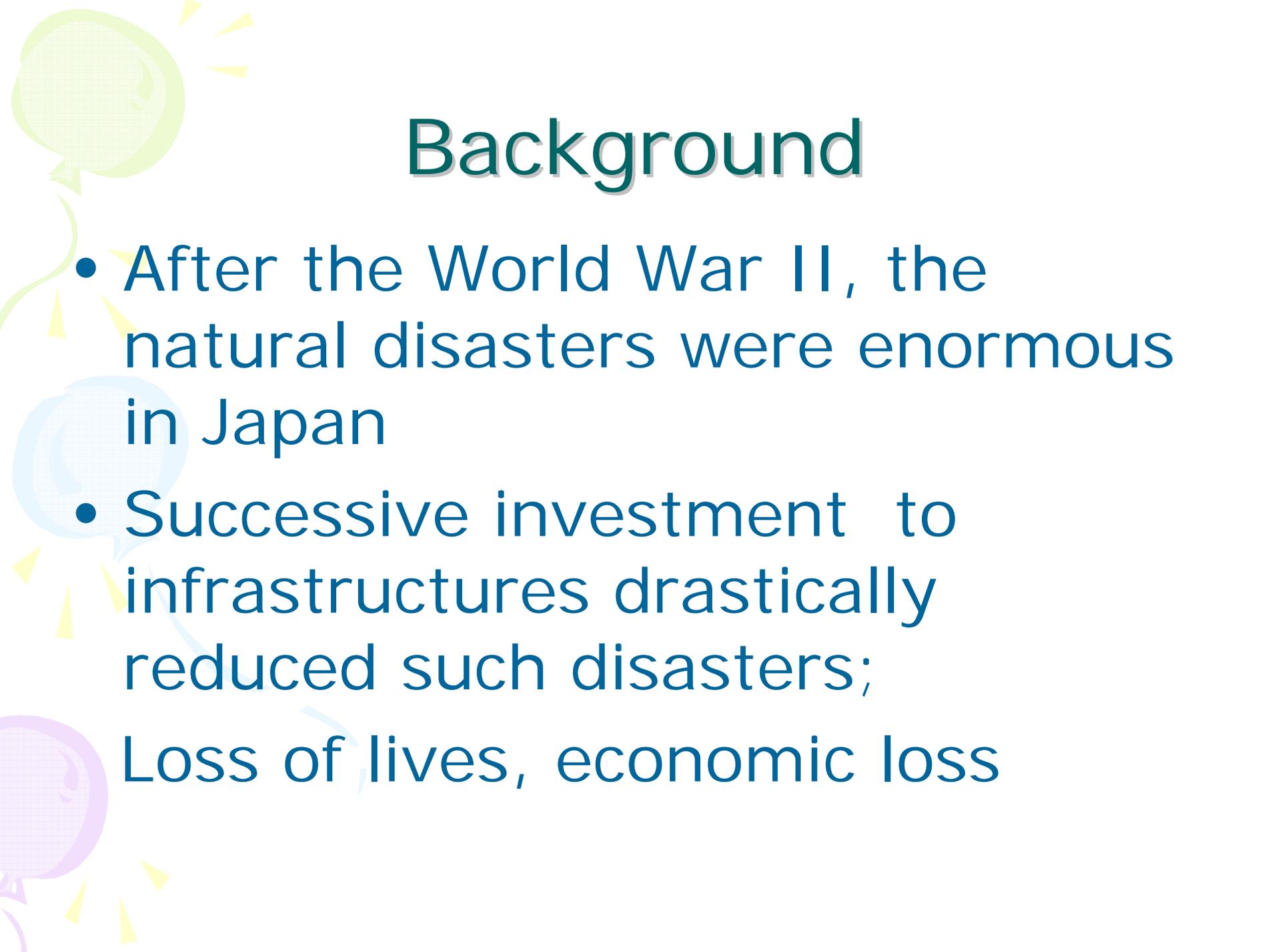


The background features several large, overlapping, colorful swirls in shades of purple, green, and blue. Scattered throughout are numerous small, yellow, triangular shapes that resemble sun rays or sparks. The overall aesthetic is bright and dynamic.

