

HOLISTIC METHOD FOR ELABORATING RISK MAPS IN RURAL ZONES

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*Risk maps are needed
for locating exactly the most dangerous places,
but also for locating the safest places,
where help centers can be located.*

INTRODUCTION

Many areas of the world are located at high risk of disasters zones. As a matter of fact, more than half of the populated zones of the world are under risk, either by earthquakes, volcanic eruptions, hurricanes, earth slides, flooding, tsunamis, fires, epidemics, etc. But this is not the main problem; after all, life is always at risk. The main problem is that, frequently, the persons are not aware of the risk, and they are not prepared for facing emergencies, for preventing and/or mitigating the effects of disasters originated by extra-ordinary phenomena, natural or anthropogenic.

To face the recurrent and growing disasters, the civil authorities have created different official instances for the civil protection of the citizens, but these instances need high risk maps, in order to locate the places where disasters have happened before, or could happen in the future, with the purpose of preventing or mitigating them in a better way.

In many great cities of the world, some very sophisticated, modern and high cost methods have been used to elaborate risk maps, which include satellite images, historic written chronologies, and interviews with some people of those cities. But this methodology is too costly and sophisticated for being applied in rural zones, where bibliographic resources are scarce.

For rural zones, where disasters have happened recently, with excessive frequency, like in Chiapas, Mexico, it is needed to develop a methodology *ad hoc* for elaborating risk maps at a minimum cost. To do so, in 2007, a research project named “Generation of geo-referenced information from the Chiapas mountains region” was executed, with the financial support from SEDESOL (Social Development Secretary)

METHODOLOGY

With the purpose of developing a methodology *ad hoc* for elaborating risk maps, feasible with local resources and at a minimum cost, several trips were made in order to know the local problematic and the available local resources potential. It was detected that there were not written bibliography, but oral memories from the more ancient inhabitants. The alphabetization level is very low, which means that very few people knows how to read, write and design maps. But it was found that with the help of moral

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leaders, such as the priest of the local church, it is feasible to work with the most capable local persons in order to get acceptable, trustful and sure results. With these elements we worked to develop the methodology showed in this paper.

The most relevant aspects of this methodology for elaborating risk maps in the rural zones are explained as follows:

- 1- Since there is not much historic written information about what has happened in the zone, then we need to take advantage of the oral information from the ancient inhabitants of the zone, by means of structured or informal interviews, in order to know what kind and magnitude of disasters have happened, and actions that they think could be useful for preventing and mitigating them in the future. This information is very useful, because it reflects the experience of the persons more interested in getting a risk map well done, with the best recommendations for minimizing the effects of the extra-ordinary phenomena that are the origin of future disasters.
- 2- Since usually there are not maps of the physical location of dwellings or public services in the rural zones, or the places that have been affected in the past by the extra-ordinary phenomena (such as earth slides, flooding, etc.) it is necessary to elaborate maps, by hand, as the first step, of this communities, showing the most dangerous places that have been affected in the past, and showing, also, the safest places, where a help center, such as a clinic or a food storage, could be installed. This risk maps must be elaborated with symbols easily understood for the members of the community, in such a way that everybody understand the information written in those maps. ,
- 3- The exact location of a rural community may be found by means of a GPS (General Positioning System) which works by means of satellite signals, and may give the exact coordinates of the place, altitude, latitude and longitude. This GPS is not expensive (about 300 USD) and can be utilized by any person previously trained.
- 4- Since it is very expensive to hire specialists who must come from outside, it is more convenient to train local people, which have some advantages and some handicaps. The advantages are that local people know better the zone, the local problematic, and the more ancient persons that may give the historic information by means of interviews. Besides, they are the people more interested in making a good risk plan, since it is vital for them and their families. Some limitations are that their level of alphabetization and their capabilities for making plans are limited, so they should be trained and supervised.
- 5- In order to solve these limitations it is necessary to have the support of some moral authorities in the community, such as the teacher, the priest, and/or the political authorities, who can aid to find the most suitable persons that may be trained to make the interviews and the risk maps.

