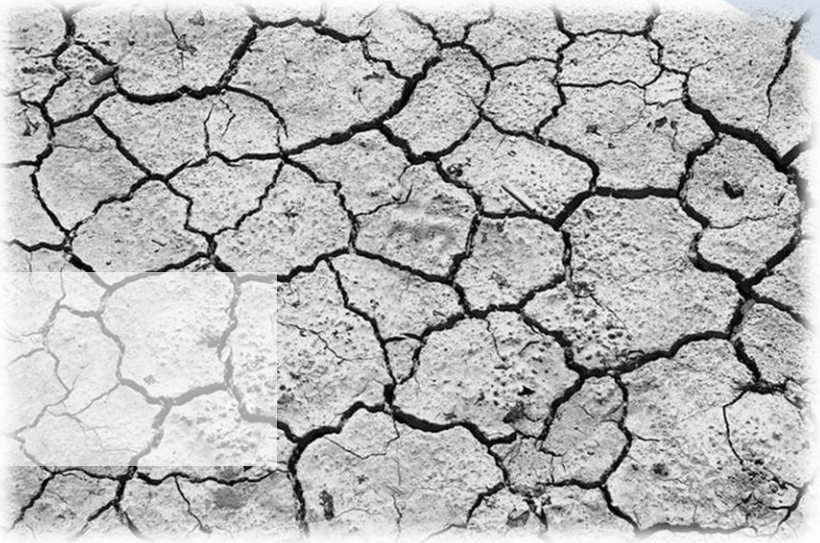
Ministry of the Interior and Safety
National Disaster Management
Research Institute

Drought management in Korea: Current trends and NDMI's R&D

2026. 2.



National Disaster Management Research Institute(NDMI)
National Integrated Drought Center(NIDC)
Research Officer HYEON CHEOL, YOON

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Escalating Climate Disasters

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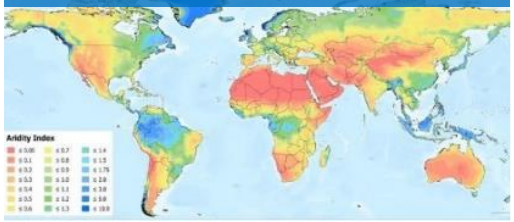
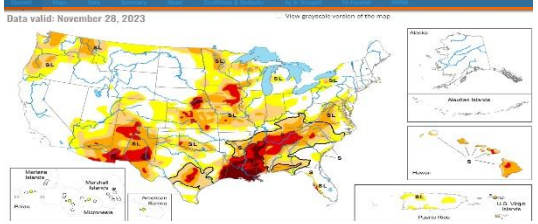
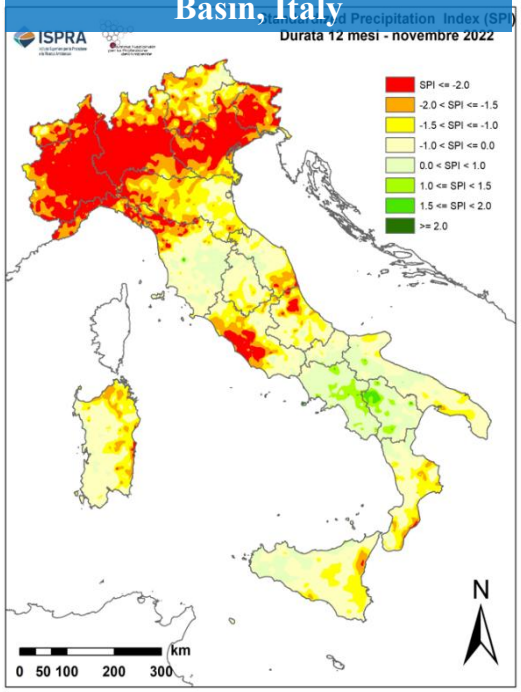


