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Introduction to climate change adaptation planning of the public enterprise in Korea

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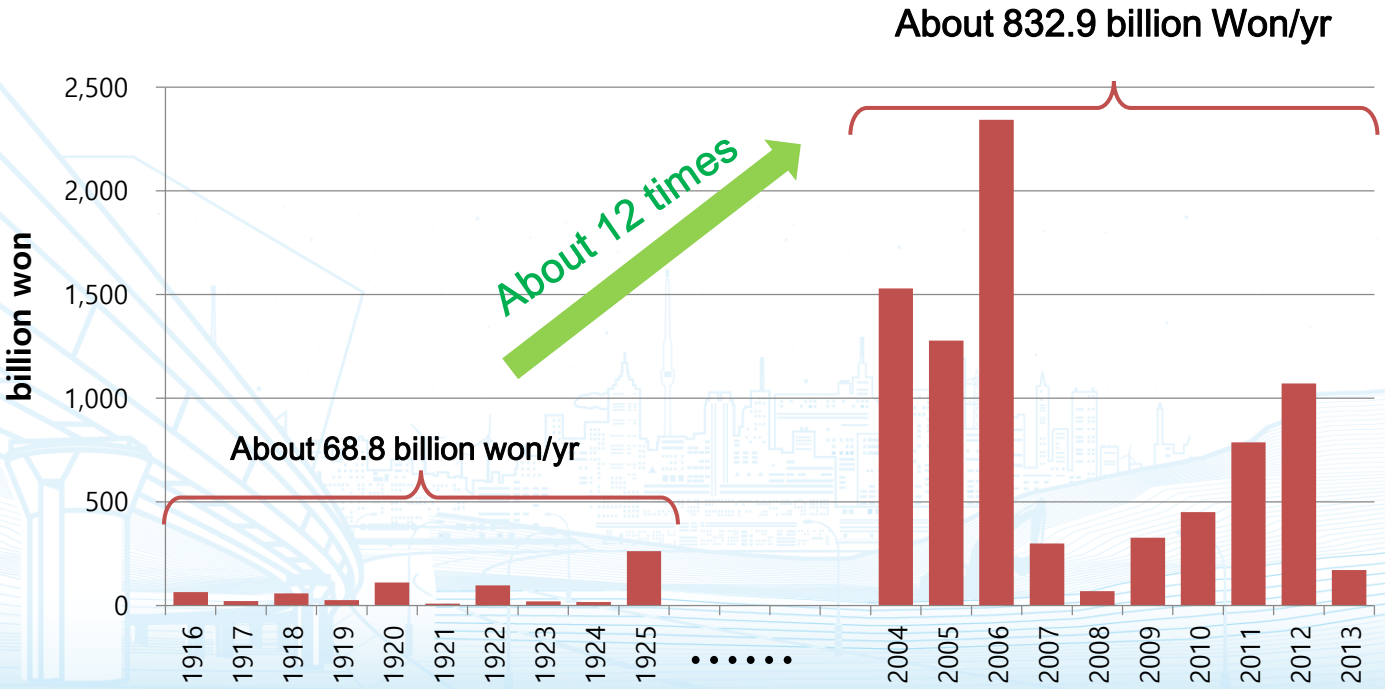
Huicheul JUNG

국가기후변화적응센터 KACCC KEI 한국환경정책·평가연구원 Korea Environment Institute

I. Background

Increasing damage caused by natural disaster in Korea

- Property loss of natural disaster has been increasing about 12 times since the beginning of the 20th century
  - Property loss from natural disaster during 1916~1925 is about 68.75 billion won/yr
  - Property loss from natural disaster during 2004~2013 is about 832.93 billion won/yr