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- 6- The training of local persons should be made by specialist, who at the beginning, could come from outside. This trainers should start their courses remarking the importance of the work that has to be done, then they should continue to give information about how to use the GPS, and finally, they should train the trainees for making interviews and for elaborating the risk maps,
- 7- Finally, all the information generated by the local trainees, should be supervised and edited by the specialist, in order that the risk maps arrive to be trustful, clear and usable for the local authorities and the members of the community.

The holistic method for developing risk maps in rural zones consist of seven steps, as follows.

- 1- The expert, responsible of the task or developing the risk maps, meets the moral and official leaders of the community in order to get their help for doing the pre-diagnostic of the risk problematic in the zone, and for detecting the local partners who may work in the zone.
- 2- The expert trains the local partners for interviewing the more ancient inhabitants in the region, for drawing maps locating dwellings an important sites in the region, and for manipulating the GPS (Global Positioning System)
- 3- Local trained partners interview the more ancient inhabitants of the community, in order to get information about the risk of disasters in the region.
- 4- Local trained partners draw the map of the community showing the dwellings, public services and the most sure and unsure places, exactly located by means of the GPS
- 5- Supervisar el trabajo de campo y editar el mapa de riesgo.
- 6- The expert supervises the interviews and maps made by the local partners and edits the risk map.
- 7- The expert shows the edited risk map to the main partners in the community in order to check that everything is correct, and for correcting in the case it is not.
- 8- The expert delivers the finally corrected and approved risk map to the local protection civil authorities, to the leaders of the community, and to the partners that participate in the collection of data and drawing of the risk map, in order that they use it in their plans and programs for disasters prevention and mitigation.

This methodology has been developed for the physical and cultural characteristics of the mountain zone of Chiapas, Mexico in 2007, and should be re-adapted and re-appropriated to other regions in case that it is needed for other regions and cultural characteristics.

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In the annexes it is showed the format to execute the interviews, and an example of a risk map developed with this methodology in a small community of Chiapas Mexico.

It is convenient to re-make this risk plans each three years or so, since the governmental period of the municipal presidents is exactly this amount of years. The circumstances and the persons change constantly, so the risk maps should actualize constantly, and especially, they should serve as the basis to prepare the contingency plans in order to prevent and mitigate future disasters.

CONCLUSION

In order to get risk maps in rural zones truthful, and at a low cost, it was developed in 2007 a holistic-participative method that allows us to get them in rural zones of Chiapas, Mexico.

By means of this holistic-participative method, it can be obtained several advantages:

- 1- The risk maps developed with this method are more trustworthy since the information is obtained by local partners who know and understand very well the local problematic and they are very interested in making a good work, since their own life is in peril.
- 2- The exact location of the most dangerous and surer places in the region is obtained by means of a GPS (General Positioning system), the most exact available technology for locating a place in the earth surface.
- 3- The risk maps developed with this method are easily understood by the members of the community and by the civil protection authorities, since they are processed by specialist with the help of local partners.
- 4- Training local partners is very useful because they are always available for the community, and they will help local authorities to prepare and to implement community contingency plans to prevent and mitigate the impact of extraordinary phenomena that are at the origin of disasters.
- 5- The cost of developing these risk maps is relatively lower than with other urban areas methods since it is not necessary to pay many specialists with room and board and transport, but only to pay local partners at a reduced rate. ,

With this holistic method, the best of possible worlds is obtained in disasters prevention and mitigation matters. The experience of local partners is taken into account and the knowledge of the specialists is profited to develop the risk maps, at a minimum cost.

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THANKFULNESS

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Annex A Format used for interviewing the oldest citizens in the community.