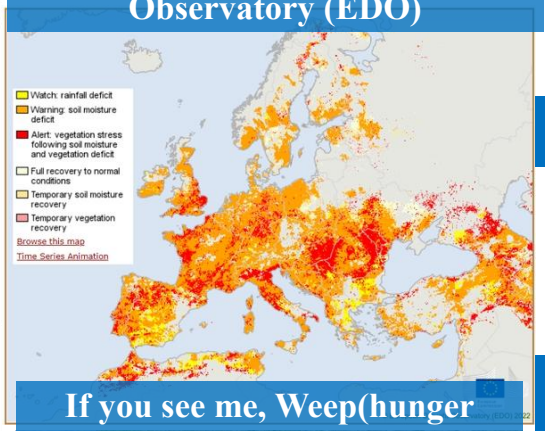
NDMC U.S. drought Monitor



2022 drought in the Po river Basin, Italy



Soil Moisture, European Drought Observatory (EDO)



If you see me, Weep(hunger stone)

Declaration of National Disaster State

Water Rationing in Gangneung City

Obong Reservoir: Depletion Risk

Review of Inter-basin Water Transfer Tunnel Utilization

Dongbok Dam: Storage Exhaustion

JUAM Dam: Storage Exhaustion

Water Rationing Crisis in Gwangju &Jeonnam

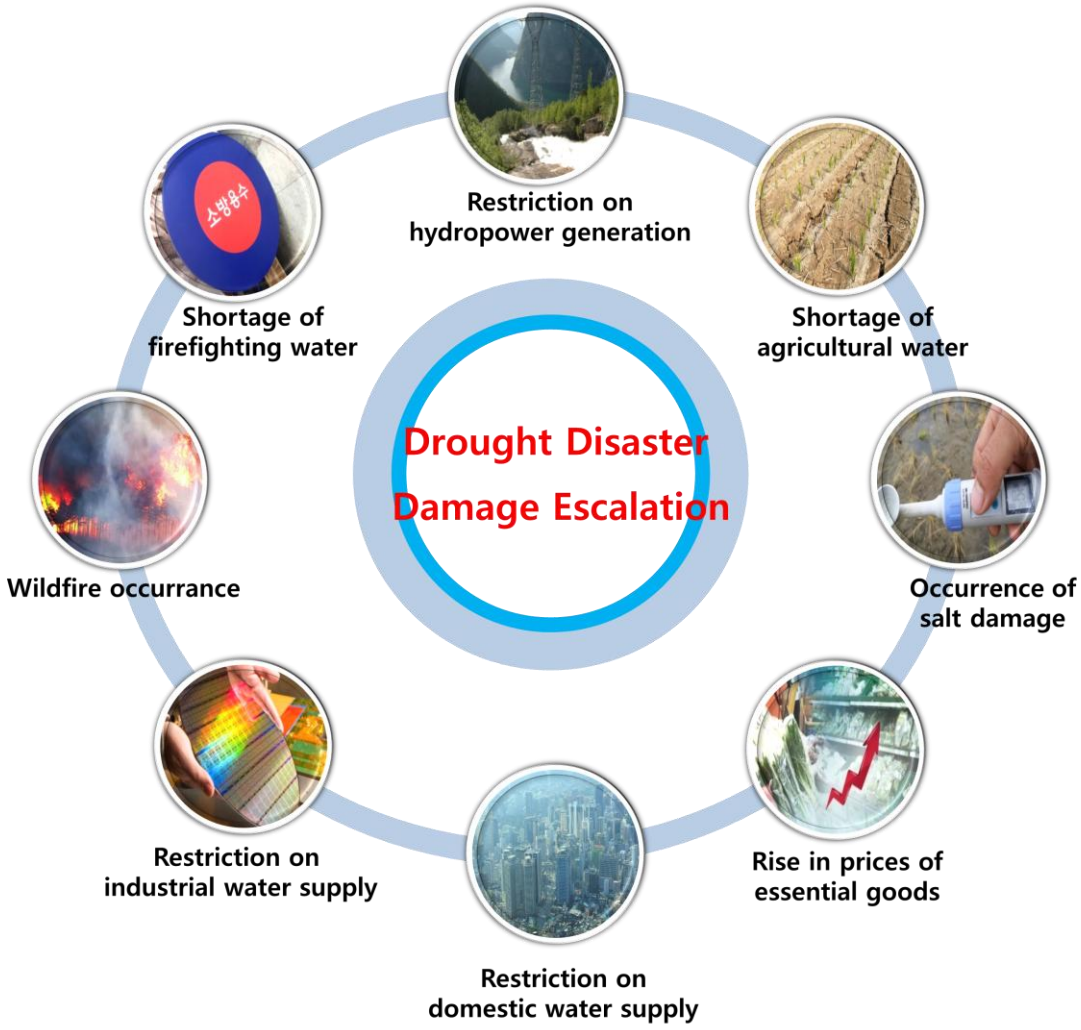
Water Supply Crisis in Industrial Complexes

2025. 8.