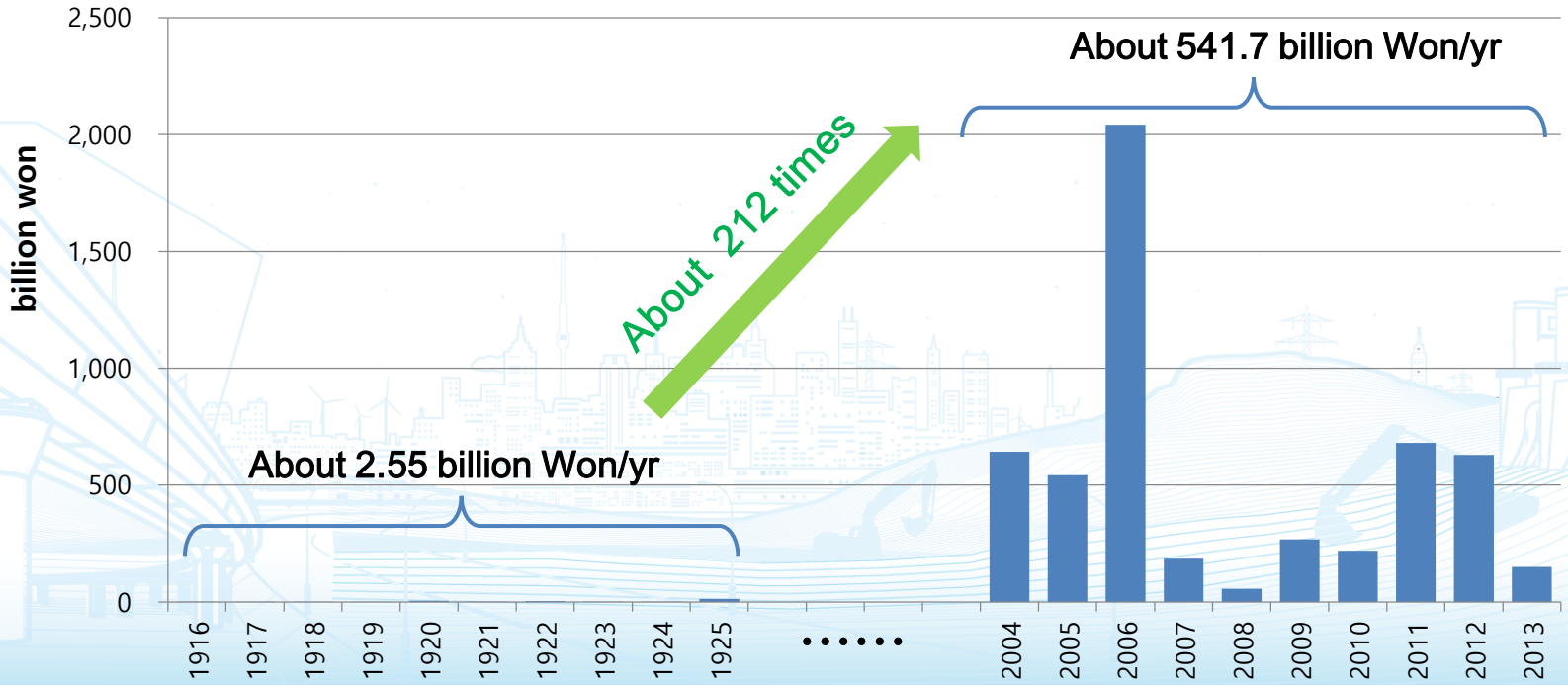


*From disaster annual report 2013

I. Background

Damage to public facilities due to natural disaster in Korea

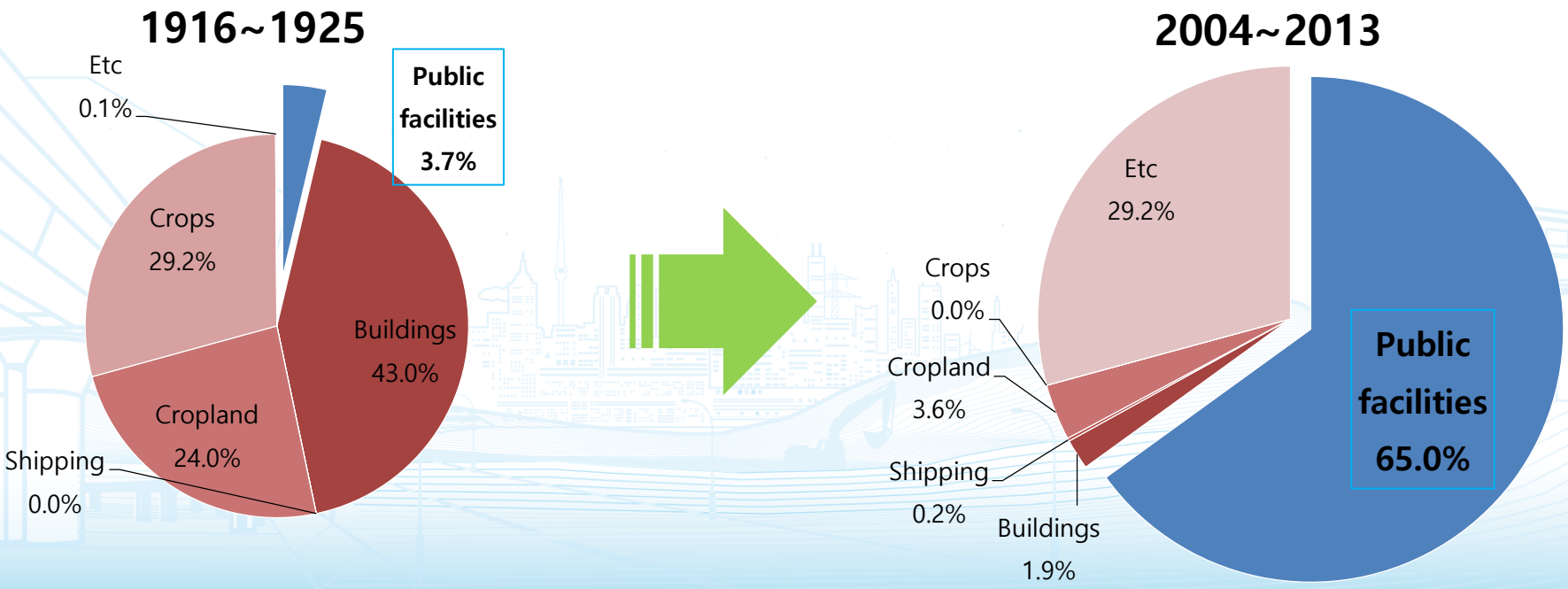
- Increased about 212 times compared to the beginning of the 20th century
  - Property loss of public facilities during 1916~1925 is about 2.55 billion won/yr
  - Property loss of public facilities during 2004~2013 is about 514.69 billion won/yr
  - This is 17 times faster than the increase in total property damages



I. Background