LEVANTAMIENTO ESTADÍSTICO – RIESGOS CHIAPAS

Realizado por _____ Fecha (Día/mes/año)

1. Nombre de persona entrevistada _____
2. Ocupación: maestr@ (), párroco o pastor (), representante político (), jefe o jefa de hogar (), otro (): _____
3. Forma de localizarlo: teléfono _____, otro _____

SECCION UNO: DATOS GENERALES

- 1.1 Comunidad: _____ 1.2 Municipio: _____
- 1.3 Número total de viviendas en la comunidad _____
- 1.4 Número de habitantes en la comunidad, TOTAL: _____, Hombres: _____ Mujeres: _____

SECCION DOS: ASPECTOS FISICOS NATURALES

- 2.1 Tipo de terreno: Plano (), Serranía (), Mixto (), Otro: _____
- 2.2 Clima: Cálido Húmedo (), Cálido Seco (), Templado (), Otro: _____
- 2.3 ¿La comunidad esta muy cerca o en el cauce de un rio? Si (), No ()
- 2.4 ¿Existe el riesgo de un deslave cerca o en la comunidad? Si (), No ()
- 2.5 ¿Existe el riesgo de temblor en la comunidad? Si (), No ()

SECCION TRES: ASPECTOS URBANOS

- 3.1 ¿Tienen red de electricidad? Si (), No ()
- 3.2 ¿Tienen red de agua entubada? Si () No ()
- 3.3 ¿Tienen red de recolección de drenaje? Si (), No ()
- 3.4 ¿Tienen servicio de recolección de basura? Si (), No ()
- 3.5 ¿Tienen servicio de transporte publico? Si (), No ()
- 3.6 ¿Cuentan con comunicaciones? Radio-transmisor (), teléfono (), Otro (): _____

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3.7 ¿Cuentan con centro de salud? Si (), No ()

3.8 ¿Cuentan con escuela de nivel? Kínder (), Primaria (), Secundaria (), Otro:

3.9 ¿Cuentan con un edificio o casa comunal grande? Si (), No ()

3.10 ¿Qué Iglesias o templos existen en su comunidad? Católica (), Protestante (), Otro: _____

SECCION CUATRO: CARACTERÍSTICAS DE LA CASA TIPICA

La casa más común, típica o normal en la comunidad, se construye con los siguientes elementos:

4.1 Paredes: Palos-Bahareque (), Tablas de madera (), Adobe (), Ladrillos-bloques (), Otro: _____

4.2 Techos: Lámina de Cartón (), Lámina galvanizada (), Rama de palmera (), Loza de concreto (), Otro: _____

4.3 Piso: Tierra (), Firme de concreto (), Loseta/Mosaico (), Otro:

4.4 Numero de cuartos en la casa: 1 cuarto (), 2 cuartos (), 3 o mas cuartos ()

4.6 Instalaciones con las que cuenta la casa: Agua entubada (), Drenaje (), Electricidad (), Teléfono (), Otro: _____

4.7 Para cocinar usan: Fogón al piso (), Fogón elevado con chimenea (), Estufa de gas o eléctrica (), Otro: _____

SECCION CINCO: ASPECTOS SOCIALES-CULTURALES-ECONOMICOS

5.1 Lengua(s) que hablan: Español (), Otra(s):

5.2 Nivel de escolaridad promedio en la comunidad: Sin estudios (), Primaria (), Secundaria (), Otro: _____

5.3 Actividades normales de un hombre adulto Agricultura (), Ganadería (), Albañil (), Comerciante (), Otra:

5.4 Actividades normales de mujer adulta Hogar (), Agricultura (), Ganadería (), Artesanía (), Comerciante (), Otra: _____

5.5 Actividades normales de jóvenes: Estudiar (), Ayudar en casa (), Trabajo fuera de casa (), Otra: _____

5.6 Gasto anual de la familia típica: menos de \$10,000 (), de 10,000 a 20,000 (), de 20,000 a 40,000 (), más ()

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SECCION SEIS: RIESGOS DE DESASTRES