Toward Adequate Preparation for Natural Disasters

**Syunsuke IKEDA
Tokyo Institute of
Technology**



Background

- After the World War II, the natural disasters were enormous in Japan
- Successive investment to infrastructures drastically reduced such disasters;
Loss of lives, economic loss

洪水の危険性



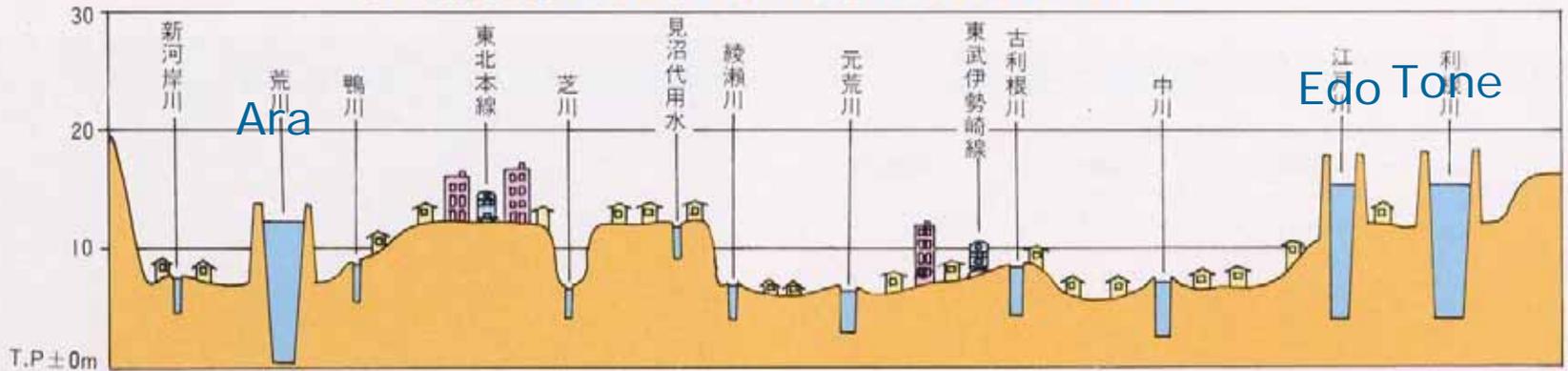
▲普通時の住宅地



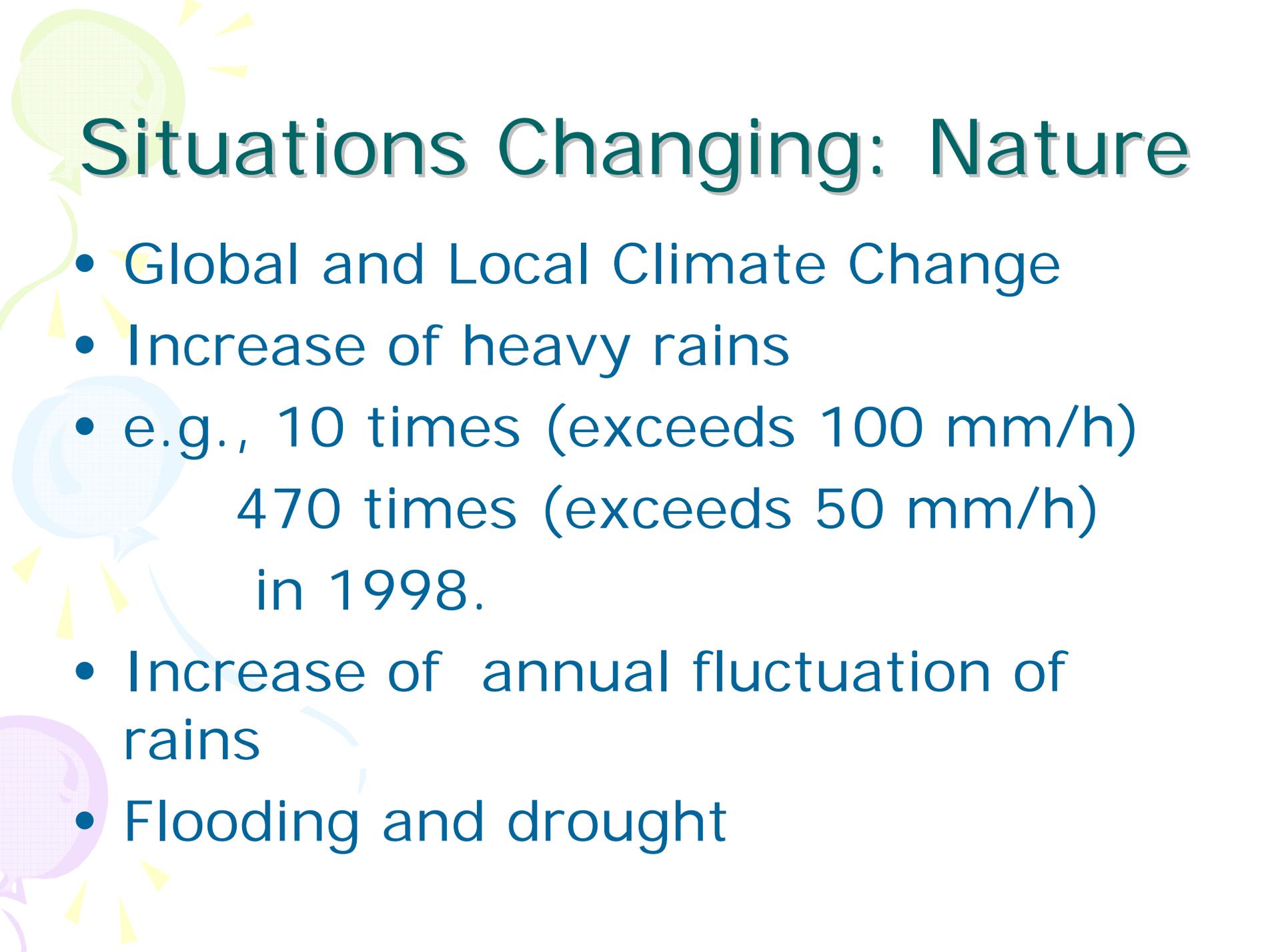
▲昭和56年台風24号時の住宅地

In 1981

中川流域は洪水時の河川水位より低い

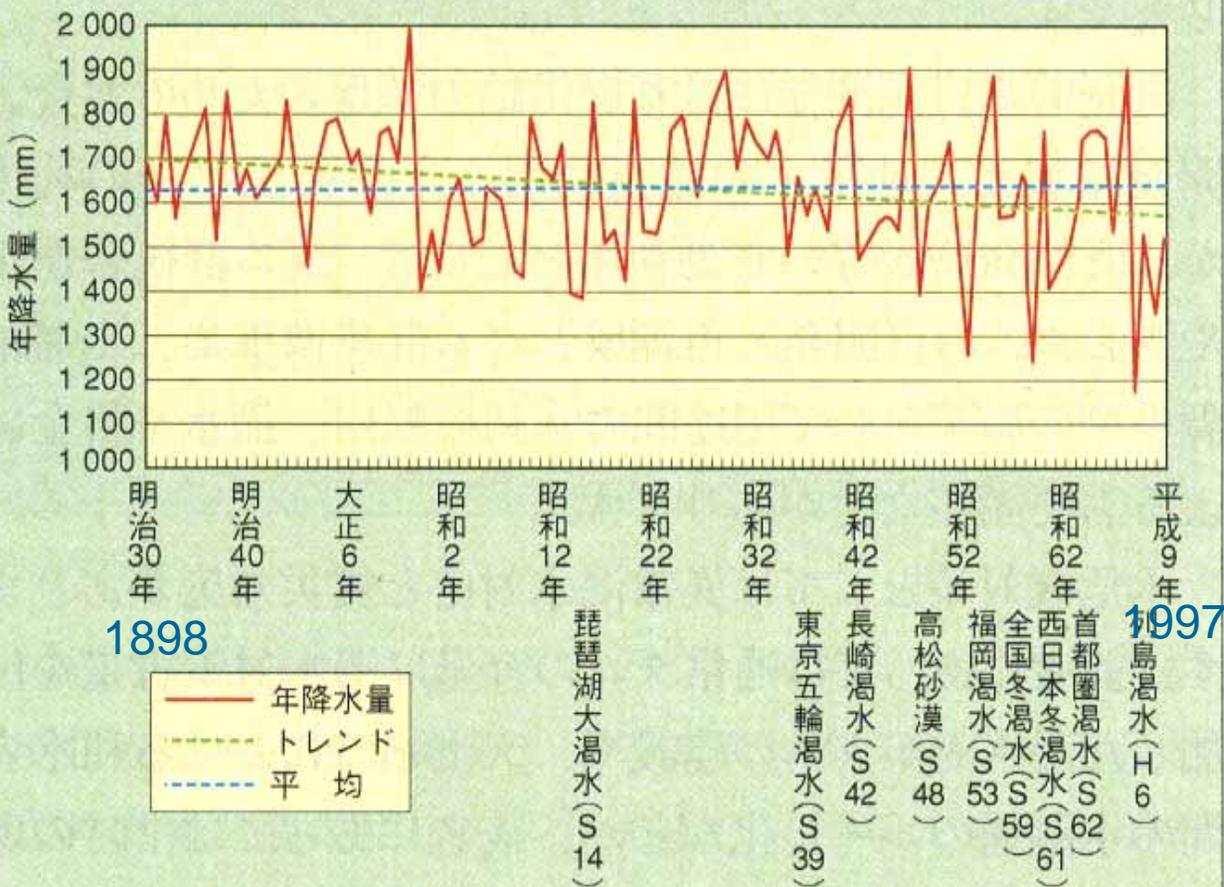