Damage to public facilities due to natural disaster in Korea

- Increased portion of property damage in public facilities caused by natural disasters
  - During 1916~1925, public property damage accounts for 3.7% of total property damage
  - During 2004~2013, public property damage accounts for 65% of total property damage



I. Background

Projection of climate change by KMA(2015)

based on RCP 8.5-A scenario of comparatively high greenhouse gas emissions

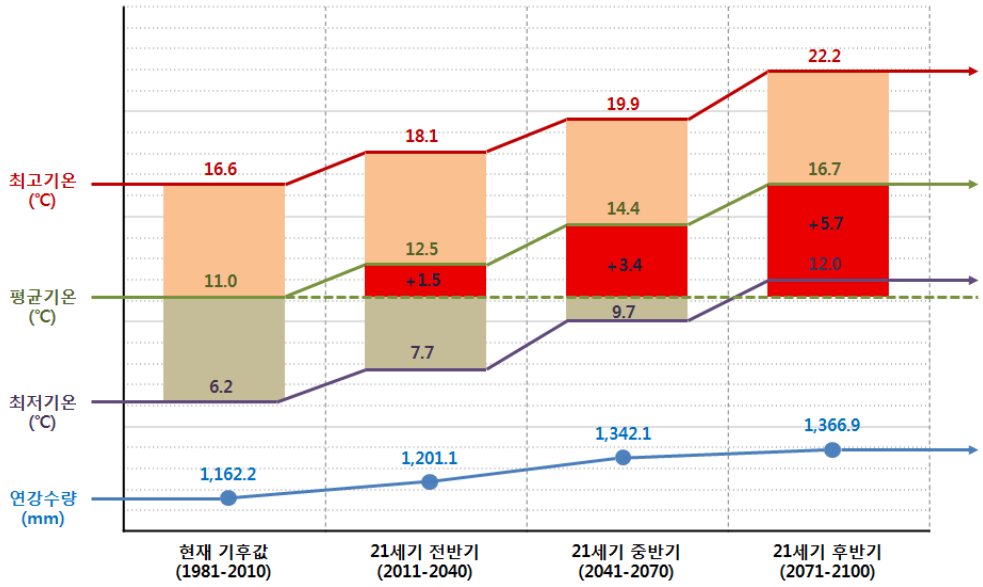
Climate change is three times faster in the future than in the past 100 years

