

Asia Construct

Disaster Risk Reduction in Infrastructure

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Contents



What is DISASTER?

What causes disasters?

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What is disaster?

- An event that results in great harm, damage, or death, or serious difficulty (Cambridge Dictionary)
- natural disasters and man-made disasters

bencana

재해

malapetaka

विपत्ति

гамшиг

අයහෝගය

災害

tai họa

disaster

Natural disaster



Man-made disaster



Explosion



Fire



Collapse



Water



Pollution



Traffic accident

Characteristics of recent disasters

- Enlarge
 - Affects on a large area
- Irregular
 - Unpredictable
- Complex
 - Multiple disasters occur simultaneously.
- Frequent
 - Occurs more frequently
 - Frequent man-made disasters

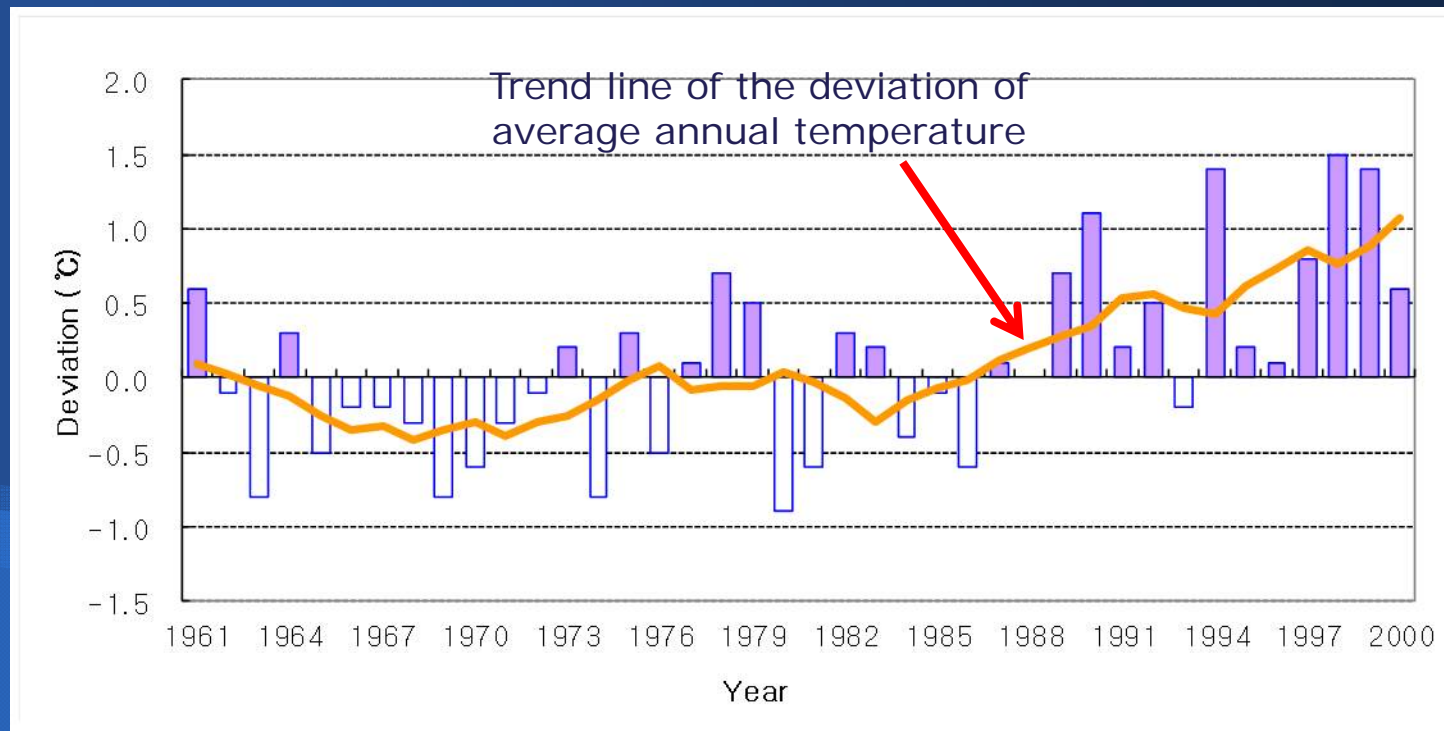


What causes disasters?