Rivers locate at higher places than urban areas



Situations Changing: Nature

- Global and Local Climate Change
- Increase of heavy rains
- e.g., 10 times (exceeds 100 mm/h)
470 times (exceeds 50 mm/h)
in 1998.
- Increase of annual fluctuation of rains
- Flooding and drought



- (注) 1. 気象庁資料に基づいて国土庁で試算，全国46地点の算術平均値。
 地点名：網走，根室，寿都，札幌，函館，宮古，山形，石巻，青森，秋田，福島，前橋，熊谷，水戸，宇都宮，甲府，東京，長野，金沢，新潟，福井，浜松，名古屋，岐阜，彦根，京都，大阪，和歌山，岡山，境，浜田，厳原，広島，多度津，徳島，松山，高知，熊本，宮崎，福岡，佐賀，長崎，鹿児島，名瀬，那覇，石垣島
2. トレンドは回帰直線による。

図-1 日本の年降水量の経年変化

Annual Fluctuation of Precipitation in Japan



Global Warming

- The trend toward global warming cannot be stopped next 2 or 3 decades even if the CO₂ gas emission is reduced drastically at now.
 - Adaptive countermeasures for the disasters which may be induced by global warming are necessary in the next 20 years.
- 
- 



Basic Viewpoint

- Size of disasters is the most important factor for consideration.