2022. 10.-23. 4.

Drought: A Large-scale Complex Disaster

✓ Nationwide Crisis: Widespread Impacts of Drought



Meteorological and hydrological characteristics of Korea

Annual Precipitation & per capita water availability

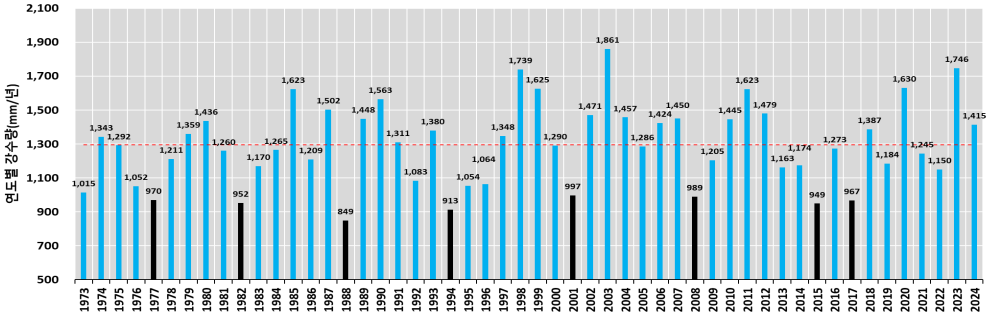
Korea 1,305㎜

Global 800㎜

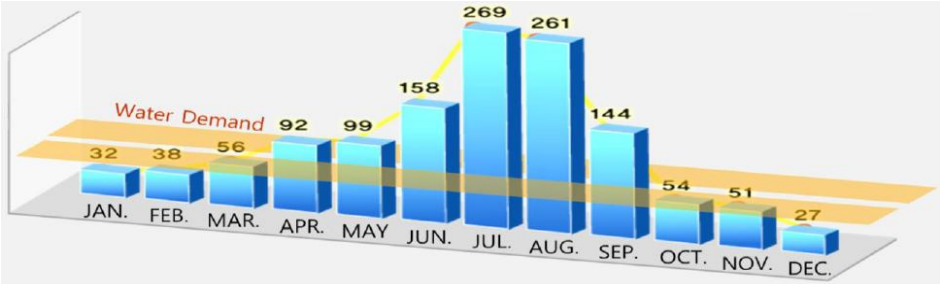
Korea 2,629㎥

Global 16,427㎥

