunications systems and ICT infrastructure -in order to provide quality communication- and to improve the management of the 12 stadiums that faced challenges in security, energy and planning (Datos y Agencias, 2012). Since April 2013, 4G networks were launched commercially in the 2.5 GHz band in the host cities of the Confederations Cup (June 2013). This expansion continued at the main Brazilian cities on the occasion of the 2014 FIFA World Cup. This investment numbered on USD 111 million –solely in the development of 4G networks-. Its main objective is speed. This system consists of a system of systems and a network of networks based on the IP protocol, which is achieved through the convergence of wired and wireless networks and can be used for wireless modems, smartphones and other mobile devices. Regarding public safety organizations, this translates into a wide range of new communications applications, that allow data transfer speed to reach broadband speed range. This means that a query to any particular database can cast complete reports, filled with images such as photos and video clips of police records instantly. Thereby, 4G networks allowed the use of existing applications with higher performance and responsiveness, as well as the extent of new applications.



## II. Safety During the 2014 FIFA World Cup

The Brazilian army helped in the process of defining the allocation of 700 MHz in Brazil, whose technology the military already knew, specifically in relation to public safety. Brazil's army was also responsible for the security of the 32 national football teams. At the same time, radio frequency communication (RF) was also operating, whose use was a priority within the arenas and to the exclusive use of staff in charge of the stadium: guards, agents, cameramen, etc., who could connect to this network without having to access the 4G network wirelessly (Datos y Agencias, 2012). This service was delivered by the Radio Frequency Systems (RFS). Also, the stadium's visitors had access to Internet 50 MB per second.

Alongside these communication advances, during the 2014 FIFA World Cup Brazil, the event was attended by drones -flying over stadiums to ensure public safety-. Elbit Systems was commissioned to provide the World Cup's technology for security, supplying a Hermes 900 drone -which patrolled the sky during the matches-. These drones were led by the Brazilian Air Force (BAF), which were added to the Hermes 450 drones, already used by the BAF to control the air (Cromo- El Observador, 2014). Another company, Risco Group, also sought the safety of those attending at the new stadium Arena Pantanal in Cuiabá. It provided advanced security systems, which identified those who attempted to enter with counterfeit tickets, controlled some 300 areas inside and outside the stadium, from access to press offices (Cromo- El Observador, 2014).

This responds to the use of technological tools in security planning. However, the outcomes will be discussed later



## II. Safety During the 2014 FIFA World Cup

### I.3 Conclusion

Certainly, the using technology during the 2014 FIFA World Cup Brazil's experience will enable the design of future mass events –such as 2015 Copa America Chile- and the visibility of technological innovations' applicability in security responsible institutions.

### III. Natural Phenomena as a Security Issue

Latin America is a region prone to severe natural phenomena, such as earthquakes, tsunamis, volcanic eruptions, hurricanes, floods, landslides, etc., that affect the development and life quality of the countries that bear them. This, because they directly affect the delay efforts' to improve living conditions, diverting resources to reconstruction or the payment of the foreign debt caused by the disaster. At the same time, arise financial consequences, due to the need to raise taxes, as well as a decrease in tax revenue caused by the interruption of economic or productive activities. They also influence a country's external economy, due to reduced exports. Moreover, they bias price levels, having a possible inflationary impact (Melli, 2005). Therefore, the occurrence of natural phenomena mainly affects the most vulnerable part of the population, who have less access to information, means of protection and fewer resources to rise again.

Thus, intense natural phenomena have become an issue of public security. Thereby, institutions such as the Organization of American States (OAS), stated in 2003 that, within the 27 new "unconventional" threats, natural disasters are one of them (Mery, 2012). Understood as a component of environmental security, Millennium Project defines them as "threats caused by natural or human processes due to ignorance, accident, mismanagement or poor design, and produced above national borders" (Hardt 2008, p.2 cited (Mery, 2012)). In modern societies, nation's security is understood as a whole, including not only crime and police work (concept that limits it to criminal actions and/or accidents), but also disasters and their management (De L'Herbe, 2014).

In developed countries there are two levels within the field of disaster management: political action and technical agencies. Both areas are detached from each other, which means the rise of a Bottom-Up model management, is decentralized and focused on the local reality of disasters (De L'Herbe, 2014). In some Latin American countries the model of disaster management is Top-Down. This means that emergencies scale to political levels, outpacing the public sphere, despite the fact that emergency management aims to maintain at base levels. In regional emergency situations there exists no response times, no promises of response time, no procedures, and no integrated system (De L'Herbe, 2014).

In both, Latin America and in the rest of the world, governments are responsible for disaster management. They seek to prevent, as far as possible, and to face the consequences with government resources -generally associated to order, security, and monitoring natural disasters partner institutions.