- Climate change
 - Global warming
 - Higher rainfall intensity
 - Increased 1-day probable max. precipitation
- Rapid urbanization, industrialization
 - High population density
 - Thoughtless development
 - Increased impervious surfaces
 - Increased underground infrastructure facilities such as electricity, gas, drainage, water supply systems

Climate change in Korea

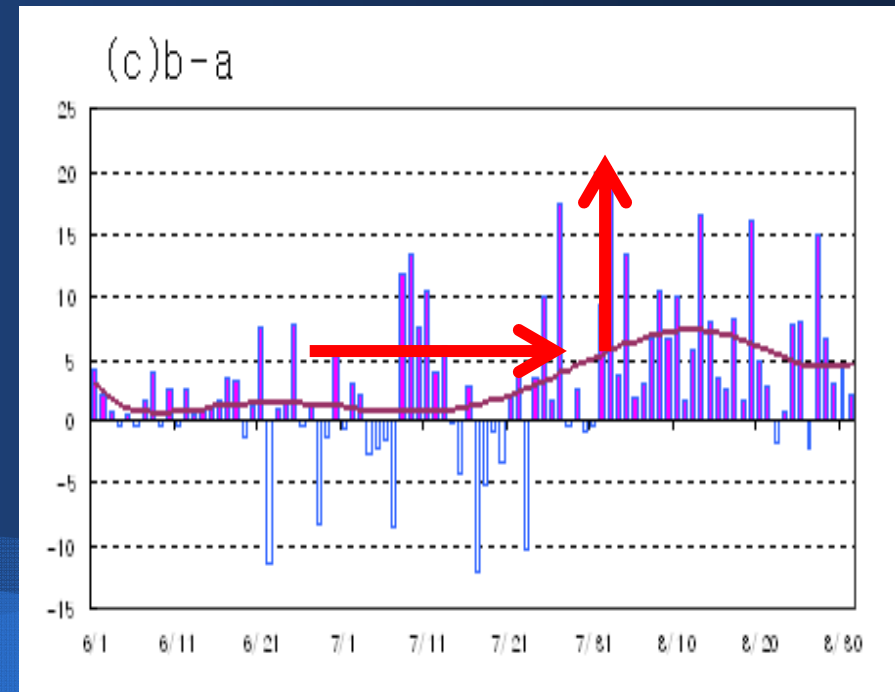
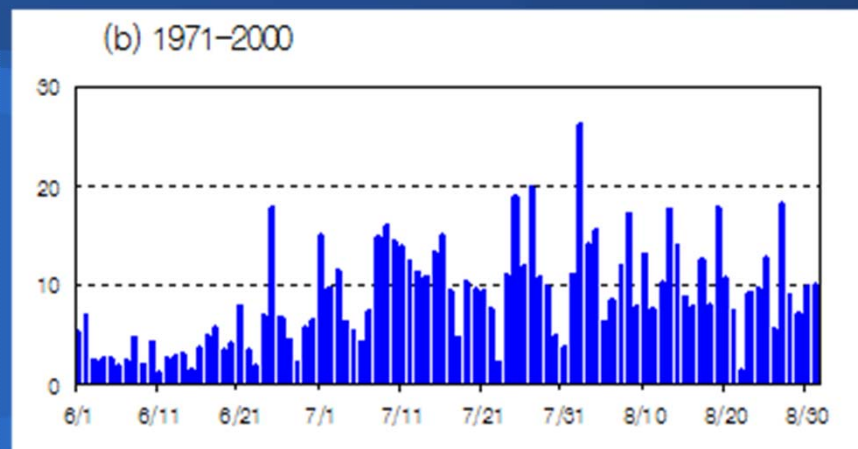
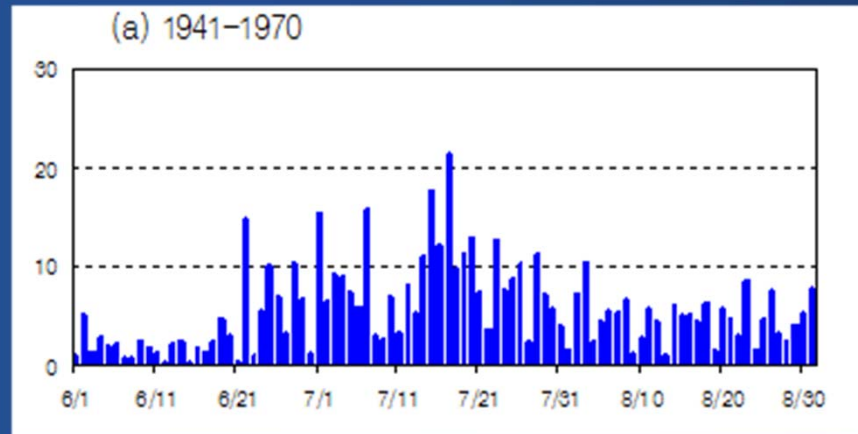
- 1.2°C increased for the last 30 years.
- Especially, it gets warmer in winter.