RIESGOS DE DESASTRES DETECTADOS EN LA COMUNIDAD

6.1 Huracanes-Tormentas tropicales: 10 años atrás (), 5 años atrás (), 2 años atrás (), éste año ()

6.2 Inundaciones: 10 años atrás (), 5 años atrás (), 2 años atrás (), éste año ()

6.3 Deslizamientos o derrumbes de terrenos: 10 años atrás (), 5 años atrás (), 2 años atrás (), éste año ()

6.4 Sismos/terremotos: 10 años atrás (), 5 años atrás (), 2 años atrás (), éste año ()

6.5 Erupciones volcánicas: 10 años atrás (), 5 años atrás (), 2 años atrás (), éste año ()

6.6 Sequías: 10 años atrás (), 5 años atrás (), 2 años atrás (), éste año ()

6.7 Incendios: 10 años atrás (), 5 años atrás (), 2 años atrás (), éste año ()

6.8 Granizadas/heladas: 10 años atrás (), 5 años atrás (), 2 años atrás (), éste año ()

6.9 Otros

6.10 ¿Cuáles de estos problemas afectan más tu comunidad? _____

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SECCION SIETE

¿QUÉ SE PUEDE HACER PARA REDUCIR EL RIESGO Y PREVENIR LOS DESASTRES? PALOMEE LAS OPCIONES RECOMENDABLES

- 7.1 Ubicar viviendas lejos de ríos o de zonas de derrumbes ()
- 7.2 Mejorar el tipo de construcción de viviendas para soportar huracanes y sismos ()
- 7.3 Realizar obras para evitar el deslizamiento de terrenos ()
- 7.4 Realizar obras para evitar o controlar inundaciones ()
- 7.5 Contar con centro comunitario, en lugar seguro, donde albergar a la comunidad, en caso necesario ()
- 7.6 Contar con sistemas de agua potable y de letrinas de emergencia ()
- 7.7 Contar con reservas de alimentos y agua para sobrevivir por lo menos una semana ()
- 7.8 Contar con servicios de emergencia y de salud locales ()
- 7.9 Capacitar a miembros de la colonia para el manejo correcto de los riesgos de desastres ()
- 7.10 Capacitar a los miembros de la comunidad para mejorar sus ingresos económicos ()
- 7.11 Educar a los miembros de la comunidad para que cuiden la naturaleza y la vida humana()
- 7.12 Otros:
-

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SECCIÓN OCHO: NECESIDADES SENTIDAS POR LA POBLACION

¿Qué crees que tu comunidad necesita con más urgencia? (pueden ser varias necesidades en cada categoría)

8.1 Más urgente:

8.2 Medianamente urgente:

8.3 Menos urgente:

SECCION NUEVE: RADIOCOMUNICACIÓN

9.1 ¿Quién es la persona responsable del equipo de radio-comunicación?

9.2 Fecha aproximada en que se instaló el equipo de radio-comunicación

9.3 ¿De qué comunidades reciben normalmente señal de radio-comunicación?

9.4 ¿Cuántas veces al día usan normalmente la radio-comunicación? _____

9.5 ¿Cuántas veces durante los últimos tres meses se uso el radio para dar aviso de:

Emergencias médicas: _____, Accidentes: _____,

Derrumbes: _____, Inundaciones: _____,

Invitación a reuniones: _____, Venta de productos: _____,

Otro (indicar): _____

¡GRACIAS POR EL APOYO BRINDADO!

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SECCIÓN DIEZ: UBICACIÓN GPS (General Positioning System)