Table 4: Institutions responsible in the presence of disaster

CENTRAL AMERICA			
Country	Responsible Institution	Support Institutions	Duty
Mexico	Department of Government	National Civil Protection System (SINAPROC)	Management
	Department of Government /UNAM	National Center for Disaster Prevention (CENAPRED)	Management and monitoring
Panama	Ministry of Government and Justice	National Civil Protection System (SINAPROC)	Management and monitoring
AMERICA DEL SUR			
Argentina	Ministry of Interior and Transportation	Dirección Nacional de Protección Civil (DNSP)	Management
	Ministry of Federal Planning, Public Investment and Services	National Commission on Space Activities (CONAE)	Monitoring
		National Institute of Seismic Prevention (INPRES)	Seismic Monitoring
Brazil	Ministry of National Integration	National Secretariat for Protection and Civil Defense (SEDEC)	Management
Chile	Ministry of Interior and Public Security	National Emergency Office (ONEMI)	Management
	Ministry of Mining	National Service of Geology and Mining (Sernageomin)	Volcanoes Monitoring Volcanoes
	Armed Forces	Hydrographic and Oceanographic Service of the Navy (SHOA)	Tsunamis Monitoring
	University of Chile	National Seismological Centre	Seismic Monitoring
		National Network Accelerographs Coverage (RENADIC)	Earthquakes Monitoring Terremotos
Colombia	Administrative Department of the Presidency of the Republic	National Unit for Disaster Risk Management (UNGRD)	Management
	National Unit for Disaster Risk Management	Colombian Civil Defense	Mitigate
	Ministry of Mines and Energy	Colombian Geological Service	Geological Hazards Monitoring
Ecuador	National Secretariat for Risk Management	National Civil Defense System	Seismic, Tsunamis Monitoring/Mitigate
		National System of Planning and Development (SENPLADES)	Management
		Coordination Unit of the Emergency Program for Addressing Natural Phenomena (COPEFEN)	Management and Mitigate
		National Institute of Meteorology and Hydrology	Flood Monitoring
		Geophysical Institute	Seismic and Volcanoes Monitoring

\* All acronyms correspond to their Spanish or Portuguese names.  
Source: prepared by research team.

In some cases, when the emergency exceeds the response capacity, States extend their coverage through defense agencies, such as the Armed Forces. These situations occur in complex and high social impact situations, which require interdisciplinary responses (Lavell, 2000), which constitute extraordinary situations.

## III. Natural Phenomena as a Security Issue

### III.1 Armed Forces' Role in Disaster

Currently, Armed Forces in Latin America and the Caribbean face different situations fostered by change processes, as pivotal as the dictatorship-democracy transitions in a broad number of countries, as well as the changing security agendas, that have included in their contents the presence of new threats and the modernization of military affairs, among others (Álvarez, Garzón Tellería & Fiumara, 2012).

Mainly due to this new context, the role of the Armed Forces in the region has acquired new shades. While their activity is still based on traditional guidelines, thanks to the development of the agenda and the dimensions of the concept of security, the activities of the Armed Forces have spread to other areas beyond the purely military.

The so called "complementary roles" of the armed forces are tied to all actions that are aimed at targets other than the primary, and that in some way, come near the civil sphere. Namely: contribute to economic development and social, Human Rights promotion, manage natural disasters, and contribute to public security tasks sporadically (Álvarez et al., 2012).

Precisely, on this last point it is worth noting that, while the expansion of the security agenda has led to the development of additional work, the Armed Forces in the region continue to maintain their traditional goal as primary. For this reason, interoperability with public security forces -for example- occurs only temporarily and in disaster or calamity situations.

The latter has been the subject of discussions considering that there are two perspectives on the matter. On the one hand, it is argued that natural disasters, need actions primarily related to the analysis of the situation and this is exclusive competence, in execution terms, to the forces of order and security (Álvarez, 2007). In contrast, it is argued that in a context where traditional war conflicts are rare, the high level of training, organization and equipment of the armed forces could be exploited in disaster situations. This latter perspective has detractors due to: a) it strongly disrupts the mission and traditional view of the institutions responsible for a country's defense, where threats to the territory are considered exogenous (Mery, 2012); and b) disasters are considered a security issue, not as a problem of internal policy, which Weaver called "securitization" (1995).

## III. Natural Phenomena as a Security Issue

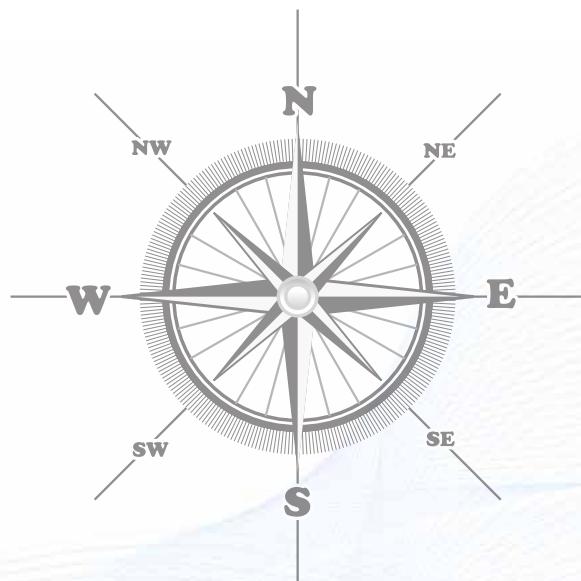
### III.2 Intense Natural Phenomena's Impact

