انجمن صنفی
کارفرمایی مهندسی
زمین‌ساز (ژئوسنتتیک) تهران

IRAN CHAPTER

دانشگاه صنعتی امیرکبیر
(پلی تکنیک تهران)

کاربرد ژئوسنتتیک‌ها در کاهش خطرات سوانح طبیعی و مدیریت خطرات محیطی

ضرورت های مدیریت بحران در بلایای طبیعی و راهکارهای کاهش ریسک

دکتر بهروز بهنام

عضو هیئت علمی دانشگاه صنعتی امیرکبیر

فهرست مطالب

کلیات:

- تعاریف پایه: ریسک، خطر، بحران، عدم قطعیت و آسیب پذیری
- استراتژی های پیش از وقوع زلزله: آمادگی، پیشگیری و روشهای افزایش تاب آوری شهری

مطالعه موردی: شهر تهران

- بررسی ریسک خطرات چندگانه: زمین لغزش،آتش سوزی پس از زلزله، نشت مواد خطرناک و ...

Definitions & Terminologies

What is RISK?
What is HAZARD?
What is UNCERTAINTY?
What is DISASTER?
What is VULNERABILITY?

- Risk is essentially the level of possibility that an action or activity will lead to a loss or to an undesired outcome. The risk may even pay off and not lead to a loss, it may lead to a gain.

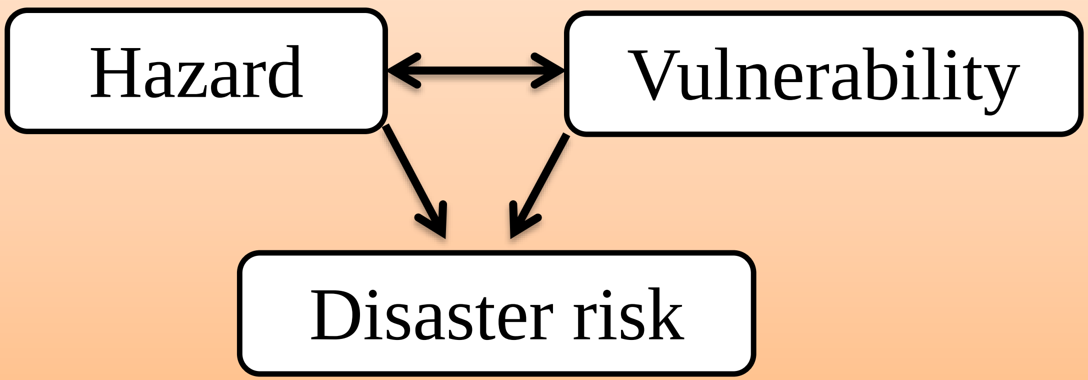
- Hazard is a potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation.

- Uncertainty is unpredictable. It has too many unknown variables which do not even allow one to estimate as to what is going to happen.

- Disaster is a sudden, calamitous event that seriously disrupts the functioning of a community or society and causes human, material, and economic or environmental losses that exceed the community's or society's ability to cope using its own resources. Though often caused by nature, disasters can have human origins.

- Vulnerability is the inability to resist a hazard or to respond when a disaster has occurred. For instance, people who live on plains are more vulnerable to floods than people who live higher up.