10.1 Entrada principal a la comunidad: Latitud: N _____ Longitud: W _____
Altitud: _____ m

10.2 Escuela preescolar: Latitud: N _____ Longitud: W _____
Altitud: _____ m

10.3 Escuela primaria: Latitud: N _____ Longitud: W _____
Altitud: _____ m

10.4 Escuela secundaria: Latitud: N _____ Longitud: W _____
Altitud: _____ m

10.5 Escuela de capacitación: Latitud: N _____ Longitud: W _____
Altitud: _____ m

10.6 Iglesia Católica: Latitud: N _____ Longitud: W _____
Altitud: _____ m

10.7 Iglesia (otra): Latitud: N _____ Longitud: W _____
Altitud: _____ m

10.8 Cancha deportiva: Latitud: N _____ Longitud: W _____
Altitud: _____ m

10.9 Centro de salud: Latitud: N _____ Longitud: W _____
Altitud: _____ m

10.10 Centro comunitario: Latitud: N _____ Longitud: W _____
Altitud: _____ m

10.11 Lugar seguro y sin cables aéreos para aterrizaje de helicópteros (mínimo: 30X30 metros)

Latitud: N _____ Longitud: W _____
Altitud: _____ m

SECCIÓN ONCE: MAPA DE RIESGOS EN LA COMUNICAD

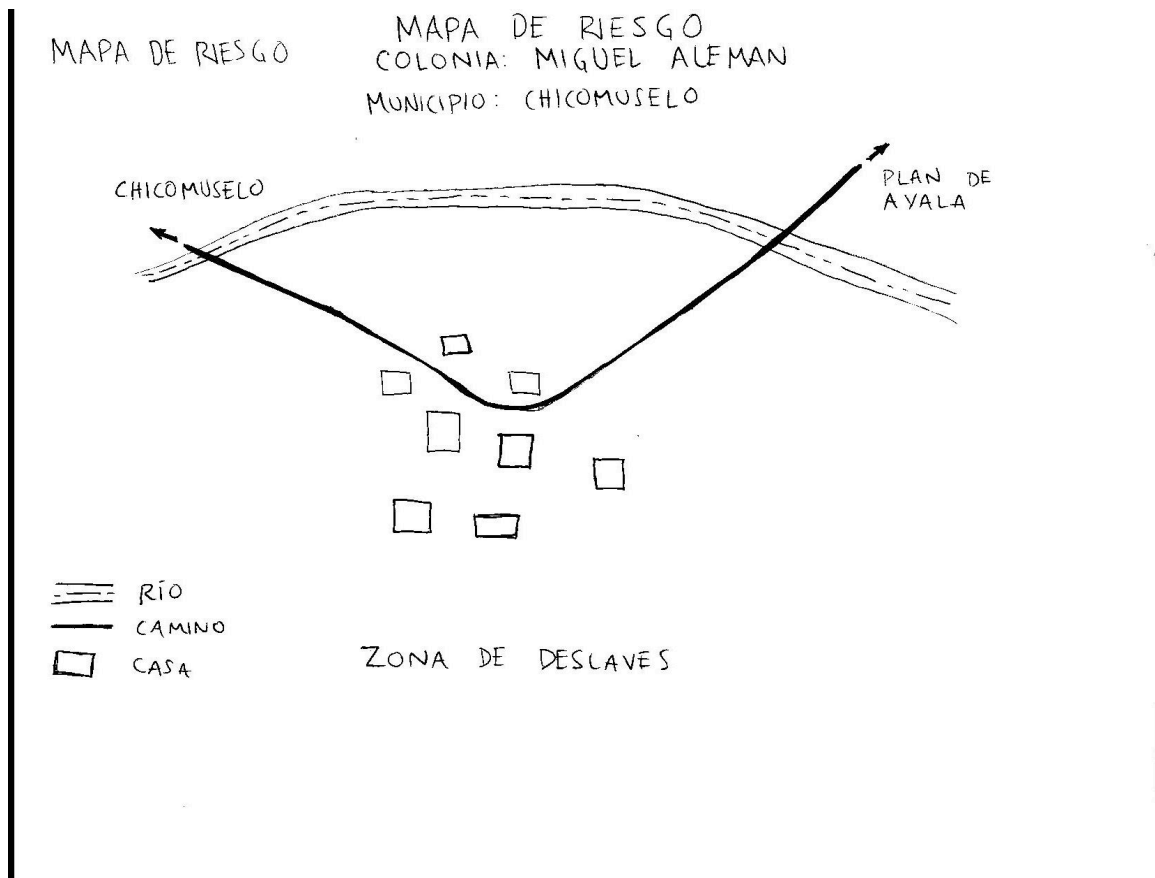
CROQUIS DE LOCALIZACION GEOGRÁFICA y MAPA DE RIESGOS EN LA COMUNIDAD

(Relacionándolo con comunidades y ciudades vecinas y caminos y carreteras)