Among the many vulnerabilities present in Latin America, the so called intense natural phenomena usually cause major havoc to the population that is affected by them. For example, solely during 2010 were recorded 2024 disaster-related deaths; 18.7 million people affected; 222,000 homes were destroyed, 1 million houses were damaged (UNISDR; Corporación Osso, 2013). These impacts were mainly related to the February 27th, 2010 earthquake in Chile and La Niña phenomenon, which lasted until March 2012 in Colombia, Costa Rica, Chile, northern Ecuador and Venezuela. It must be kept in mind that the amount of damages and losses is not necessarily proportional to the population or the size of the country, but is related to the vulnerability and threats that those countries hold. For example, the population of Colombia is five times that of Honduras and three times that of Guatemala, but all three of them belong to the six countries with highest damages and total losses per 100 thousand inhabitants, both during 2010 and 2011 (UNISDR; Corporación Osso, 2013).

There is an association between natural disasters and the environmental threats they posed. These highlight uncontrolled risks. However, these can also be seen as unresolved development problems (Cardona, Bertoni, Gibbs, Hermelin, & Lovell, 2010).

The authors argue that the risk of disaster is defined as the probability of future damages and losses associated with the event of environmental threats, where the degrees and types of losses depend on the exposure and vulnerability level of each society (Cardona et al, 2010 ). Therefore, it is necessary to understand disaster as a social condition that disrupts the normal functioning of a society, due to the magnitude of the losses, damages and sustained impact (Cardona et al, 2010). To be classified as such, a disaster must meet at least one of the following criteria (CEPAL, 2012):

- 10 or more people deceased
- 100 people affected
- State of emergency declaration



### III. Natural Phenomena as a Security Issue

In Latin America, the term "natural disaster" is often used to mention the occurrence of intense natural phenomena, sucha as (CEPAL, 2012):

#### 1. Geophysical

- 1.1. Earthquakes: they are the result of a sudden release of energy stored in the earth's crust, creating seismic waves and generating a land movement.
- 1.2. Volcanic eruptions: they include all volcanic activity, ie, both the transportation of magma and gases to the surface of the earth (which may be accompanied by tremors and eruptions), as well as the interaction of magma and water (eg, groundwater and crater lakes) below the surface of the earth, which can lead to phreatic eruptions.
- 1.3. Dry mass movements: any downward movement of a large volume of lithologic material or debris. They can be produced by seismic activity, rain, volcanic eruptions or anthropogenic impacts (erosion, mining and gas extraction). There are four types of mass movements: rockslides, avalanches, landslides and submergence.

#### 2. Meteorological

- 2.1. Storms: they are a weather phenomenon produced by variations in the temperature of the atmosphere, displaying winds, big clouds, violent rainfall accompanied by lightning and thunders. There are three subtypes of thunderstorms: local storms, tropical cyclones and extratropical cyclones (winter storms).

#### 3. Hydrological

- 3.1. Floods: consist on the process in which part of the earth's surface is covered temporarily by water, due to the significant increase in the level of a stream, lake, a water reserve or coastal region (tidal waves).
- 3.2. Wet mass movements: they include all downward movement of a large volume of lithological material or debris, which main triggers agents are gravity and water. There are four subtypes of mass movements: rockslides, avalanches, landslides and submergence.

#### 4. Climatological

- 4.1. Extreme temperatures: there are three types: heat waves, cold waves and winter storms (extreme winters). A heat wave corresponds to a prolonged period of excessive heat –in relation to the area's normal weather patterns- often accompanied by moisture. A cold wave can be a prolonged period of excessive cold or sudden incursion of very cold air over a large area. Winter storms and extreme winters cause impacts due to snow and ice.
- 4.2. Drought: it corresponds to a rainfall deficit over a period of time (a season, a year or several years). Its calculation is related to the multi-year average statistics in the questioned area.
- 4.3. Fire: It refers to uncontrolled fire, usually in wild areas. There are two subtypes of fires: forest and land.

### III. Natural Phenomena as a Security Issue

Table 5: National Environmental Risks

CENTRAL AMERICA	
Country	Main Environmental Risks
<b>Mexico</b>	Floods, earthquakes, volcanic activity and weather phenomena (hurricanes and storms in the Caribbean and Gulf coasts).
<b>Panama</b>	This country has lower environmental impacts than the rest of the region. However, this does not mean it is free of threats. It has active fault, which implies risk of earthquakes, floods and hydrometeorological phenomena.
SOUTH AMERICA	
<b>Argentina</b>	It possesses multiple risks due to geographic location, population distribution, territorial extension. Those risks are: earthquakes (west of the territory), floods (tributary of the River Plate Basin), volcanoes (Andes), severe storms.
<b>Brazil</b>	Brazilian climatic conditions (tropical-temperate) and geographical constitution (2/3 of the territory is occupied by the Amazon basin, 1/5 by La Plata basin and the rest by other rivers and tributaries) make it prone to large floods and frost in south, and droughts at the northeast. Vulnerability to anthropogenic threats (damaged ecosystems).
<b>Chile</b>	Due to its territorial extension, it has a variety of climates and soils. 80% of its territory is mountainous and the remaining 20% consists of valleys and plains. Main risks: drought during the summer, winter flooding, high volcanic activity, and the highest seismic activity rate recorded in the region (risk associated with tsunamis).
<b>Colombia</b>	Area of high geological complexity. Main threats: earthquakes, volcanic activity, landslides, avalanches, overflows, floods, hurricanes and storms (due to its climatic and hydrological conditions).
<b>Ecuador</b>	Its vulnerabilities are its location in the "Pacific Ring of Fire" area and the presence of the Andes Mountains. These elements expose the country to high risks of geological origin, such as earthquakes and volcanic eruptions, land movements, tsunamis and hydrometeorological events.
<b>Peru</b>	Set amid the presence of tropical and subtropical areas, it also has high seismic activity. Main risks: earthquakes, mudslides, landslides, floods, droughts and ecological changes in the sea (temperature variations).