- Climate risk management should be updated in vulnerable regions or economical sectors. What is now rare and improbable "extreme events" can become "normal" weather in years to come

RCP8.5 (2080s)	Republic of Korea
Temp. avg	+5.3℃
Precipitation	+18%
Extreme heat days	10.1 → 40.4days
Tropical nights	3.8 → 52.1days
Heavy rainfall	+40%

※ BASE: 1981~2010, Future: 2071~2100

Korean Peninsula (RCP 8.5)



II. Overview of adaptation planning in PEs

1. Legal foundation and characteristics of adaptation plan for PEs

- Clause 4, § 48 of the Framework Act on Low Carbon, Green Growth and § 38 of its implementing ordinances (April 14th of 2011)
- The adaptation plan for public institution and local public enterprise is mid- to long-term measures for protecting facilities from the impact of climate change, citizen safety and preventing service interruption etc.
- Focusing on major facilities, facility managers, and public services etc. to manage climate change response and to mitigate damage

❖ **Public enterprise(PE)**, a business organization wholly or partly owned by the state and controlled through a public authority. -The Editors of Encyclopaedia Britannica-

II. Overview of adaptation planning in PEs

2. Outline of adaptation plan for PEs

- (Planning host) Public institutions under「the Act on the Management of Public Institutions 」and local enterprises under「Local Public Enterprise Act」
  - 24 public institutions and 24 local public enterprises (total 48 agencies) that own and manage public facilities expected to suffer from climate change
- (Main contents) climate change impact monitoring and risk assessment, adaptation action plans
- (Target years for risk assessment) 20 years from the time of establishment of adaptation measures considering the durability of the facility
  - 5year rolling plan by facility and workplace(site) level

II. Overview of adaptation planning in PEs

3. List of institutions and enterprises

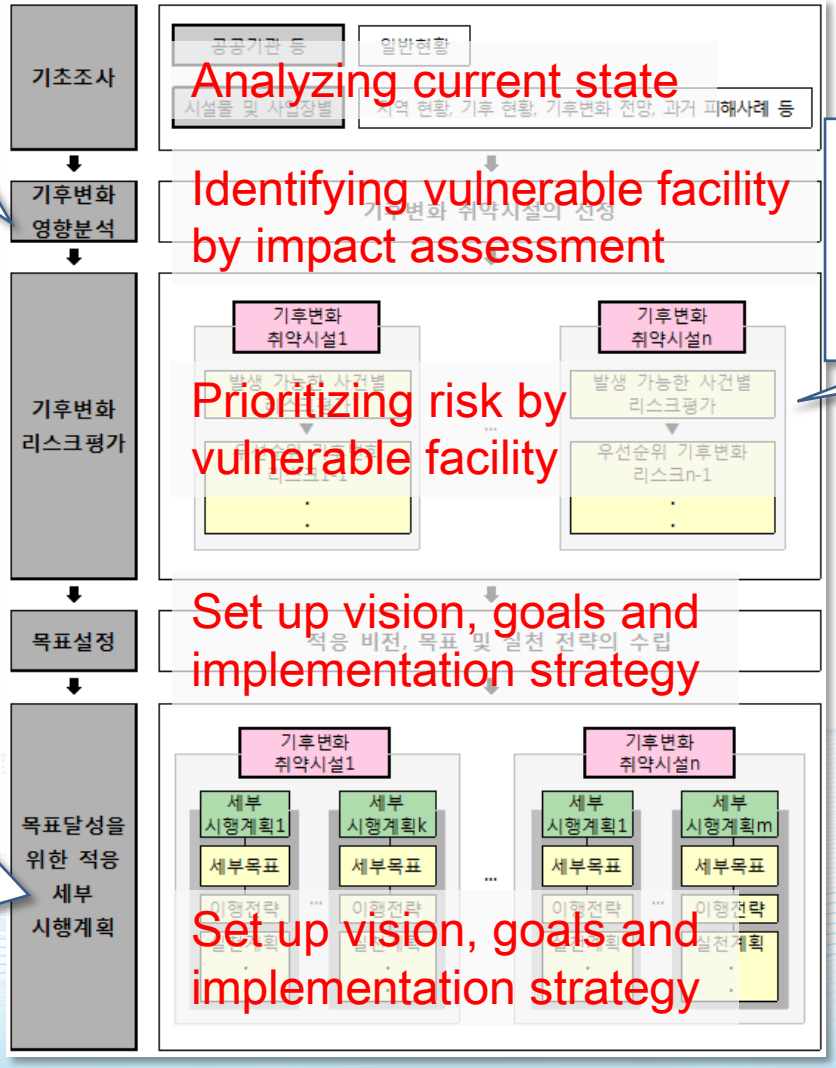
- 24 public institutions and 24 local public enterprises (total 48 agencies)
- : 2017/12 : 2016/12