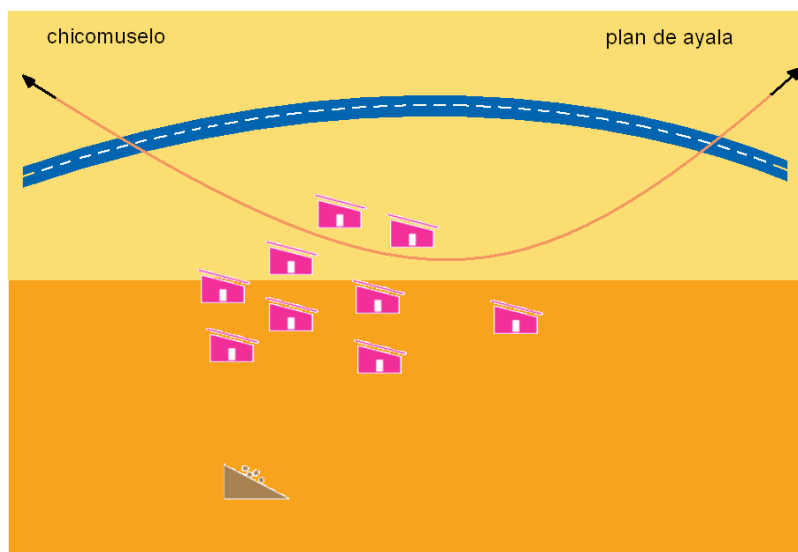
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Annex B. Examples of risk maps developed with the Holistic Method