Source: prepared by research team, from information obtained at (EIRD): [www.eird.org/perfiles-paises/perfiles/index.php/](http://www.eird.org/perfiles-paises/perfiles/index.php/)

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Latin America has usually confused risk with the threat, without distinguishing between an intense natural phenomenon and a disaster. The risk can not be understood solely as the possible occurrence of a natural phenomenon, while the disaster is the materialization of the risk (Cardona et al, 2010). The latter has been restricted to the calculation of the losses represented by physical damage, rather than being understood in a more comprehensive way. The problem with this approach, is the null reference to resilience, the potential to absorb and/or recover from the impact. Thus, disaster is understood just as the exposure or susceptibility to damage, as the following two tables show:

Table 6: Impact of disasters in Central America (selected countries), 2000-2013

Disaster type	Country	Number of disasters	Number of people killed	Number of people injured	Number of people affected	Number of people homeless	Total affected	Total damages (.000 USD)
Drought	Mexico	3	0	0	2565000	0	2565000	310000
Drought	Panama	1	0	0	0	0	0	200000
Earthquake (seismic activity)	Mexico	5	35	1319	247680	4000	252999	1586300
Earthquake (seismic activity)	Panama	2	2	75	1000	340	1415	0
Epidemic	Mexico	1	0	0	41687	0	41687	0
Epidemic	Panama	1	0	0	173	0	173	0
Extreme Temperature	Mexico	6	159	0	120000	0	120000	500000
Flood	Mexico	29	500	104	3353020	43000	3396124	3019600
Flood	Panama	23	87	336	135155	4565	140056	18800
Mass movement wet	Mexico	7	140	0	200	0	200	0
Storms	Mexico	42	479	230	5643996	330800	5975026	22522400
Volcanic Eruption	Mexico	2	0	0	41300	0	41300	0
Wildfire	Panama	1	0	0	1436	0	1436	0

Source: Center for Research on the Epidemiology of Disasters, s.f.

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Table 7: Impact of disasters in South America (selected countries), 2000-2013

Disaster type	Country	Number of disasters	Number of people killed	Number of people injured	Number of people affected	Number of people homeless	Total affected	Total damages (.000 USD)
Drought	Argentina	2	0	0	0	0	0	120000
Drought	Brazil	7	0	0	2062000	0	2062000	3110000
Drought	Ecuador	2	0	0	110665	0	110665	1700
Drought	Peru	3	0	0	21500	0	21500	0
Earthquake (seismic activity)	Argentina	1	0	27	500	200	727	0
Earthquake (seismic activity)	Brazil	1	1	6	280	0	286	0
Earthquake (seismic activity)	Chile	5	586	10685	1937968	800000	2748653	30205000
Earthquake (seismic activity)	Colombia	6	14	96	12258	2500	14854	14000
Earthquake (seismic activity)	Peru	9	750	4438	896741	127955	1029134	900050
Epidemic	Argentina	1	6	0	13366	0	13366	0
Epidemic	Brazil	4	203	0	1548723	0	1548723	0
Epidemic	Colombia	2	91	0	24406	0	24406	0
Epidemic	Ecuador	5	23	0	111287	0	111287	0
Epidemic	Peru	3	24	0	65960	0	65960	0
Extreme temperature	Argentina	6	85	0	3500	0	3500	0
Extreme temperature	Brazil	3	39	0	0	0	0	0
Extreme temperature	Chile	8	6	0	76100	0	76100	1010000
Extreme temperature	Peru	8	1452	1824262	3250534	5247	5080043	0
Flood	Argentina	21	138	47	1056228	32800	1089075	3418210
Flood	Brazil	51	2397	1475	5881583	370345	6253403	4745870
Flood	Chile	15	74	0	645870	34263	680133	265000
Flood	Colombia	37	1792	1774	8931085	49000	8981859	3432000
Flood	Ecuador	14	226	140	520877	17649	538666	1018800
Flood	Peru	22	471	1004	2238315	54325	2293644	0
Insect Infestation	Peru	1	0	0	0	0	0	0
Mass movement dry	Colombia	1	12	0	0	0	0	0
Mass movement dry	Ecuador	1	60	0	0	0	0	0
Mass movement wet	Argentina	1	4	0	20000	0	20000	15000
Mass movement wet	Brazil	5	162	0	5170	144500	149670	86000
Mass movement wet	Colombia	10	449	74	875	2653	3602	0
Mass movement wet	Ecuador	5	75	55	300	180	535	0
Mass movement wet	Peru	9	277	85	1140	1370	2595	0
Storm	Argentina	11	80	268	13900	4630	18798	25000
Storm	Brazil	6	28	192	165650	5790	171632	440000
Storm	Chile	2	47	0	2112	400	2512	0
Storm	Colombia	2	5	200	3074	7500	10774	0
Storm	Peru	2	75	0	86682	0	86682	0
Volcanic eruption	Argentina	2	0	0	0	0	0	0
Volcanic eruption	Chile	2	0	0	11500	0	11500	0
Volcanic eruption	Colombia	7	16	7	42351	0	42358	0
Volcanic eruption	Ecuador	7	5	13	500170	0	500183	160975
Volcanic eruption	Peru	1	0	0	3000	0	3000	0
Wildfire	Argentina	2	8	0	0	0	0	0
Wildfire	Chile	5	8	0	400	1367	1767	480000
Wildfire	Colombia	2	0	0	200	0	200	0
Wildfire	Ecuador	1	5	70	1875	0	1945	0