Reason 1 Significant Precipitation variability, 849~1,861mm

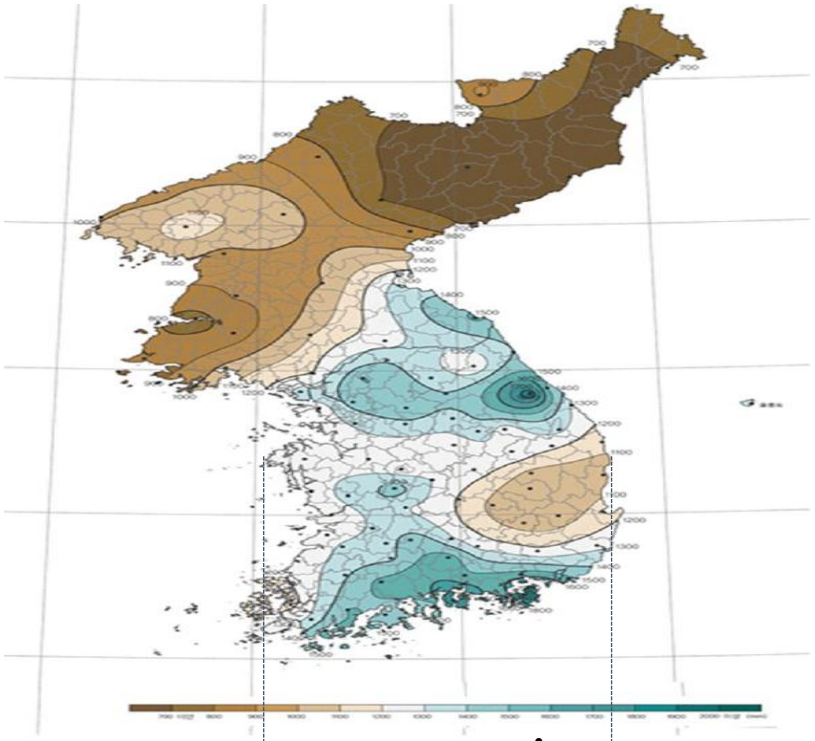


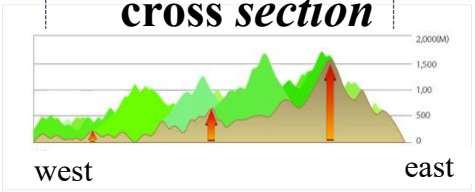
Reason 2 65% of the annual precipitation is concentrated in the Summer season



Reason 3 Regional Differences & Geographical Conditions

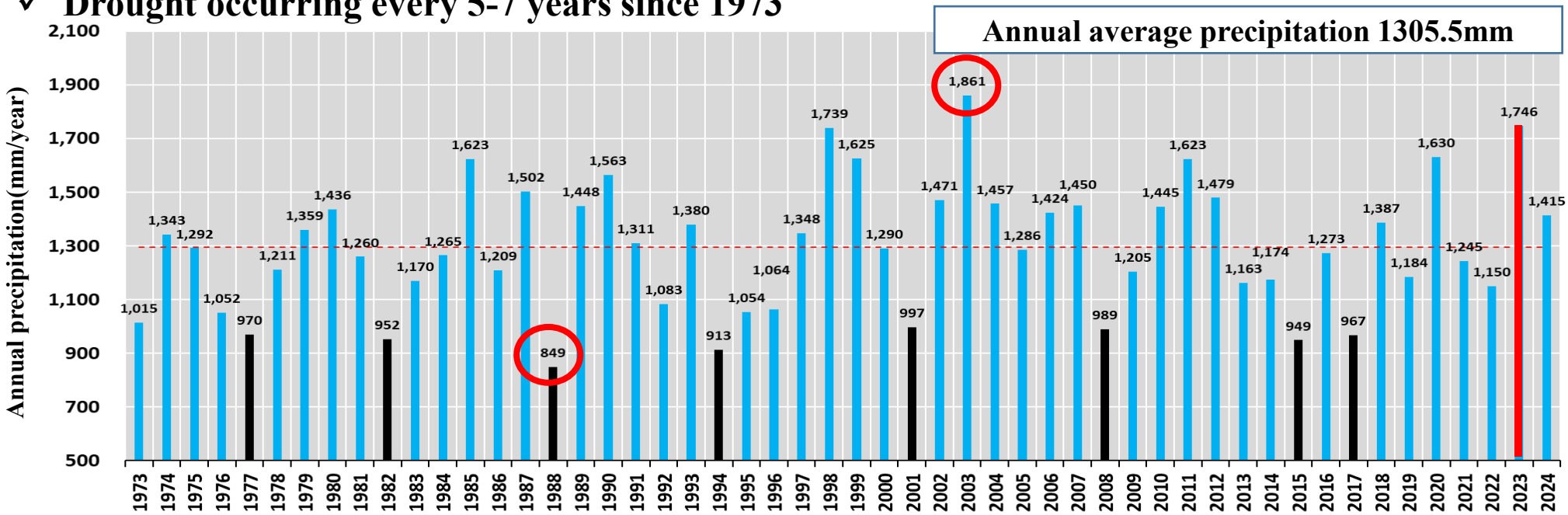
- Nakdong River 1,100mm vs. Southern coast 1,400mm
- rapid runoff due to steep stream gradients