	Total	Public institutions and enterprises
Public institution(enterprise)	24	-
Power facilities(Power plant, substations, transmission and distribution, heating and cooling etc.)	8	Korea Electric Power Co., Korea Midland Power Co., Korea Western Power Co., Korea South-East Power Co., Korea East-West Power Co,. Korea Southern Power Co., Korea Hydro and Nuclear Power Co., Korea District Heating Co.
Oil resource management facilities (Oil petroleum, gas, coal etc.)	3	The Korea Oil Co., Korea Gas Co., The Korea Coal Co.
Transportation city infrastructure(Road, railroad, airport, harbor etc.)	9	Incheon International Airport Co, Korea Airports Co, Busan Port Authority, Incheon Port Authority, Ulsan Port Authority, Yeosu Gwangyang Port Authority, Korea Expressway Co., Korea Railroad Co., Korea Rail Network Authority
Environmental infrastructure(Landfill, sewage treatment plant, National parks etc.)	2	Korea National Park Service, Sudokwon Landfill Site Management Co.
Water supply facilities (Reservoir, DAM etc.)	2	Korea Water Resources Co, Korea Rural Community Co.
Local public enterprise	24	-
Power facilities(Power plant, substations, transmission and distribution, heating and cooling etc.)	1	Jeju Energy Co.
Transportation city infrastructure(Road, railroad, airport, harbor etc.)	7	Seoul Metro, Busan Transportation Co, Daegu Metropolitan Transit Co, Incheon Transit Co., Gwangju Metropolitan Rapid Transit Co., Daejeon Metropolitan Express Transit Co.
Environmental infrastructure(sewage treatment plant, etc.)	8	8 enterprises directly managed by provincial and metropolitan city governments (Busan, Daegu, Incheon, Gwangju, Deajeon, Ulsan, Sejong, Jeju)
Water supply facilities	9	9 enterprises directly managed by provincial and metropolitan city governments (Seoul, Busan, Daegu, Incheon, Gwangju, Deajeon, Ulsan, Sejong, Jeju)

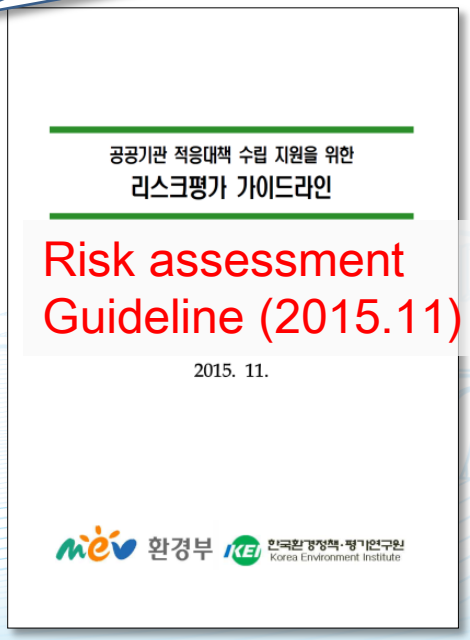
II. Overview of adaptation planning in PEs