Source: Center for Research on the Epidemiology of Disasters, s.f.

### III. Natural Phenomena as a Security Issue

#### III.3 Technology and disasters

In the face of disasters, its vulnerability elements must be remembered: poverty, disorganization, lack of social cohesion, fatalistic ideologies, social exclusion, among others. Thus, a broader conception of the problem and better organization of societal response against them is required (Fernández & Chavarria, 2012). Moreover, it is possible to divide a disaster in three stages: prevention, the event itself and the process of reconstruction. Thereby, comprehensive risk management involves three public policies. Namely: risk identification, risk reduction and disaster management (Fernandez & Chavarria, 2012). All three of them work with direct aspects of human development, such as enhancing population, cooperation, equity, sustainability, and above all, security against avoidable risks, chronic threats and sudden shocks, going beyond the physical safety and legal certainty, although included.

The comprehensive approach to disasters is relatively new. Cardona et al (2010) argue that, only during the 90s some governmental scientific bodies related to hydrometeorology, the geosciences and environmental protection, have been strengthening and modernizing processes with greater potential for instrumentation. Due to the lateness of these processes, comprehensive early warning and formal systems have not achieved a reasonable development level. For example, the current use of geospatial information technology in real time means a delay in the process of prevention.

The use of ICTs by the States for the prevention and mitigation of the impact of natural disasters, also known as Disaster Risk Management (DRM) (Fernández & Chavarria, 2012), have a positive impact, since they help to disseminate information on threats, vulnerabilities, risks and issue warnings to both, natural and anthropogenic hazards (Fernández & Chavarria, 2012). Thus, DRM is a social process that helps strengthening the capacities of society against threats. It is impossible to contemplate the possibility of avoiding the occurrence of an earthquake or hurricane, but with the right institutional ICT capacities, their impacts can be reduced. Special progress has been made through satellite technology, fiber optics, mobile technology and geographic information systems. At the same time, citizens can also contribute to mitigating impacts, when having appropriate tools, such as instruction on emergency, reflective signposts and/or early warning.

L'Herbe (2014) states that the application of ICT in emergency treatment contributes to the management development at two levels: tactical and administrative. Likewise, it also helps to build and manage intelligence information in two areas: policy and incident management. This process ensures the government and business continuity (which is related to structural recovery and physical and mental well-being of communities). Technologies enable integration and interoperability (common language).

Another important aspect of the use of ICTs, after the social impact of a catastrophe, is its major use in the local and international aid organization (Fidler, 2007) as well as its wide communication range. Thus, they reduce the harmful consequences of such situations, such as the lack of basic supplies, and socially support the uncertainty and anxiety due to misinformation, connecting quickly family and friends.

Consistent with these statements, there are some people who argue that ICTs are tools for greater human development, understood as a process of expanding the possibilities for people and increasing their ability to perform their desirable lifestyles according to their values (PNUD Chile, 2006). So, ICTs are an element of a complex of personal, social and institutional relationships, interwoven with politics, economics, science, education and culture. This is the reason why technologies are not neutral about their sociopolitical development. Therefore, they must be analyzed not only from the perspective of its practical usefulness in specific situations, but also their social effects and their ability to be available for society (PNUD Chile, 2006).