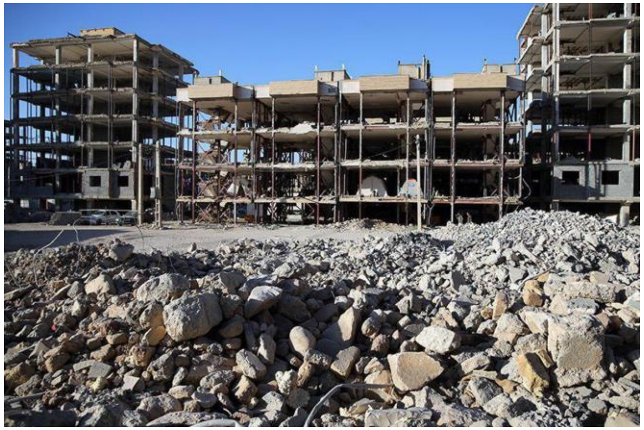
$$Risk = Hazard \times Vulnerability$$



Principal earthquake hazards, expected effects and hazard-reduction techniques

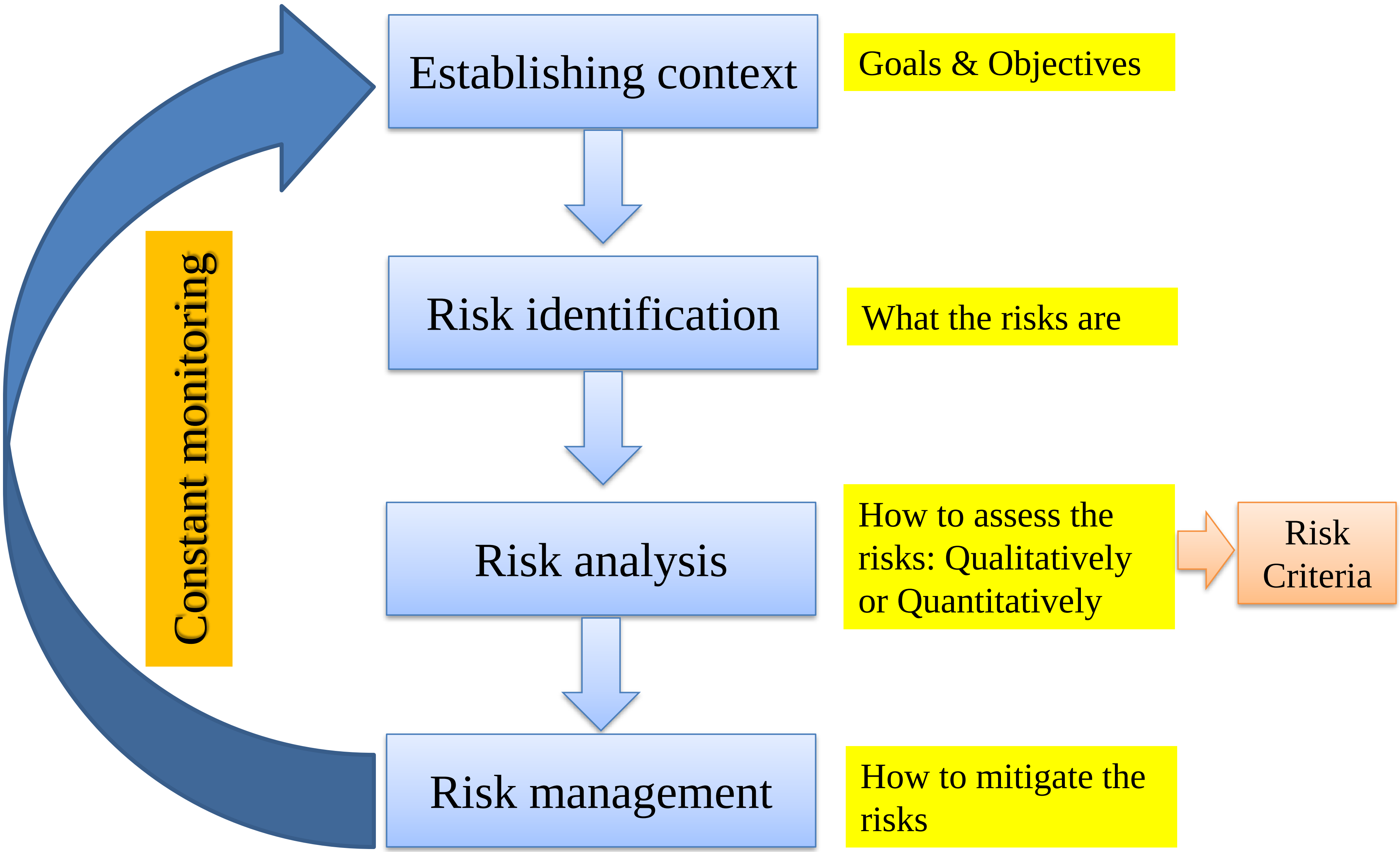
Hazard	Effects	Hazard-Reduction Techniques
Ground Shaking	Damage or collapse of structures	Make structures seismically resistant, secure heavy objects
Surface Fault Rupture	Tilting and ground displacement	Set structures back from fault
Regional Subsidence	Ground tilting; flooding and loss of head in gravity-flow structures	Create buffer zones, build dikes, restrict basements, design tolerance for tilting
Liquefaction	Differential settlement, ground cracking, subsidence, downslope movement of earth material	Treat soil, design structural solutions
Rock Fall	Damage due to impact	Avoid hazard, remove or stabilize rock, protect structures
Landslides	Damage to structures, loss of foundation support	Avoid hazard, remove material, stabilize slopes
Seiches	Inundation, drowning, erosion	Avoid hazard, flood-proof and/or strengthen structures, elevate buildings

All the regulations pointed out in codes and criteria shall be met.



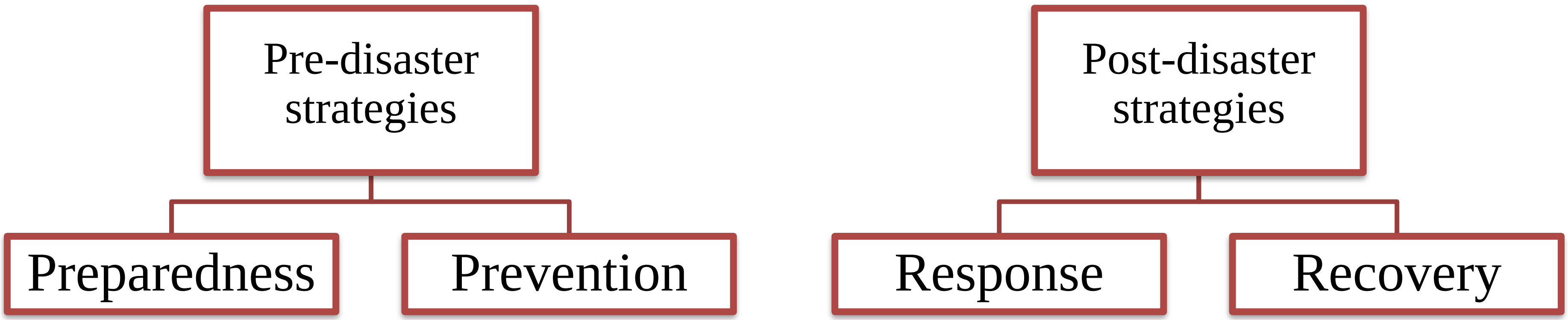
شرکت صنایع نساجی هلال ایران (سهامی عام)
دارنده گواهینامه مدیریت کیفیت ISO 9001 : 2000
چادر امدادی
کنترل کیفیت:
سریال تولید:
مشخصات چادر امدادی تیپ ۲
کف چادر
۱۲ متر مربع (۴×۳)
وزن کل
۴۱ کیلوگرم
جنس کف و پوشش
پلی استر روکش شده با PVC
جنس بدنه
پلی استر - پنبه
جنس پل و پایه
لوله ۲۵ میلیمتر فولاد St12
ارتفاع وسط چادر
۲ متر
ارتفاع کنار چادر
۱/۶ متر