3. Procedure of adaptation planning in the public enterprises

Using climate change projection and past damage cases → Estimation of vulnerable facilities with significant damage and losses due to climate change



Considering the possibility of risk and the magnitude of its impact taking place in each vulnerable facility → Extraction of priority climate change risk by vulnerable facilities



Risk assessment Guideline (2015.11)

Establishing specific measures and action plans to manage vulnerable facilities and businesses that require proactive response to climate change and to reduce their priority risks

II. Overview of adaptation planning in PEs

4. Contents of adaptation plan

Classification	Contents
I. Overview of adaptation plan	• Background, foundation, need, purpose, characteristics, scope etc.
II. Current state of public institutions	• Current state of risk management system • Current state of major facilities, workplaces etc.
III. Current state of climate and related Impact analysis	• Identifying planning area condition and characteristics • Current climate state and future change (by facility and workplace) • Climate change impact assessment to identify vulnerable facilities
IV. Climate change risk assessment	• Climate change risk identification • Climate change risk factor analysis and classification • Climate change risk assessment (by facility and workplace) • Comprehensive analysis to define priority of risk by facility
V. Establishing adaptation goals and strategies	• Vision and goals • Overall strategic direction of action plan
VI. Adaptation action plan	• Climate change adaptation action plan (by facility and workplace)
VII. Framework of implementation and management	• Establishment of implementation system • Management of implementation status

III. Climate related disaster information for PEs

Keyword analysis on mass media: Design and implementation

- By collecting and analyzing the impact of weather and climate change phenomena on facilities and businesses of public institutions and local public enterprise ⇒ Identifying potential impacts of climate change on similar facilities and businesses
- Searching the impact on facilities, facility managers, and public services by using media information

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- Internet portal : Naver news (http://news.naver.com/)
- Searching periods: 1980-01-01~2015-07-31 (`35.5 yrs)
- Searching range: News tile and body
- Searching media : news papers, broadcasting and communication press
- Searching keywords : combination of facility , sites and related climate stress factors
  - (facility site) representative keywords such as name, location and alias of major facilities and sites by public institution and local enterprise
  - (climate stress factor) heat wave, cold wave, heavy rainfall, heavy snowfall, strong wind etc.

III. Climate related disaster information for PEs

Keyword analysis on mass media: Design and implementation

< Example of searching keywords by facility and climate stress factor>

Social Infrastructure			Climate Stress factor
Category	Class I	Class II (example)*	
Power facilities	Fire power	Electric transmission tower and transmission line, the coolant system, Control facility, Drainage facility, power plant etc.	Heat waves Cold waves Heavy rainfall Heavy snowfall Strong wind
	Atomic power	power plant, various pipes, the coolant system, a power grid(power lines and towers) etc.	
	Hydraulic power	Electric transmission, Control facility,, water supply system, a drainage channel, a power grid(power lines and towers) etc.	
	Complex power	Electric transmission tower and transmission line, the coolant system, Control facility, Drainage facility, power plant etc.	
	Solar power	the coolant system, Solar module etc.	
	Wind power	a wind generator, Hydraulic system, wind wings, sensors etc.	
Transportation/ city infrastructure	road	Highway, a general road, Street and streetlights, Bridge etc.	
	airport	Runway, Air freight terminal, Scaffold etc.	
	railroad	Route and roadbed, train related(electric braking system, braking system, train entrance door), station pipe, a switchboard etc.	
	harbor	breakwater, Harbor Security Fence, Port facility(crane etc.) etc.	

III. Climate related disaster information for PEs

Keyword analysis on mass media: Results

<Example of weather•climate change impact information sheet>

Facility Types	Event Date	Event Area	Climate Stress factor	Impact target (ex, facility, facility manager, etc.)	Detail description of impact (direct impact)	Impact type classification	Indirect impact	source