<Source: Korea Meteorological Administration>

Climate change in Korea

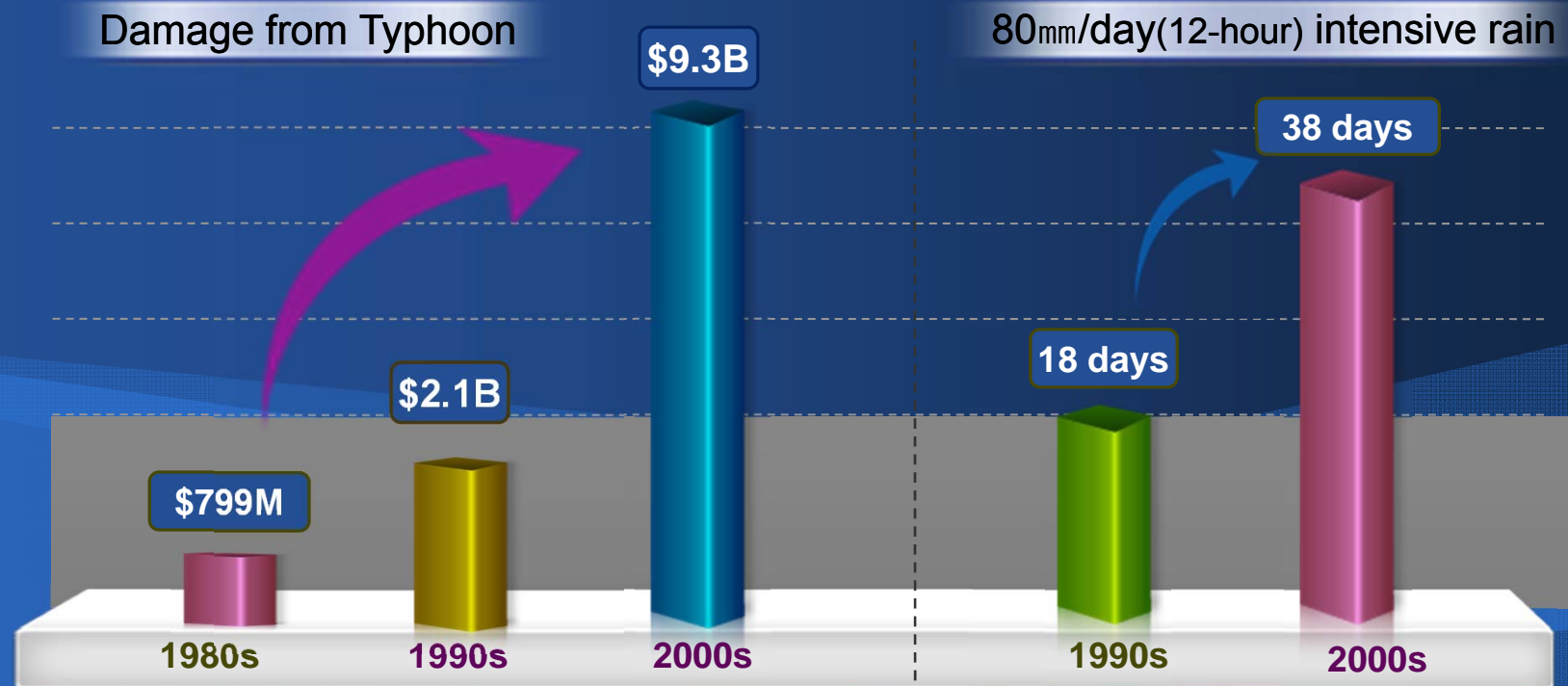
- Change in summer precipitation over Seoul
- Rainfall intensity increased
- Average rainfall not changed, concentration period changed to Aug.