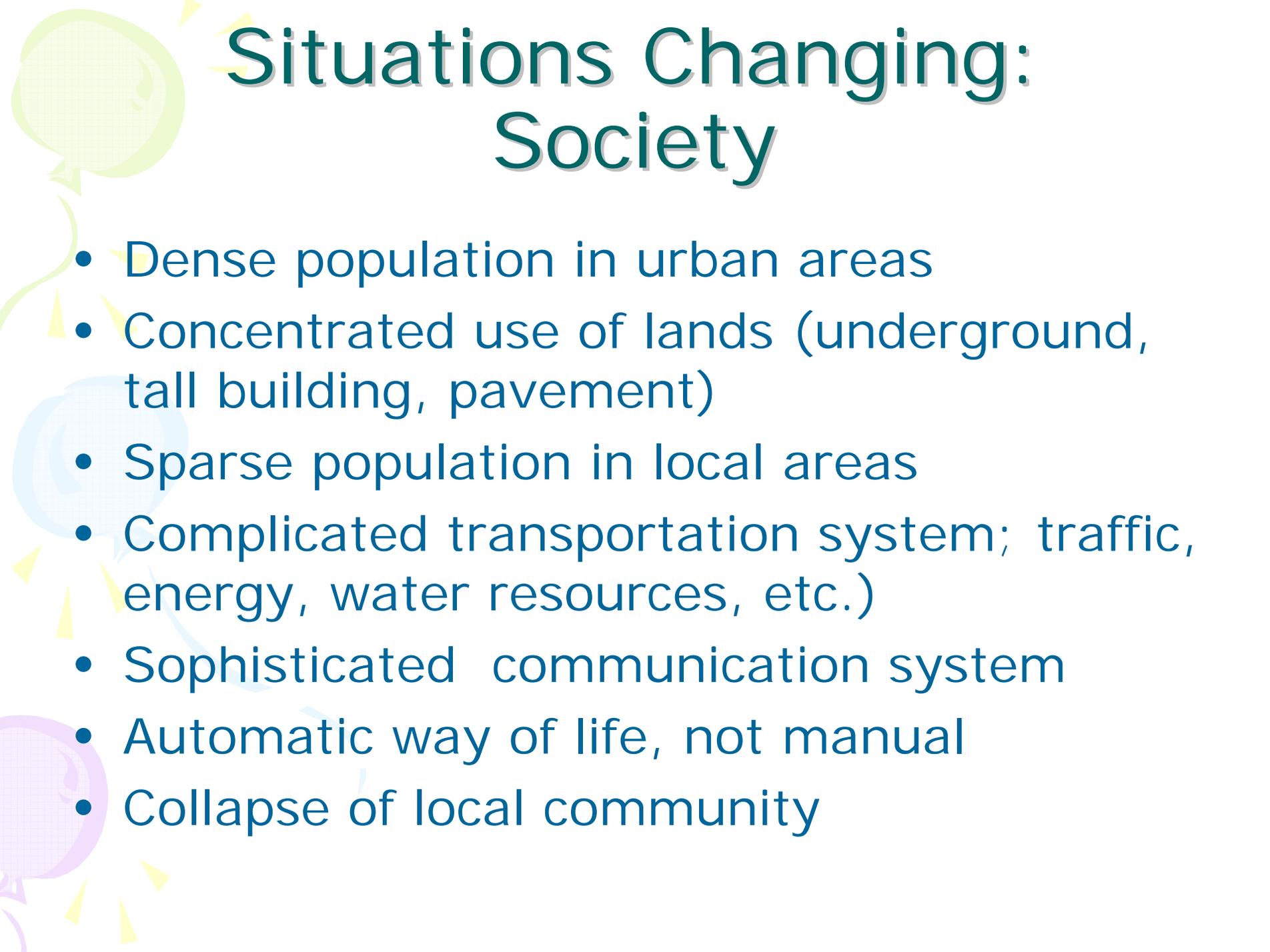
Ordinary size: infrastructures

Huge size: Infrastructure + Soft measure

- Basic factors to decide the standard of infrastructures:

Natural factors, Social factors

- Risk analysis is required
- 



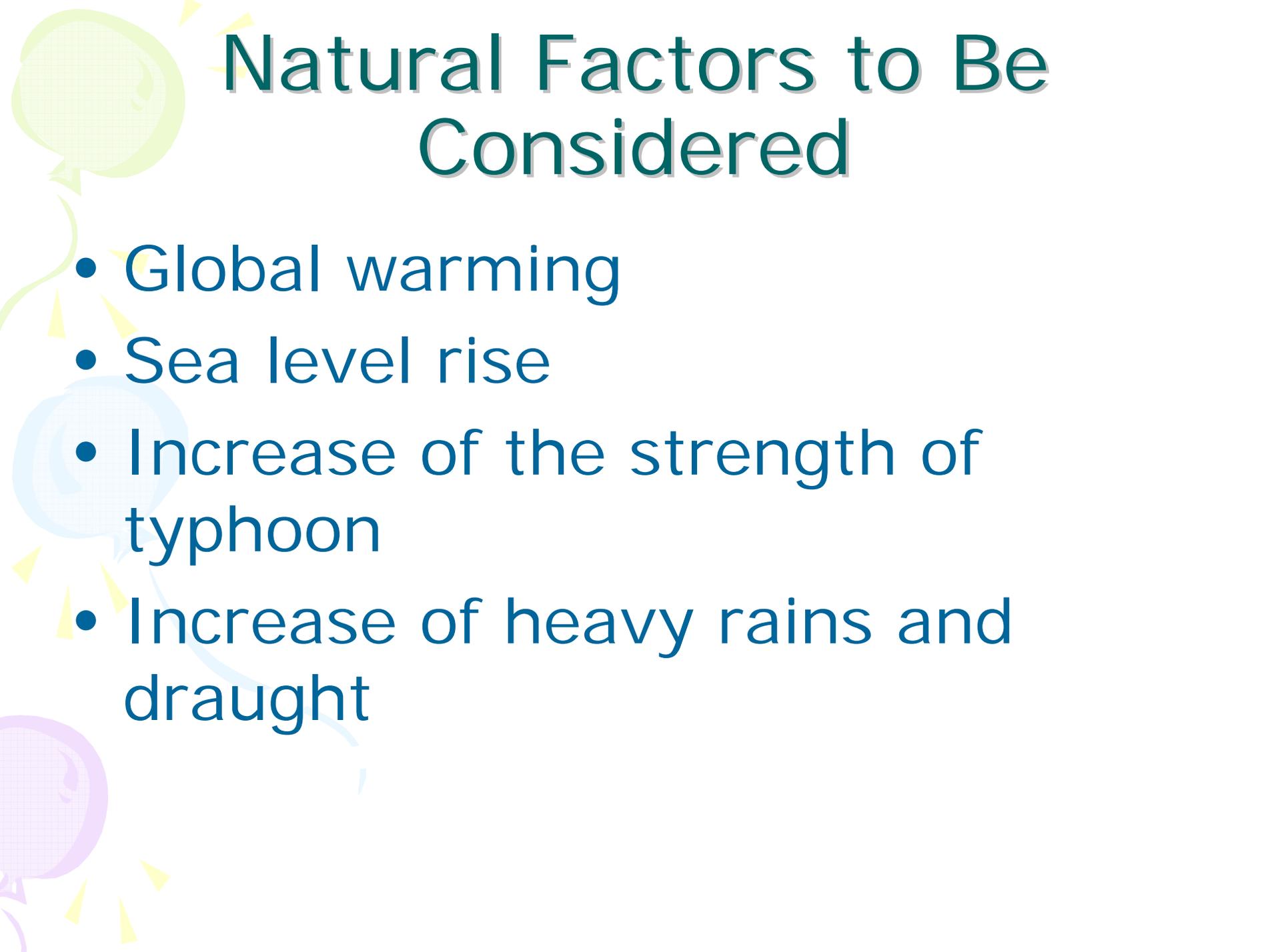
Situations Changing: Society

- Dense population in urban areas
- Concentrated use of lands (underground, tall building, pavement)
- Sparse population in local areas
- Complicated transportation system; traffic, energy, water resources, etc.)
- Sophisticated communication system
- Automatic way of life, not manual
- Collapse of local community



Social Factors to Be Considered

- Economic power
- Structures of population (Size, Distributions in Age and Space)
- Maintenance of regional and global economic/political power
- Standard of safety that people admit



Natural Factors to Be Considered

- Global warming
- Sea level rise
- Increase of the strength of typhoon
- Increase of heavy rains and draught