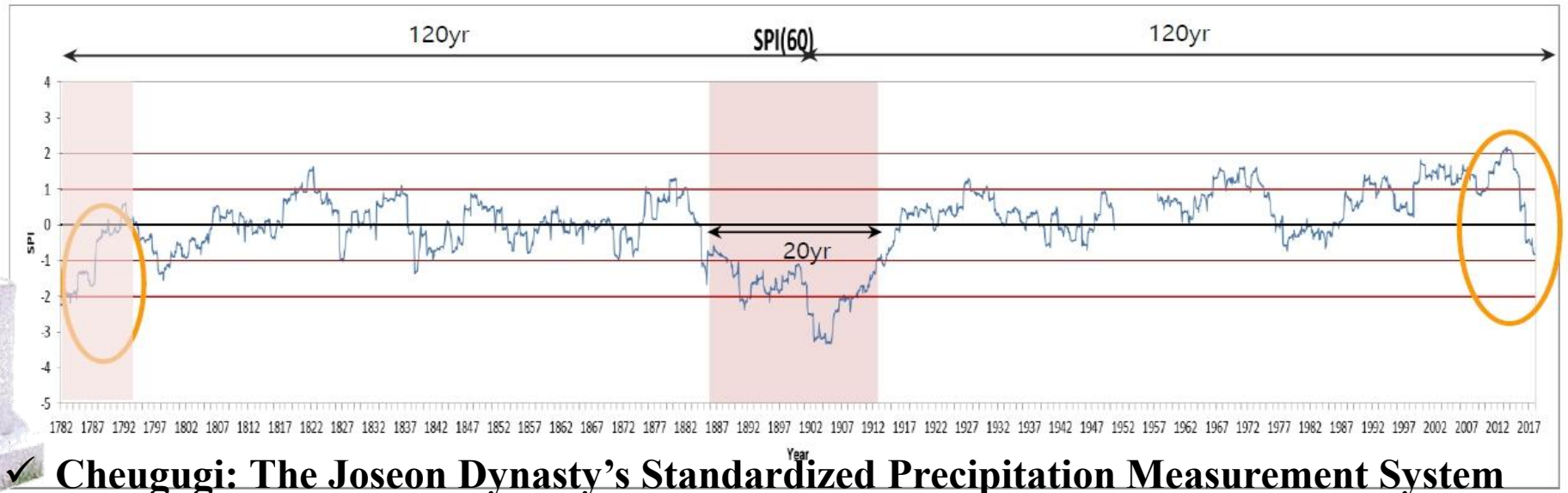




Historical Precipitation data

✓ **Drought occurring every 5-7 years since 1973**





✓ **Cheugugi: The Joseon Dynasty's Standardized Precipitation Measurement System**

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Severe drought events in the Gwangju and Jeonnam regions

Severe Drought in Gwangju and Jeonnam Region in 2022-2023

<The upper floor of Dongbuk Dam located in Hwasun>

"Six Days Without Water: Even Washing Faces is a Luxury; Residents Travel to the Mainland Seeking Emergency Water."

가뭄이 바꾼 섬 주민들의 일상

노화도 '2일 급수, 6일 단수' 조치
목욕·빨래는 급수 기간에만 하고
급식에서 설거지 어려운 메뉴 빼
식수 불합격 지하수 퍼 쓰는 판
섬진강댐 저수율 19% '역대 최저'

남부지역을 덮친 50년 만의 최악의 가뭄으로 전남 완도군 노화도에서는 '2일 급수, 6일 단수'라는 극단적인 조치가 일상이 됐다. 학교 급식 메뉴에서 고기와 같은 기름기 많은 메뉴를 빼 설거지에 사용하는 물을 줄이고, 양치할 때도 컵 사용은 필수가 됐다. 노화도뿐 아니라 남부지역의 섬 주민들은 그나마 물 사정이 낙낙한 뭍으로 '물 동냥'을 다니기도 한다. 서울신문이 지난 8~10일 찾은 노화도와 경남 통영시 욕지도는 1년 넘게 이어진 가뭄으로 일상이 크게 바뀌었다.