<Source: Korea Meteorological Administration>

Climate change and disasters

- Exposed to hazards from climate change
 - Typhoon, frequent intensive rain
 - 3.2 times the damage every 10 years

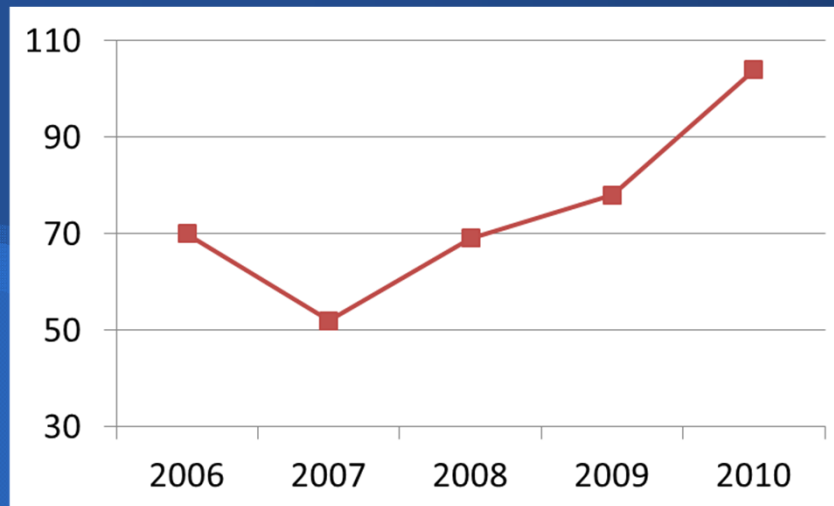


Flooding in Seoul



Man-made disasters

Bursts of Water Supply System



<Bursts of Water supply system in Seoul>



Bridge Collapse



- Sungsu Bridge crossing Han River in Seoul
- At 7:40 A.M. on Oct. 21, 1994
- 32 died, 17 injured
- Reopened on Jul. 3, 1997
- One of concrete slaps fell due to a failure of the suspension structure
- Improper welding of the steel trusses of the suspension structure
- Improper maintenance

Building Collapse



- Sampoong Department Store in Seoul
- Construction completed in 1989.
- Open to the public in 1990

- At 5:57 P.M. on Jun. 29, 1994
- 502 died
- 939 injured
- 6 missed
- \$254 million damage

- Rapid development
- Air conditioning unit
- Plan changed

Building Collapse



12:30 PM: Store facility manager thinks air conditioning units are to blame for vibrations. He shuts them off.

4:00 PM: The store facility manager explains to the head manager that the cracks around Column 5E have increased to 4 inches since the morning. The structural engineer who built the store complex is present at this meeting. He recommends closing the store immediately for urgent repairs. The head manager refuses.