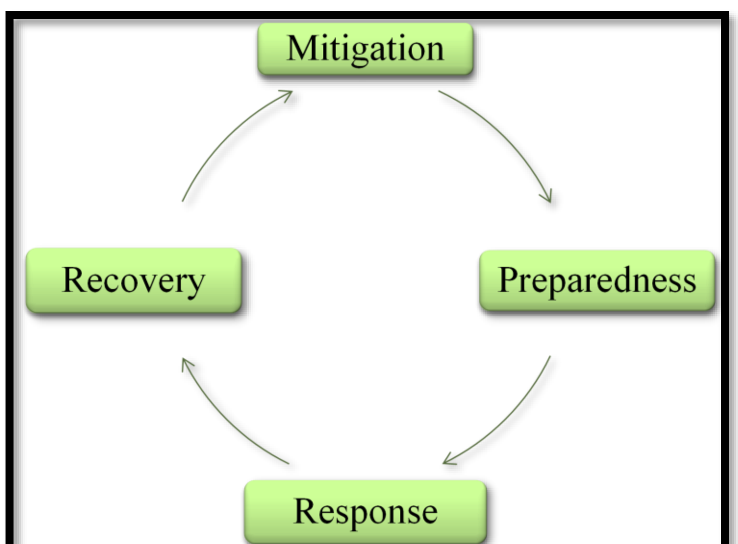
Risk management process



Disaster Risk Management

Involves mitigations to the threats resulted from the risk in order to either avoiding the risk, or reducing the risk or transferring the risk.





Preparedness & Prevention
OBJECTIVES

Note: It is not a comprehensive list and is not in order of priority.

1. Increase earthquake awareness and education.
2. Improve emergency response and recovery.
3. Improve the seismic safety of buildings and infrastructure.
4. Improve essential geoscience information.
5. Assess earthquake risk.

Incorporate earthquake education in school curricula

Output: Multi-level curriculum for earthquake education in all public schools.

Outcome: All students are provided with earthquake science and safety training as a part of their regular education.

Disclose geologic hazards in real-estate transactions

Output: Homebuyers are made aware of geologic hazards at a property prior to making a purchase.

Outcome: Homebuyers are more informed in their decisions.

Implementation

Accurate maps showing geologic hazards are useful to inform sellers, real-estate agents, and local governments of potential hazards, but aren't necessary to implement disclosure if only known hazards or damage from hazards are to be disclosed.

Establish community emergency response teams statewide (CERTs).

Output: Trained volunteer community emergency response teams exist statewide.

Outcome: Reduce life, property, and environmental loss by providing more immediate response in a disaster.

Improve the post-earthquake operational status of essential service buildings.

Output: All essential government services buildings are identified. Buildings constructed previously are retrofitted or relocated as needed, to meet standards that will allow them to remain operational.

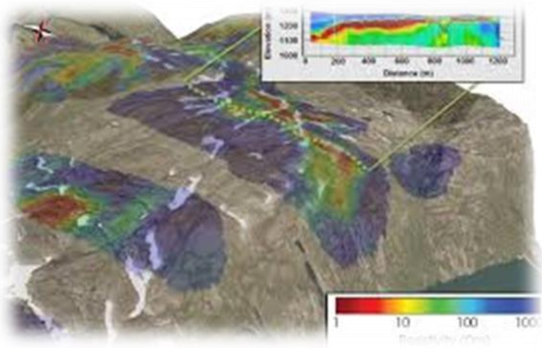
Outcome: The ability to provide uninhibited disaster relief services.

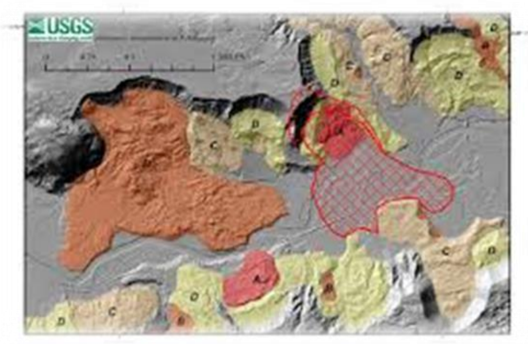
Objective 4: Improve essential geoscience information

Strategy1: Reduce earthquake losses by mapping and identifying geologic hazards.

Output: Hazard maps for all earthquake-prone urban areas.

Outcome: Development and management are safer, more reasoned, and more cost-effective.





Strategy2: Perform geologic-hazards investigations for critical public facilities.

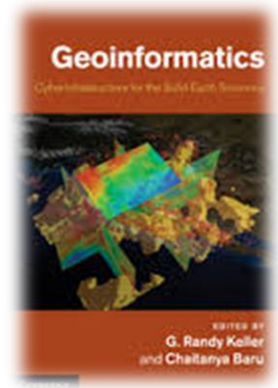
Output: Geologic-hazard investigations are performed for all new critical public facilities.

Outcome: Critical facilities will not be sited in hazardous areas and, in the event of a natural disaster, facilities that are needed for emergency response will remain intact.

Strategy3: Ensure design professionals and building officials are kept current on relevant geoscience information.

Output: Periodic meetings of geoscientists, engineers, and building officials to discuss implications of geoscience information to building safety.

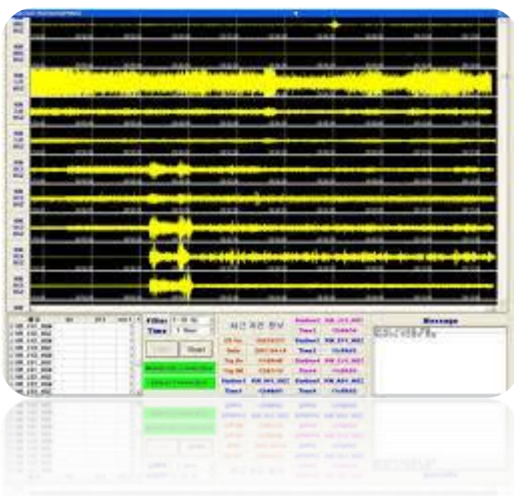
Outcome: Up-to-date, reliable geoscience information is used to guide the safe and economical earthquake-resistant design of new buildings.



Strategy4: Determine appropriate seismic criteria and procedures for evaluating performance of existing dams.

Output: Guidelines for seismic safety assessments of existing dams.