완도에서도 40분 정도 배를 타고 들어가야 하는 노화도는 최근 '2일 급수, 4일 단수'에서 '2일 급수, 6일 단수' 조치를 취하고 있다. 이 지역 수원지의 저수율은 1.97%에 그친다. 어곳뿐 아니라 완도 금일, 보길, 소안 등 다른 섬들도 수원지 저수율이 4~7%대라 사정이 다르지 않다. 주민들은 식수 불합격 판정을 받은 관정의 지하수까지 퍼 쓰는 형편이다.

긴 가뭄은 초등학생들의 급식 메뉴마저 바꿨다. 노화중앙초등학교는 돈가스나 새우튀김처럼 기름기가 많은 음식은 설거지할 때 물 사용이 많아 제공 횟수를 줄였다. 대신 오이부추겉절이, 야채비빔국수, 디시마무침과 같은 메뉴가 자리를 대했다. 교실과 복도를 청소할 때도 물을 뿌리지 않고 걸레질만 한다. 신연심 교장은 "결례를 행굴 물도 아껴 써야 하지만, 이로 인해 아이들 호흡기 질환이 우려된다"고 했다.

노화도 길거리에는 3t짜리 파란색 물탱크가 놓여 있다. 급수 기간 이곳에 물을 채워 놓고 6일 동안 써야 한다. 주민 김경미(63)씨는 "목욕과 빨래는 급수 기간에만 하고, 2~3번 일을 보고 모아서 변기 물을 내린다"며 "채소 행군 물이나 세수한 물은 모아 뒀다가 화장실 청소할 때 쓴다"고 말했다.

노화중앙초에서도 물탱크가 '생명수'나 다름없다. 본관, 급식실, 교직원 관사를 포함해 총 80t의 물을 저장해 쓰고 있지만 사흘이면 20t짜리 물탱크 하나가 동난다. 학교 식당 앞 음수대 수도꼭지는 사용하지 않은 지 오래돼 녹슬어 있었다. 먹고, 마시고, 씻는 것조차 여의찮은 이곳에서 아이들은 '생존'을 위해 물을 아끼는 게 몸에 배어 있었다. 이틀 닦을 때는 개인 양치컵에 한 번만 물을 담아 입을 헹궜고, 1초만 물을 틀어 우유갑을 씻었다.

통영에서 배로 1시간 30분 정도 걸리는 욕지도에서는 민박이나 펜션처럼 물 사용량이 많은 곳을 운영하는 주민들이 다른 지역으로 물 동냥을 다닌다. 한상봉 욕지도 주민자치위원장은 "면사무소에서 농수로 저장해 놓은 물을 받아 가기도 하고, 욕지로 나가 돈을 주고 물을 실어 오기도 한다"고 했다.

'물이 많은 섬'으로 유명한 욕지도도 최악의 가뭄을 피해 가지 못하면서 욕지댐 저수율은 36.6%로 떨어졌다. 주민 강성근씨는 "이웃집 98세 어르신이 '살면서 거기(욕지댐) 물이 마른 건 처음 본다'고 하더라"고 전했다.

사정이 이렇다 보니 다른 지역에서 온 교사들은 평일에 빨랫감을 모아 뒀다가 주말에 육지 본가에 가져가 빨래하고 온다. 욕지면사무소 관계자는 "주말에 물을 길어다가 논금만 때는 주민들도 많다"고 말했다.

전북의 주요 식수원이자 농업용수 공급원인 섬진강댐의 저수율이 19.2%로 역대 최저 수준을 기록했다. 한국수자원공사 섬진강댐지사가 다음달 중순부터 농업용수 공급을 시작하면 강물이 완전히 마를 가능성도 있다.