**Table 8: Used Technologies in Disaster Situations**

<b>CENTRAL AMERICA</b>	<b>Used Technologies</b>
<b>Guatemala</b>	<ul style="list-style-type: none"> <li>- Early Warning System (EWS), which works by collecting information through satellite monitoring.</li> <li>- Information Management in Emergency or Disaster System (SISMICDE), which establishes itself as a database that records, stores and processes all the information about disasters.</li> <li>- Emergency reports number: # 1566.</li> </ul>
<b>Mexico</b>	<ul style="list-style-type: none"> <li>- Satellite technology to monitor volcanoes, seismic, hydrographic and hydrometeorological activity.</li> <li>- QuakeAlarm, strategically placed in public buildings, thereby generating early warnings.</li> <li>- 4G LTE Network: By constitutional mandate, a shared network 4G LTE will be built in the 700 MHz band, in order to increase public broadband access across the country. It is anticipated that this network is also a priority, shared and used to emergency and safety communications.</li> </ul>
<b>Panama</b>	<ul style="list-style-type: none"> <li>- Satellite Technology and topographic radar, monitoring and visualizing volcanic, and seismic activity, hurricanes, storms and fires. The data enable the development of a website (<a href="http://www.servir.net">www.servir.net</a>), in which citizens can find interactive maps and 3D anaglyphs. The Humid Tropics Water Center of Latin America and the Caribbean (CATHALAC) has created a regional visualization and monitoring system for Mesoamerica using satellite and geolocation technology, which has enabled the development of climate models that are also available at <a href="http://www.servir.net">www.servir.net</a></li> <li>- Hotline * 335</li> <li>- 4G LTE Network: operating since 2011. Commercial network, as well as use for public safety (there are 10 MHz exclusive for public services).</li> </ul>
<b>SOUTH AMERICA</b>	<b>Used Technologies</b>
<b>Argentina</b>	<ul style="list-style-type: none"> <li>- Satellite Technology: satellite information is used for emergency management (monitoring and tracking each case through telecommunication networks, Earth observation, weather monitoring and global positioning).</li> <li>- 4G LTE Network: tender announced during the current year.</li> </ul>
<b>Brazil</b>	<ul style="list-style-type: none"> <li>- Satellite Technology: orbital control is carried out on wildfires, enabling the calculations on forecast risk. This satellite monitoring is done by the National Institute for Space Research (INPE).</li> <li>- Radars, Telematic Networks and Satellite Technology: allow to generate releases on precipitation and its consequences. Monitoring also enables mapping. The Flood Warning System of São Paulo (SAISP) is operated by Hydraulic Technology Center (HTC),</li> <li>- 4G LTE Network: operating since 2011. Commercial network, as well as use for public safety. It is worth noting that the Brazilian Army became the first organization in Latin America to use LTE / 4G for public safety.</li> </ul>
<b>Chile</b>	<ul style="list-style-type: none"> <li>- P25: standard rule that encourages the development of interoperable digital communication products based on user type. It is a communication system that reduces response times by connecting with other emergency agencies (Firefighters, SAMU). It further comprises a satellite operation, allowing communication not to fail at any given crisis. P25 seeks to connect the country into a single radio network to optimize field work.</li> </ul>

<b>Chile</b>	<ul style="list-style-type: none"> <li>- SAE: Emergency Alert System is a tool promoted by the government, which through georeference, enables to send information via text message to smartphones. This alert is activated in case of tsunami risks, higher intensity earthquakes and volcanic eruptions.</li> <li>- Zello: is an application available for smartphones and computers, that allows to create public channels of simultaneous communication, facilitating connection with any user regardless of where he/she is. It is used by the National Emergency Network (RNE) NGO.</li> <li>- QuakeAlarm: Used by the National Emergency Network (RNE) NGO.</li> <li>- GPS and Geo-referencing programs: applications that allow satellite location of the exact place where an emergency or disaster is happening.</li> <li>- 4G LTE Network: commercially operating since 2014. Its application in public safety is still being studied.</li> </ul>
<b>Colombia</b>	<ul style="list-style-type: none"> <li>- Satellite Technology: deliverers seismic data.</li> <li>- EARLYBIRD EARTHWORM: processing and acquisition systems of primary earthquakes' signals, which have helped to develop early warning protocols.</li> <li>- 4G LTE Network: commercially operating since 2012. Its application in public safety is still being studied.</li> </ul>
<b>Ecuador</b>	<ul style="list-style-type: none"> <li>- Website "National Information System": it provides informations on "adverse events" (whether they are related to disasters or traffic information). It also records the daily monitoring of weather events. It also offers the ability to download satellite maps and routes.</li> <li>- Oceanographic monitoring system, through the use of oceanographic buoys that measure ocean-atmospheric conditions (operated by the Oceanographic Institute of the Navy, INOCAR).</li> <li>- Satellite production of: aerial photographs, thematic cartography, and atlas by the Military Geographic Institute of Ecuador.</li> <li>- Space technologies, operated by the Space Institute of Ecuador (satellite navigation systems, space and earth observation).</li> <li>- Developing software (by International Latil Media and MASA), aiming to produce interaction among various agents (military, fire departments, ministries) when facing the same scenario, in order to make decisions and immediate impact measure of a natural or anthropogenic disaster.</li> <li>- 4G LTE Network: operating since 2013. For commercial and public safety use.</li> </ul>
<b>Peru</b>	<ul style="list-style-type: none"> <li>- Globalstar Satellite System: it allows satellite voice communication and data transmission in emergency situations.</li> <li>- Free voice courier # 119: previous recording to a cell phone, this system allows to store voice messages in an emergency situation.</li> <li>- 4G LTE Network: commercially operating since January 2013 in five districts of Lima. Its application in public safety is still being studied.</li> </ul>

\* All acronyms correspond to their Spanish or Portuguese names.

Source: prepared by research team, 2014.