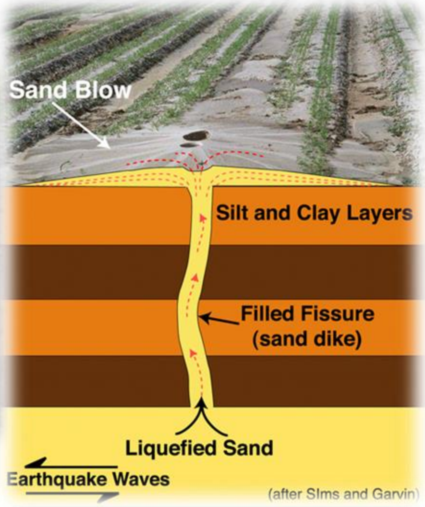
Outcome: Uniform, state-of-the-art assessments of seismic safety of dams.



Strategy5: Reduce earthquake-induced liquefaction risk to highway structures.

Output: Identify all hazardous bridges; generate a plan for mitigation of each structure.

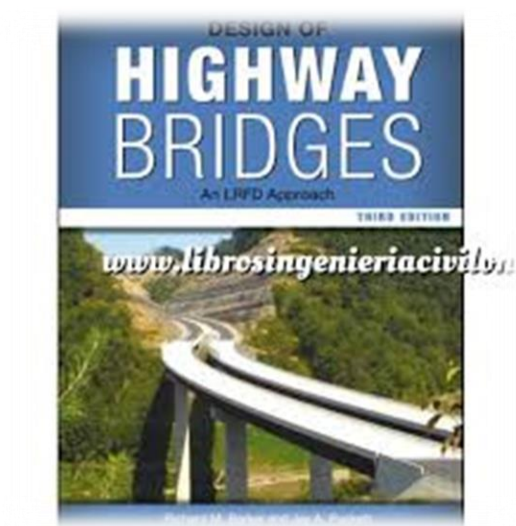
Outcome: Highway bridges are safer in the event of earthquake-induced liquefaction.

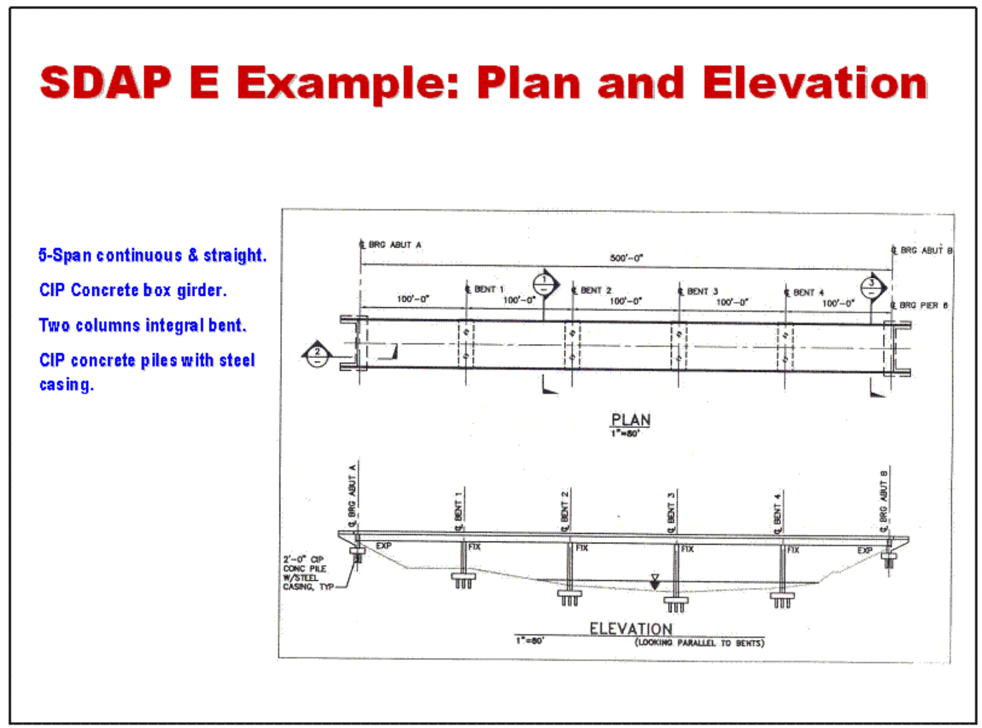


Strategy6: Determine appropriate seismic design coefficients for highway bridges.

Output: Calculate and incorporate new seismic design coefficients in design work.

Outcome: (1) Ensure that the best available information is used for the safe and economical design of the new bridges. (2) Prevent the need for retrofit of the bridges in the near future. (3) Reduce bridge damage in an earthquake.