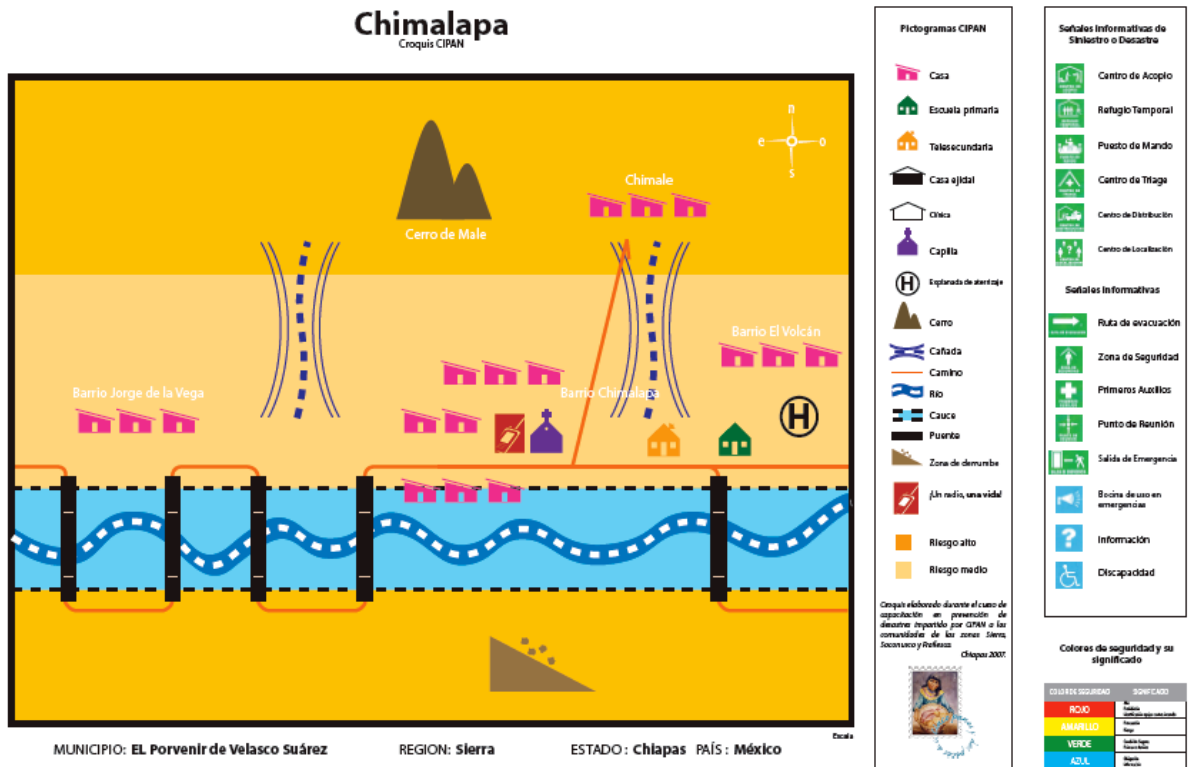
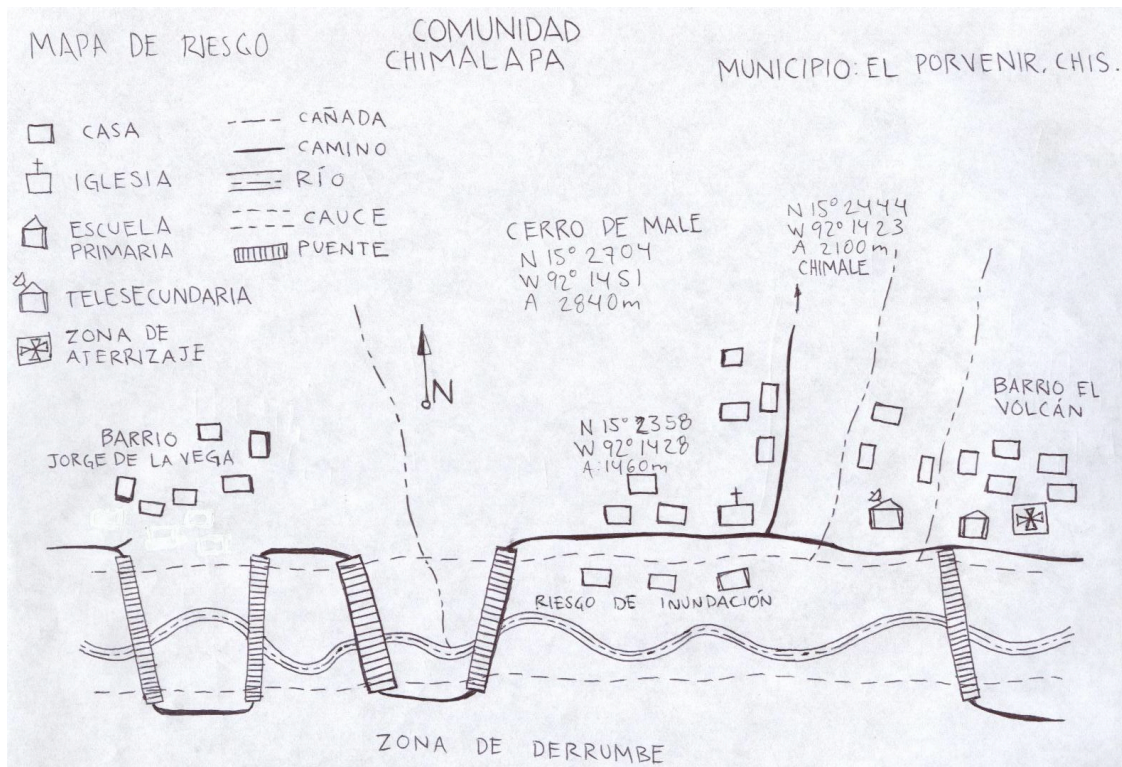
mapa de riesgo
 colonia: miguel aleman
 municipio: chicomuselo
 población: 640