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As it has been appreciated, several Latin American countries had made great efforts to include technologies at different levels of disaster management and emergencies. Thus, it is important to emphasize the approach of the Organization of American States, through its Inter-American Telecommunication Commission (2013): the use of the 700 MHz band for Public Relief and Disaster Protection (PPDR) based on International Mobile Telecommunications (IMT) systems. Therefore, the use of PPDR networks at 700 MHz is trending element in the region (Organización de los Estados Americanos, 2013).



### III. Natural Phenomena as a Security Issue

#### III.3.1 Technologies for disasters throughout Latin America

Probabilistic Risk Assessment Program (CAPRA for its name in Spanish) is a digital open source initiative platform created in 2008, which uses probabilistic techniques to analyze threats and losses created by natural disasters. This software contains risk maps and geographic location systems, allowing the support of risk management, calculations' representation of natural hazards, and the establishment of a community that shares knowledge and best practices. Also, by using this platform, it is possible to fulfill technical assistance processes, that support the development of policies and risk reduction programs.

Through the use of CAPRA, there have been technical assistance processes in Peru, Chile, Colombia and Panama, among others.

Thanks to CAPRA, Peru could complement the information contained in the seismicity map previously prepared. It did so by adding relevant data, such as the assessment of seismic hazard and seismic sources, knowledge that strengthened the institutional processes of risk management and that allowed to upgrade the construction's technical standards and tectonic map of the country.

Related to the above, through CAPRA, Peru could also assess probable losses for high intensity earthquakes in Lima's metropolitan area. This information has strengthened sectoral basis and action frameworks in this context, especially in education and health areas.

The technical assistance process for the implementation of CAPRA in Chile is being carried out since 2011. It basically involves strengthening local disaster management in a clear effort to decentralize strategies. In this regard, there have been developed probabilistic models for earthquake and tsunami risk in the Region of Atacama, in order to give consistency to the regional policies and improve technical capabilities.

In the case of Colombia, the use of this software's technical assistance process has been oriented to the probabilistic analysis of risks, threats and damages due to volcanic activity, especially strengthening disaster management at the municipal level (795 municipalities have been supported). Thanks to the software's implementation, there has been an updating and improving construction standards and the decrease in life losses.

Finally, the application of CAPRA in Panama is mainly framed in the construction of harm reduction models for earthquakes, in order to strengthen the health, education and housing area action frameworks (Probabilistic Risk Assessment Program).

Besides the use of softwares such as CAPRA, in the context of disaster risk management in Latin America, other technologies such as satellite technology, GPS, optical fiber communication and further use of mobile telephony, Internet and social networks are used. For example, Central America has embarked upon a volcanic activity monitoring program through satellite images (the project is called "Central American Network for the use of Satellite Images for Monitoring and Scientific Research of Active Volcanoes and Early Warning of Volcanic Eruption"), leading to the subsequent creation of a regional network, which began monitoring 24 volcanoes, with support from the NOAA satellites (Fernández & Chavarria, 2012).

The use of technology for disaster management has also taken hold in Brazil. During 2011, the government of President Rousseff announced the creation of a "supercomputer", that would be able to collect all satellite produced and weather radars data, in order to alert all those areas at risk of flooding and avalanche.

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The supercomputer, which according to government estimates would take four years to be built, would not only operate to alert the population, but also as an anticipatory disaster element, so that people are aware of a risk situation 6 days in advance (Clarín, 2011).

Moreover, through the National Coordinator for Disaster Reduction (CONRED for its name in Spanish), Guatemala has two technological innovations that can generate bonds with citizens. The first one is the CONRED Radio, which seeks to give solutions to specific problems in case of emergencies, educating the public on disaster risk management and, above all, build and shape a resilient community through the delivery of accurate timely information by continuous transmission. CONRED coverage also extends to cyberspace, through the channel "CONRED GT" on YouTube platform, where it disseminates daily information about the disaster risk management.

Likewise, through the National System of Civil Protection (NSCP), Panama has an application available for smartphones, through which it is possible to keep the public informed regarding events and natural disasters. Its download is free.

Generally speaking, it is possible to say that the websites and social networks are the most suitable tool for the dissemination of information to the population as a whole. Thanks to its massive and friendly use, they allow the opening of the data channels from the information provided by citizens to authorities and agencies or NGO's in charge of its management, during emergency and disaster. Thus, optimizing responsiveness. The dissemination of information through these channels helps reduce anxiety and fear among citizens in crisis situations.

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### III.3.2 Challenges

Latin America is an area of intense natural phenomena, that lead to disasters. Furthermore, it appears that these will be more frequent and severe in the future, due to climate change (especially hydro and weather meteorological phenomena). This poses challenges for both the institutions and the regional population. These challenges relate on how to tackle the three stages of the phenomenon: prevention, emergency and reconstruction.

These challenges are:

#### Institutions

- Consider disaster management as a technical and non-political activity.
- Promote coordination among government agencies and emergency and disasters' NGOs.

#### Information Management and Technology

- The addition of new technologies in disaster management should be attached to the training for all those involved in the process, ie, both professional and citizen.
- Strengthen and be consistent with the information and data that international disaster management platforms, such as CAPRA, need.
- The use of technology should be guided towards building intelligence for decision making.
- Make progress on a Bottom-Up disaster management model.
- The use of technologies in emergencies should be developed simply and with massive reach. Since disasters are local in nature, technology should be focused on people.