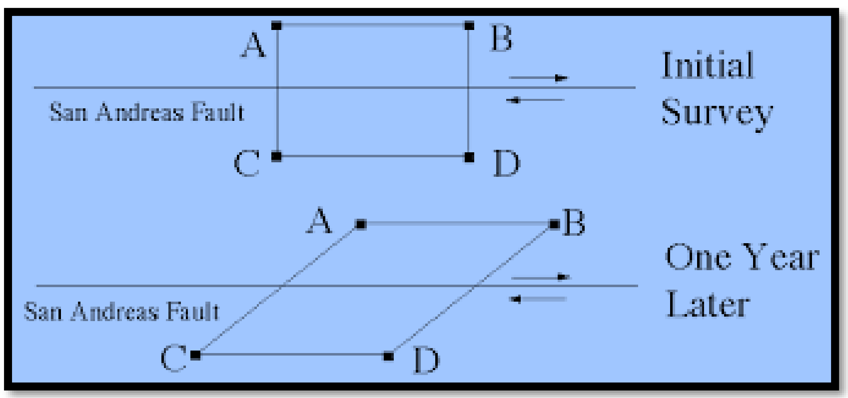


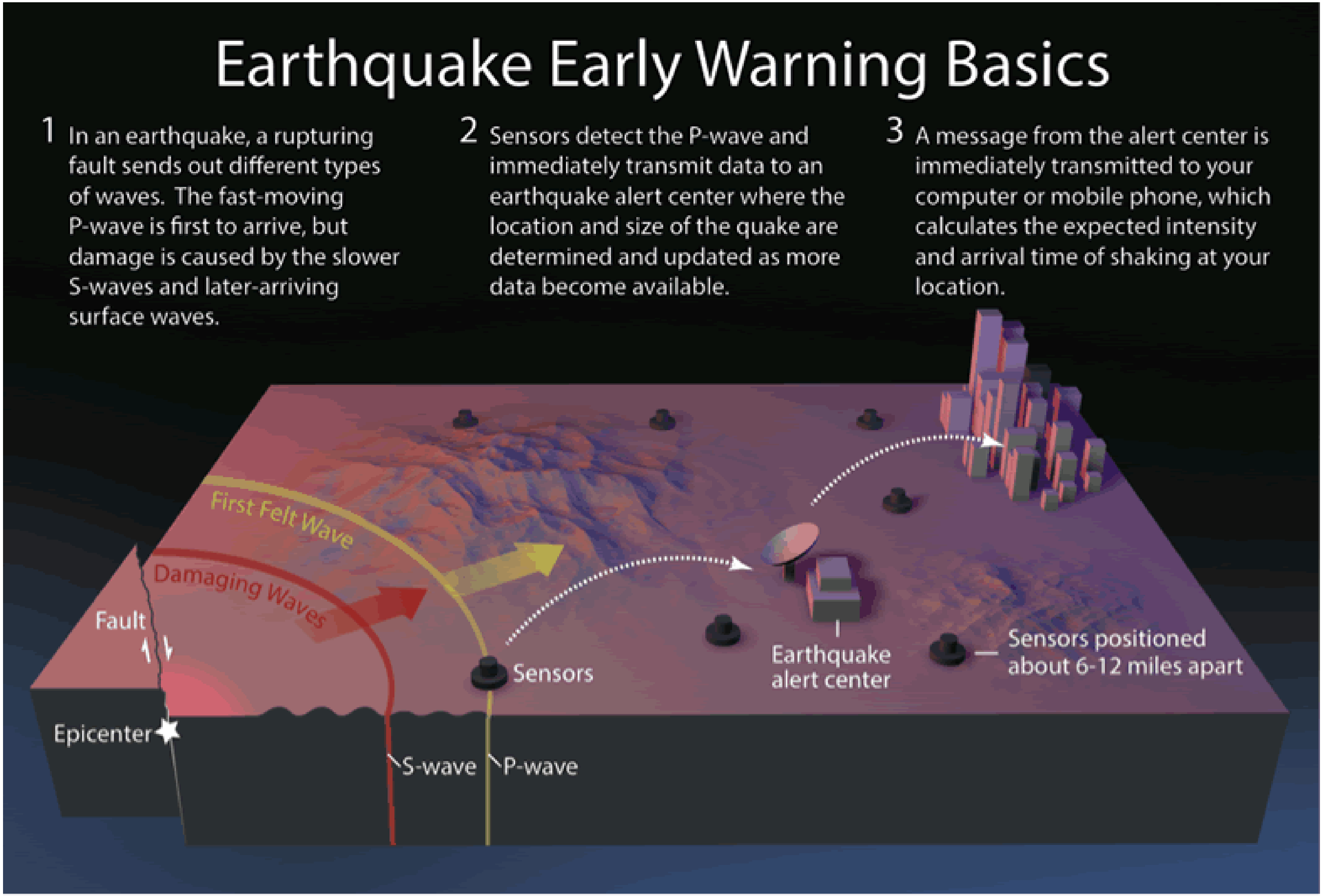


Strategy7: Monitor faults using Global Positioning System (GPS) measurements.

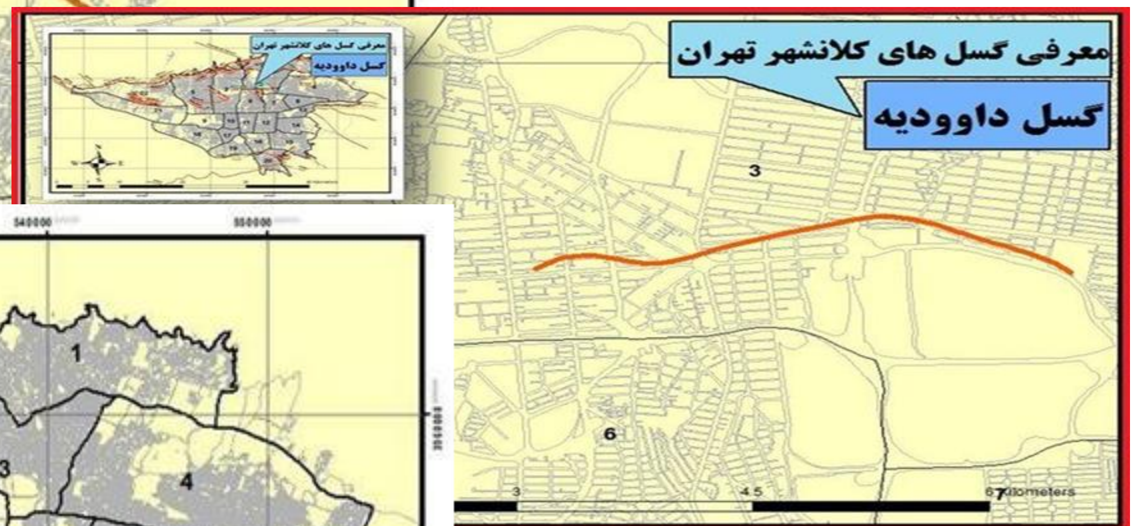
Output: Regular monitoring of a network of GPS benchmarks.