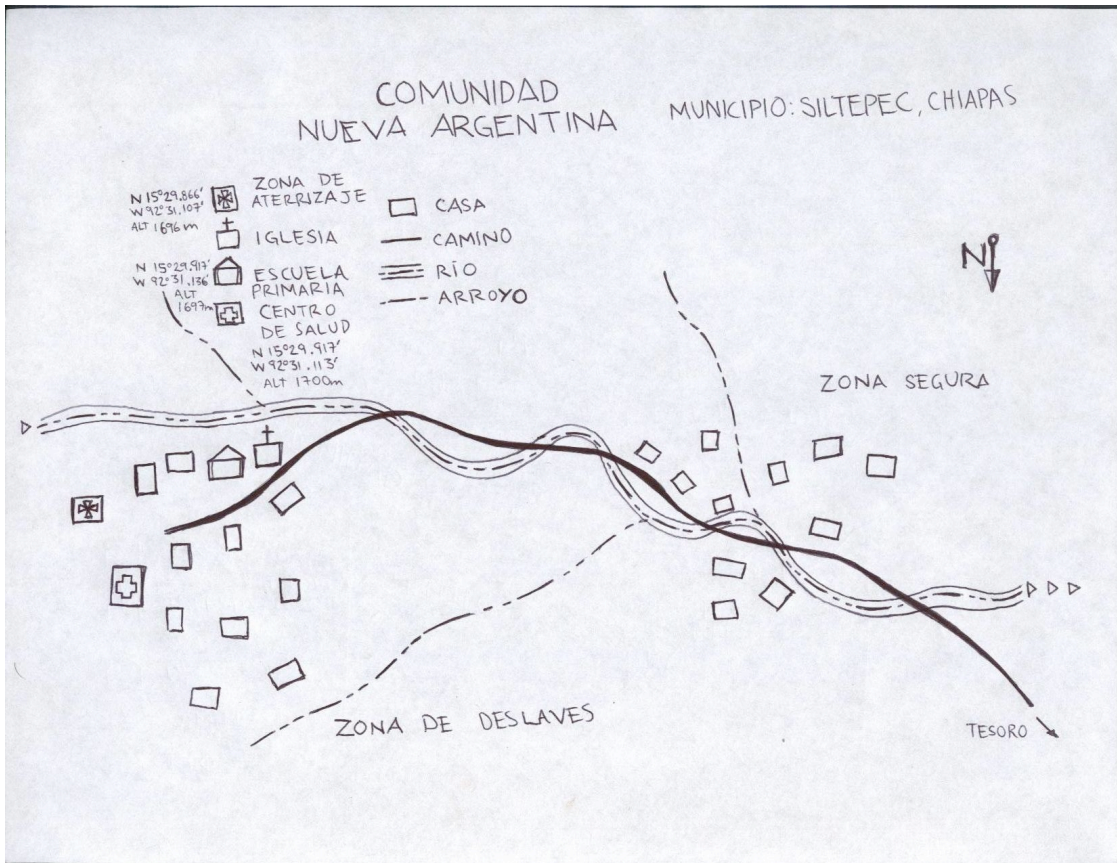
- Pictogramas CIPAN**
- Casa
 - Escuela primaria
 - Telesecundaria
 - Casa ejidal
 - Clínica
 - Capilla
 - Estación de aterrizaje
 - Cerro
 - Cañada
 - Camino
 - Río
 - Cauce
 - Puente
 - Zona de derrumbe
 - ¡In radio, una vida!
 - Riesgo alto
 - Riesgo medio

- Señales informativas de Siniestro o Desastre**
- Centro de Acopio
 - Refugio Temporal
 - Puesto de Mando
 - Centro de Triaje
 - Centro de Distribución
 - Centro de Localización
- Señales informativas**
- Ruta de evacuación
 - Zona de Seguridad
 - Primeros Auxilios
 - Punto de Reunión
 - Salida de Emergencia
 - Bocina de uso en emergencias
 - Información
 - Discapacidad

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mapa de riesgo
comunidad: nueva argentina
municipio: siltepec

población: 400



Pictogramas CIPAN

- Casa
- Escuela primaria
- Telesecundaria
- Casa ejidal
- Clínica
- Capilla
- Explanado de aterrizaje
- Cerro
- Cañada
- Camino
- Río
- Cauce
- Puente
- Zona de derrumbe
- ¡In radio, una vida!

Señales informativas de Siniestro o Desastre

- Centro de Acopio
- Refugio Temporal
- Puesto de Mando
- Centro de Triage
- Centro de Distribución
- Centro de Localización

Señales informativas

- Ruta de evacuación
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