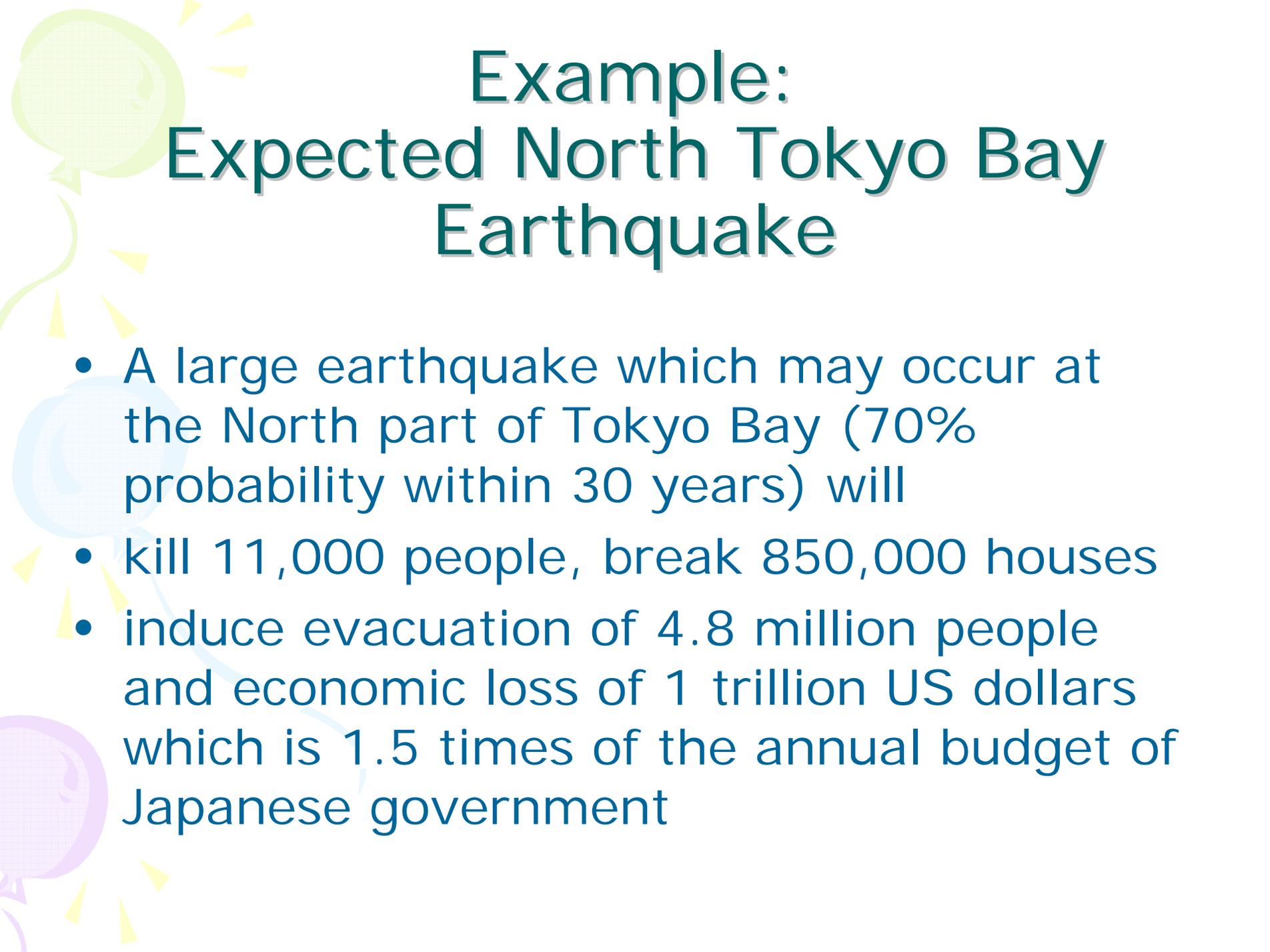
For Huge Disasters

- Important Factors to evaluate the risk:
- Long term impact on the local society and the nation
- International impact on economy, Loss of international economic competitiveness
- Loss of national security for the threat of foreign countries



Countermeasures

- Well-balanced combination of hard countermeasure such as infrastructures and soft countermeasures, e.g.
 - Adoption of international insurance system
 - Well-balanced spatial distribution of population
 - Selection of residential area based on the risk of disaster
- 
- 



Example: Expected North Tokyo Bay Earthquake

- A large earthquake which may occur at the North part of Tokyo Bay (70% probability within 30 years) will
- kill 11,000 people, break 850,000 houses
- induce evacuation of 4.8 million people and economic loss of 1 trillion US dollars which is 1.5 times of the annual budget of Japanese government

Continued

- It will induce;
- unrecoverable damage to the economy and political instability
- various effects on the national security
- A reasonable amount of investment should be made in advance, which must be decided based on risk analysis
- Risk communication with public and education are needed

Conclusions

- Natural and social environments are changing rapidly
- The government should decide the adequate and reasonable amount of investment for the disasters considering natural and social environments
- Adaptive countermeasures for disasters are necessary in the next 2 or 3 decades
- Risk communication and education are necessary to obtain the understanding of tax payers