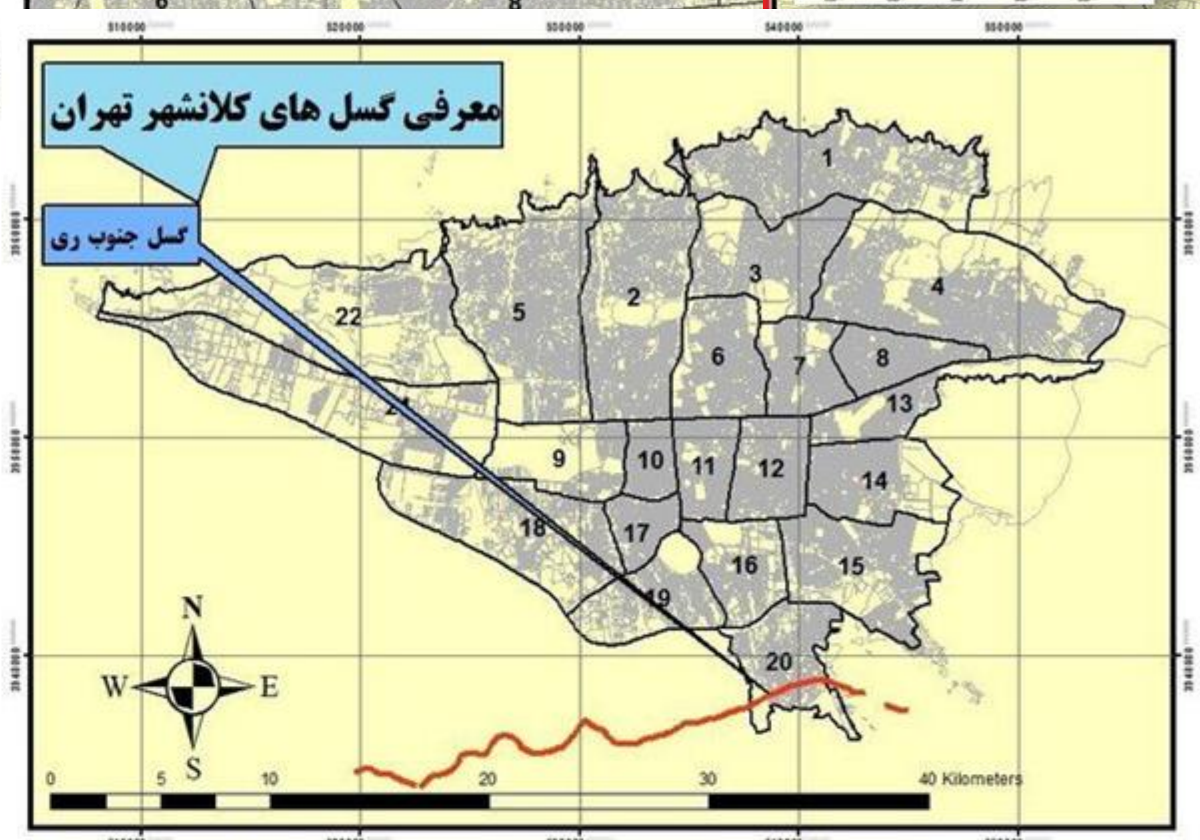
Outcome: Strain build up and ground deformation associated with faults are understood on a very detailed level, allowing more accurate estimation of the likelihood of large earthquakes and accompanying hazards.




Earthquake Early Warning Basics
1 In an earthquake, a rupturing fault sends out different types of waves. The fast-moving P-wave is first to arrive, but damage is caused by the slower S-waves and later-arriving surface waves.
2 Sensors detect the P-wave and immediately transmit data to an earthquake alert center where the location and size of the quake are determined and updated as more data become available.
3 A message from the alert center is immediately transmitted to your computer or mobile phone, which calculates the expected intensity and arrival time of shaking at your location.
First Felt Wave
Damaging Waves
Fault
Epicenter
Sensors
S-wave
P-wave
Earthquake alert center
Sensors positioned about 6-12 miles apart