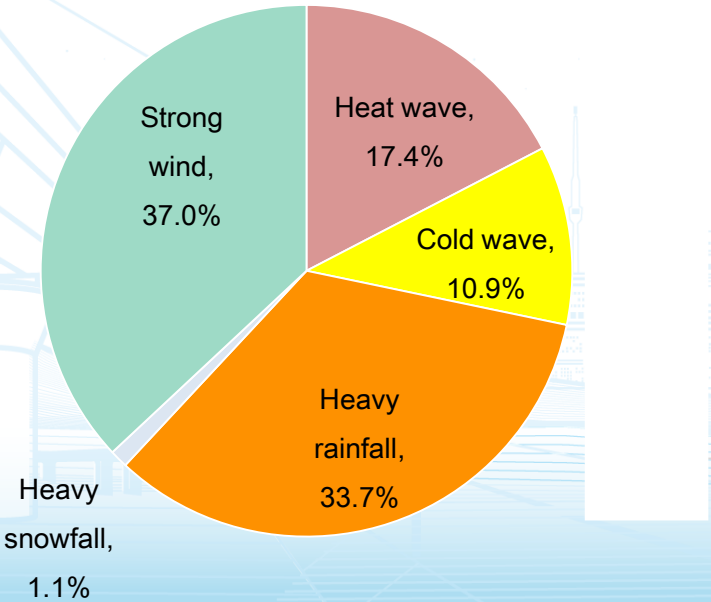
- As a results of key word searching, total **1,305 cases** were collected and analyzed

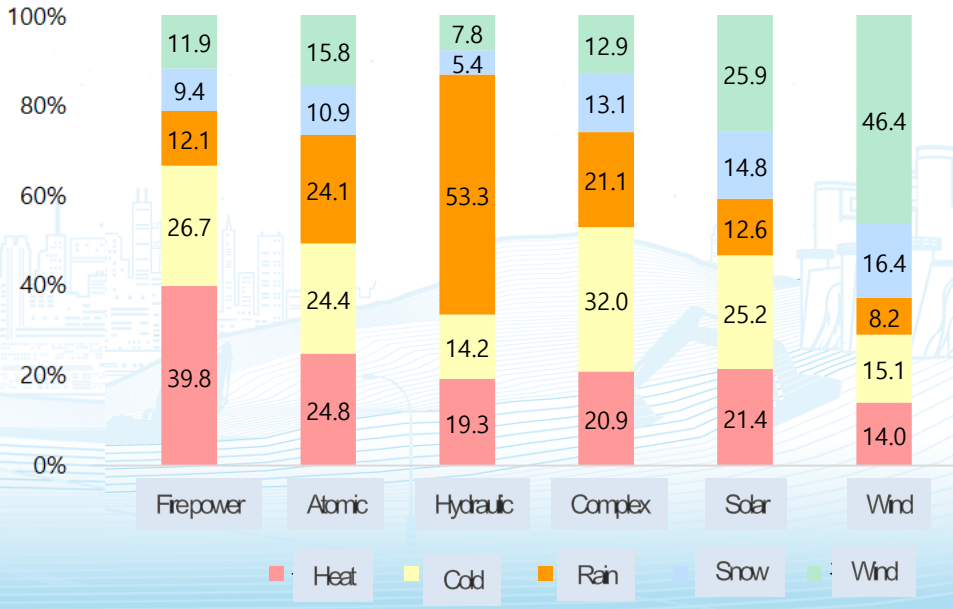
	Heat Wave	Cold Wave	Heavy Rainfall	Heavy Snowfall	Strong Wind	Sub Total
Power facilities	16	10	31	1	34	92
Oil, resource facilities	0	1	3	1	3	8
Transportation•city infrastructure	39	85	324	378	173	999
Environmental infrastructure	1	2	66	32	22	123
Water supply facilities	6	19	55	0	4	84
Sub Total	62	117	479	412	236	1,306

III. Climate related disaster information for PEs

Keyword analysis results: Power Facilities

- Analysis of the Impact of Climate Change on Electric Power Facilities
  - (climate stress factor) **strong winds and heavy rainfall** are most affected factors
  - (affected regions) **heat wave-Jeonnam(JN), Chungnam(CN); cold wave-**Incheon(IC), JN, CN **heavy rainfall-** Gangwon(GW), **Strong wind-** JN, CNProvinces
  - (Sub-class) **Strong Wind** is most stressed factor affecting on **Fire , Atomic and Wind Power**, **Heavy rainfall** is on **Hydraulic and Solar Power**, **Cold wave and strong wind** are on **Complex Power**





Thank you for attention

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