#### Applicability

- Develop public education plans to enable all people to be prepared for an emergency situation and generate a culture of self-care.
- Promote the existence of a single emergency number, in order to put an end to wait times in call centers of the various institutions involved in emergencies.
- When planning disaster management, consider the most appropriate way –from the citizen's perspective- to declare the end process of recovery and reconstruction, supporting processes in mental health. This helps to empower resilience and have prepared citizens.
- Consider recovery as an element of the impact, ie, make progress in the implementation of policies, which although they do not prevent- lessen the impact.

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### III.3.4 Conclusions

- Understanding natural disasters as a security issue allows governments to expand its response spectrum, using mechanisms such as the state of emergency. Thus, providing greater security to the country.
- Technological innovations are a frequently used tool in DRM and Emergency Management, ceasing to be a complementary support, but rather becoming a valued asset in the various countries of the region, both in the area of prevention and the flow of communication.
- Natural disasters are not confined to drawn boundaries, therefore, it is very important to enhance information transparency and accessibility for open international digital platforms.

The next stages of this study will deepen on natural disasters and technology, and will address innovation in public policies on emergency risk management, focusing primarily on the experiences of Mexico, Panama, Colombia, Ecuador, Brazil, Argentina, Peru and Chile.

There will also be included documents that will complement and extend the look of the study, produced by key actors in security and disaster for example. Namely: Lorena Donoso (Advisor of the Chilean Institute of Law and Technology); Sálvano Briceño (Former Director of the Secretariat of the International Strategy for Disaster Reduction UN/ISDR); Michel de L'Herbe (Consultant in Emergency Management & Business Continuity); Diana Ariztizabal (Coordinator of the Gender and Disaster Network for Latin America and the Caribbean), among others.

The final report of this study seeks to be a contribution to the progress and advancement in the area of citizen security in Latin America, as well as a source of reliable and updated support for agencies and institutions responsible for guaranteeing security to the population.

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# V. Appendage

Table 9: Characterization of Latin American Police

CENTRAL AMERICA (selected countries)					
Country	Organisms	Mission	Operation	Dependency	Nature
Guatemala	<b>National Civil Police</b>	Armed Force responsible for safeguarding public order and ensure safety.	Public safety, public order, prevention and control of crime, and other national issues.	Government Ministry	Civil
	<b>Civil Protection Guard</b>	Supports the PNC in high-tort risk areas.			
Mexico	<b>Federal Police</b>	Preserves order, freedoms and public peace by preventing crime.	Public safety, public order, prevention and control of crime.	Ministry of Public Security	Military
	<b>Federal Ministerial Police</b>	Research (intelligence) of federal crimes.			
	<b>Municipal Police</b>	Civil armed institution, ensures exercise of capabilities and the dispatch of law entrusted issues		Office of the Attorney-General	Civil
Panama	<b>National Police of Panama</b>	Responsible for maintaining and ensuring public order, through prevention and fight against crime.	Public safety, public order, prevention and control of crime, and other national issues.	National Government	Civil
SOUTH AMERICA (selected countries)					
Argentina	<b>Federal Police of Argentina</b>	Armed civil institution with the monopoly of police power to ensure domestic order, grant judicial support through research work (intelligence) and combat crime.	Public safety, public order, prevention and control of crime.	Ministry of Security	Civil
Brazil	<b>Federal Police</b>	Prevention and judicial support on federal crimes.	Public safety, public order, prevention and control of crime.	Ministry of Justice	Military

<b>Brazil</b>	<b>Federal Highway Police</b>	In charge of the road control.		Ministry of Justice	
	<b>Federal Railways Police</b>	In charge of the railway control.		Ministry of Justice	
	<b>State Military Police</b>	Ensures safety and public order.		Governorates	
	<b>State Civil Police</b>	Crime Investigation (intelligence) and assistance to the judiciary.		Governorates	
<b>Chile</b>	<b>Chilean Police</b>	Ensures public order and domestic security.		Ministry of Interior	Military
	<b>Investigative Police of Chile</b>	Crime investigation, immigration control, monitor permanence of foreigners in the country, and cooperate with international law enforcement agencies		Ministry of Interior	Civil
<b>Colombia</b>	<b>National Police of Colombia</b>	Domestic public order, protects life, honor, beliefs, rights and freedoms of all people.	Public safety, public order, prevention and control of crime, and other national issues.	Ministry of National Defense	Civil
<b>Ecuador</b>	<b>National Civil Police</b>	State civil institution, armed, technical, hierarchical, disciplined, professional and highly skilled.	Pubic safety, public order, protection of the free rights exercise and safety of persons within the national territory	Ministry of Interior	Civil
<b>Peru</b>	<b>National Police of Peru</b>	Ensures and maintains domestic order, protects the community, protects compliance with laws, investigates criminal offenses, border controls.	Public safety, public order, prevention and control of crime, and other national issues.	Ministry of Interior	Military

Sources: INTERPOL & FLACSO Chile, 2007.

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