معرفی گسل های کلانشهر تهران
گسل لویزان
1
2
3
4
6
8


معرفی گسل های کلانشهر تهران
گسل داوودیه
3
6
Kilometers


معرفی گسل های کلانشهر تهران
گسل جنوب ری
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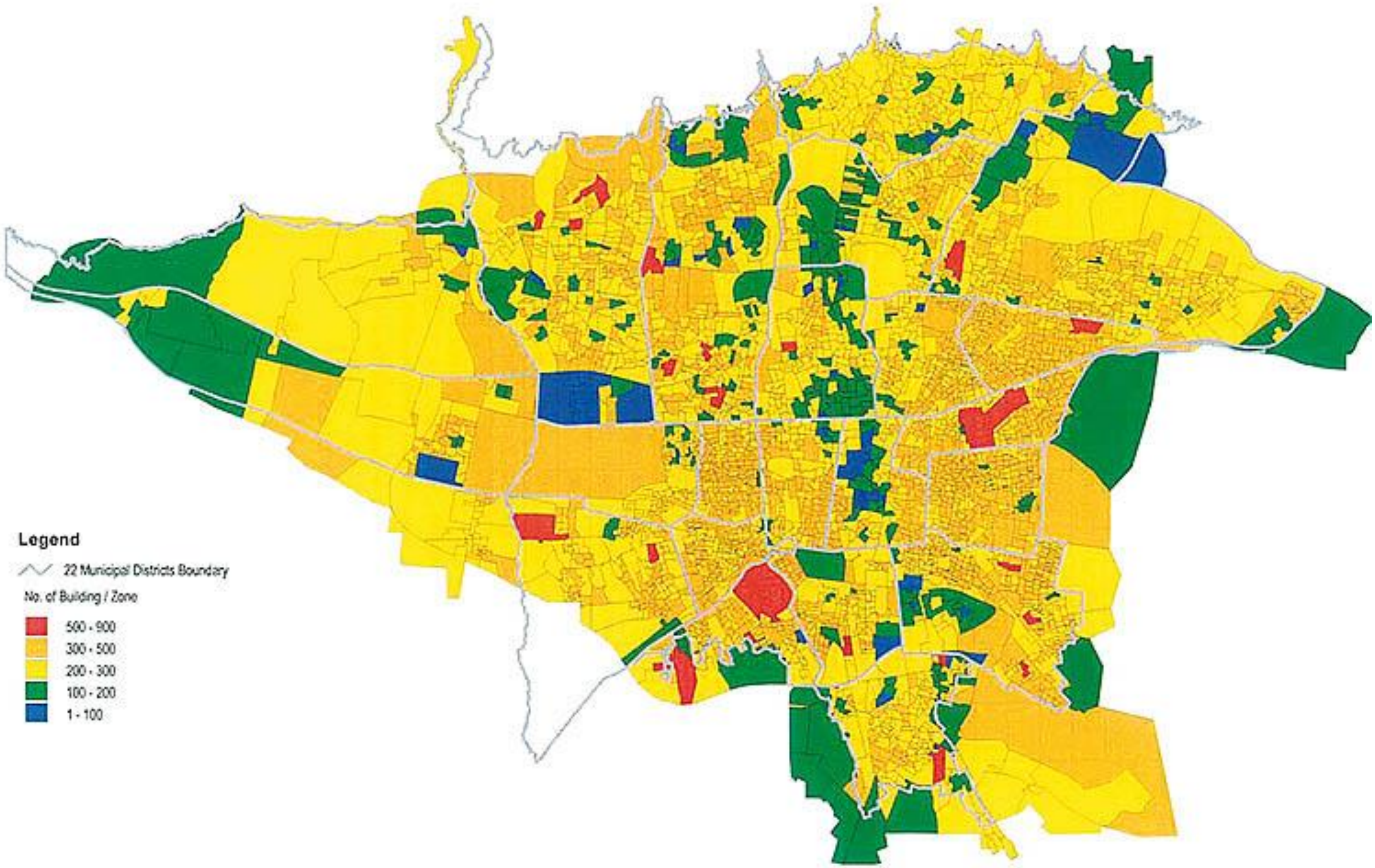
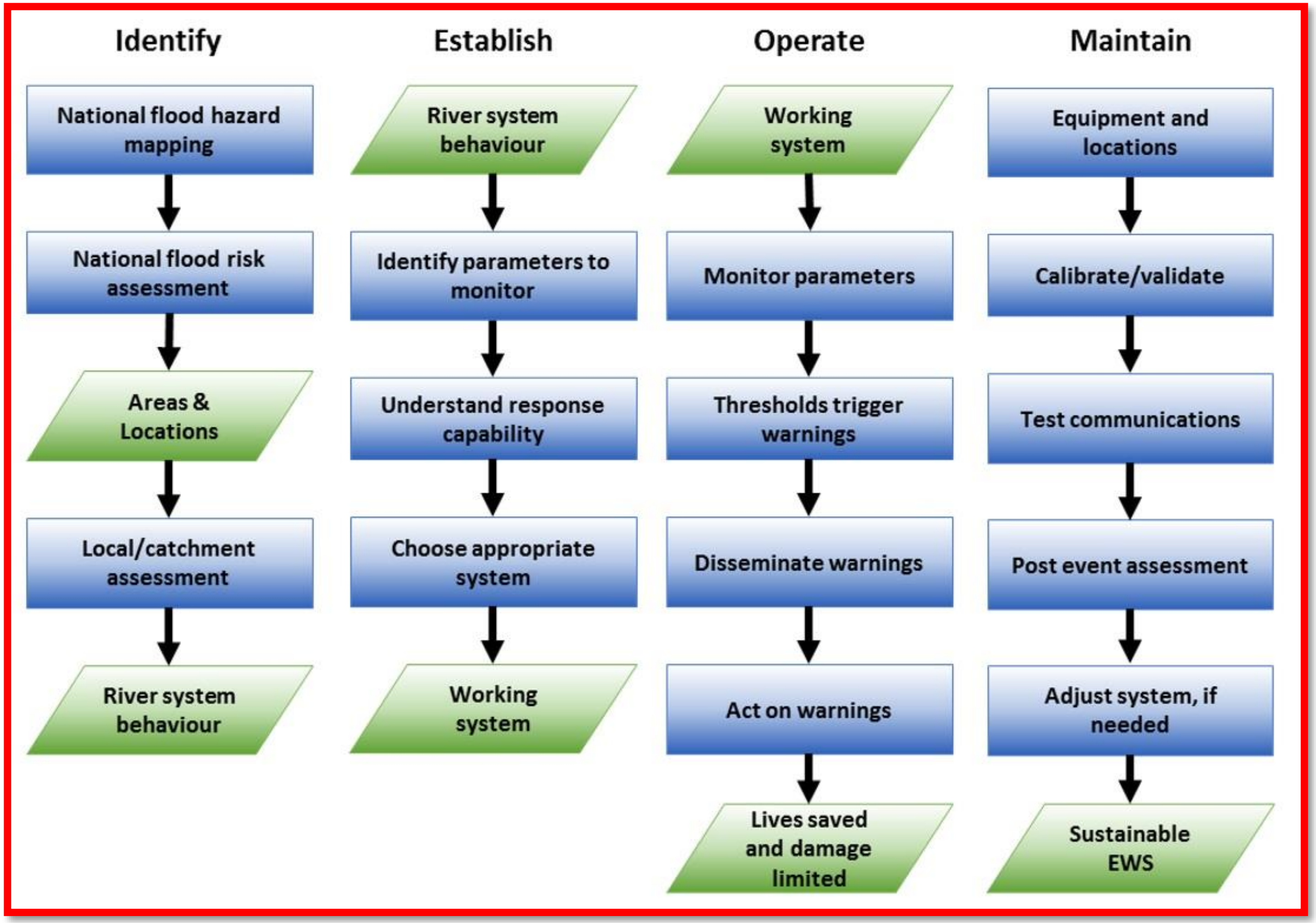
30
40 Kilometers