5:40 PM: Customers hear a loud noise from the top floor, the ceiling shifts.

5:47 PM: Customers hear an even louder disturbance from the top floor.

5:52 PM: Entire building vibrates violently. Building progressively collapses in less than 20 seconds.

Subway Fire



- Daegu Metropolitan Subway
- At 9:53 A.M. on Feb. 18, 2003
- 198 died
- 147 injured
- An arsonist set fire.
- Regulations tightened
- All materials have been replaced with nonflammable ones.
- Regulations on evacuation systems have been tightened.



Increasing disaster risks in urban area

- High-rise buildings and underground facilities
 - As of Mar. 2012, 69 skyscrapers and 194 underground complexes in Seoul
 - Life-line underground infrastructure is not currently identified and managed.
 - A number of such structures are being built.
- A number of subway users
 - 7 million people use Seoul metropolitan subway daily.
 - Are those people safe enough to any disaster?
- 31 Grand bridges longer than 1km over Han River

Government's actions

- Declared “Special Act for the safety control of public structures” in 1995
- Established Korea Infrastructure Safety & Technology Corporation (KISTEC)
 - In-depth inspection on major public structures
 - Development and operation of a Disasters Information Center on Construction and Traffic
- Declared ‘Construction Supervision’ system
 - 3rd party must take part in a construction project for safety guarantee. 🚀

Welcome to **KISTEC**
“ Korea Infrastructure Safety
& Technology Corporation ”



Infrastructure maintenance system

- 110,000 infrastructure facilities over the country are inspected regularly.
- Grades system: A, B, C, D, E
 - Facilities of grade D and E are kept less than 1.0%.
- However, people still feel unsafe on infrastructure.
- Now, we are changing maintenance paradigm to include various attributes such as resilience to disasters.

Resilience to disaster

- Report card for infrastructure
 - American Society of Civil Engineers
 - Physical condition of infrastructure
- From 2005, Resilience (public safety) has been added to the assessment criteria.
 - The ability to withstand and recover from natural and man-made hazards

TABLE A ★ 2009 Report Card for America's Infrastructure

Aviation	D
Bridges	C
Dams	D
Drinking Water	D-
Energy	D+
Hazardous Waste	D
Inland Waterways	D-
Levees	D-
Public Parks and Recreation	C-
Rail	C-
Roads	D-
Schools	D
Solid Waste	C+
Transit	D
Wastewater	D-

AMERICA'S
INFRASTRUCTURE G.P.A.

D

ESTIMATED 5 YEAR
INVESTMENT NEED

\$2.2
TRILLION

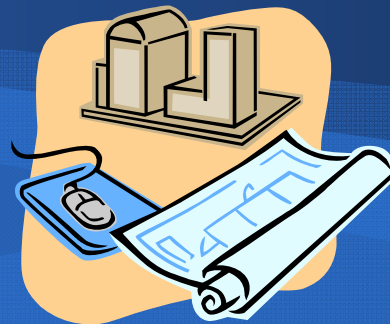
NOTES

Each category was evaluated on the basis of capacity, condition, funding, future need, operation and maintenance, public safety and resilience

A = Exceptional
B = Good
C = Mediocre
D = Poor
F = Failing

Design Trends

- Old drainage systems which were built in 1970s have not been properly repaired or sufficiently reinforced.
- Design criteria have not been updated to reflect current climate in Korea.
- Recently, design criteria have been tightened.
 - 10-year frequency rainfall → 30-year frequency rainfall



Conclusion

- Disaster is just next to you!
 - Urban infrastructure, safe and resilient enough?
- Respond to climate change
 - Design criteria need to be tightened.
- Proper maintenance of infrastructure
- Design for resilience to hazards
 - Sustainability and resilience
- Eco-friendly urban development
- Government leadership is required to protect people from disasters.

Thank You !