پرتلفات ترین و حساس ترین نقاط تهران هنگام زلزله

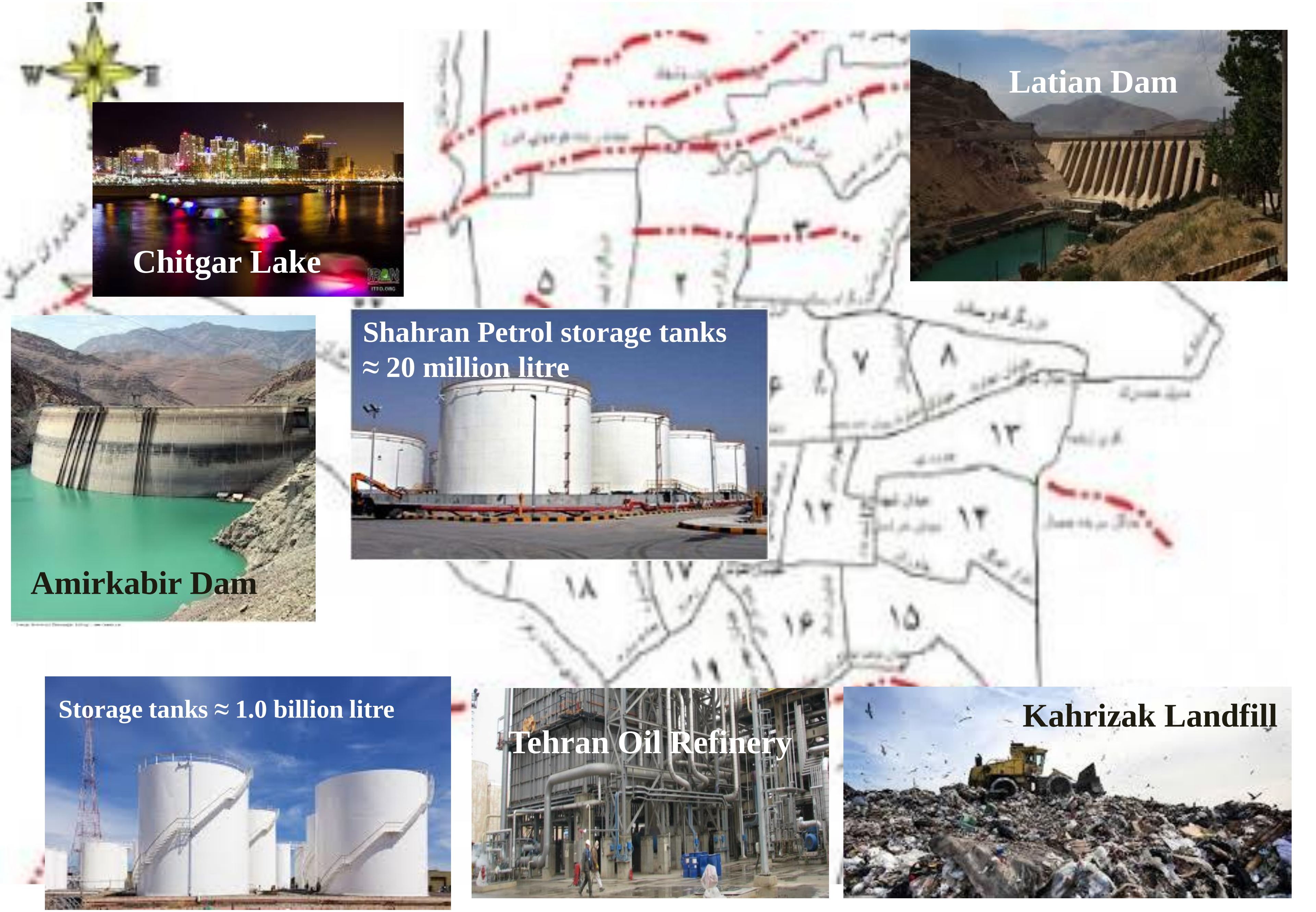


- ساختمان مدرن **اسناد ملی ایران** دقیقا روی گسل بزرگ سید خندان و در فاصله ۱۰۰ متری محل تقاطع این گسل با گسل داوودیه قرار دارد.
- ساختمان **بانک مرکزی** بین فاصله ۲۰۰متری از گسل داوودیه و ۴۰۰ متری گسل سید خندان قرار دارد.
- ساختمان بلند مرتبه **روزنامه اطلاعات** در کنار گسل در زیر بزرگراه جهان کودک واقع است و همچنین در پشت آن ساختمان گسل سید خندان قرار دارد.
- مجموعه ساختمان‌های **کتابخانه ملی ایران** بر روی طاقدیس‌های داوودیه قرار دارد.
- ساختمان بلند مرتبه **بنیاد مستضعفان** در کنار گسل تلویزیون واقع شده است.
- ساختمان **وزارت راه** بین دوگسل تلویزیون باختری و عباس آباد واقع شده است.
- ساختمان‌های بلند مرتبه **آتی ساز** در کنار هتل اوین، در محل تقاطع گسل محمودیه و گسل عمود بر آن قرار دارند.
- **پل معلق پارک وی** که در تقاطع خیابان ولیعصر و بزرگراه چمران واقع است دقیقا روی گسل محمودیه قرار دارد.
- **پل بزرگراه صدر** روی خیابان دکتر شریعتی گسل قیطریه را قطع کرده است.

Multi-Hazard Early Warning System (**MHEWS**)



Schematic representation of the components of a MHEWS (here for flood for example)


Latian Dam
Chitgar Lake
Shahran Petrol storage tanks
≈ 20 million litre
Amirkabir Dam
Storage tanks ≈ 1.0 billion litre
Tehran Oil Refinery
Kahrizak Landfill

The End

Thank you!

Any question; please contact me via:

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