통영·완도 김정화·무인 류지홍 기자

Severe drought events in the Gwangju and Jeonnam regions

<2022>

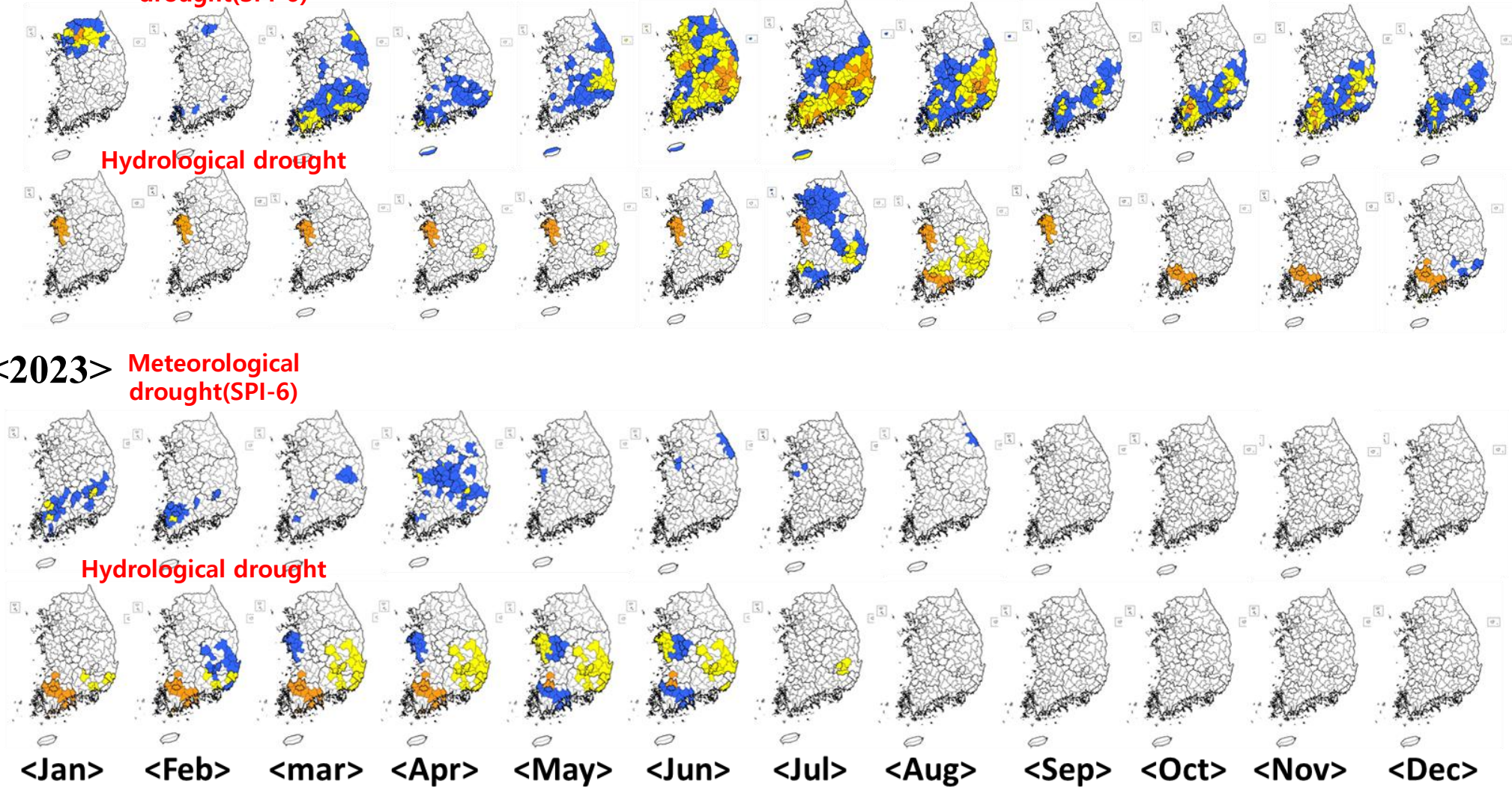
Meteorological drought(SPI-6)

Hydrological drought

<2023>

Meteorological drought(SPI-6)

Hydrological drought



Severe drought events in the Gangneung, Gangwon Province(2025)

National Disaster Emergency Declaration(8.30.~9.22.)


Obong Reservoir at 10% Storage

Declaration of a State of Disaster


Fire & Military Water Transport


Nationwide Bottled Water Relief

Water Saving Campaign


Pressure Control for Water Saving

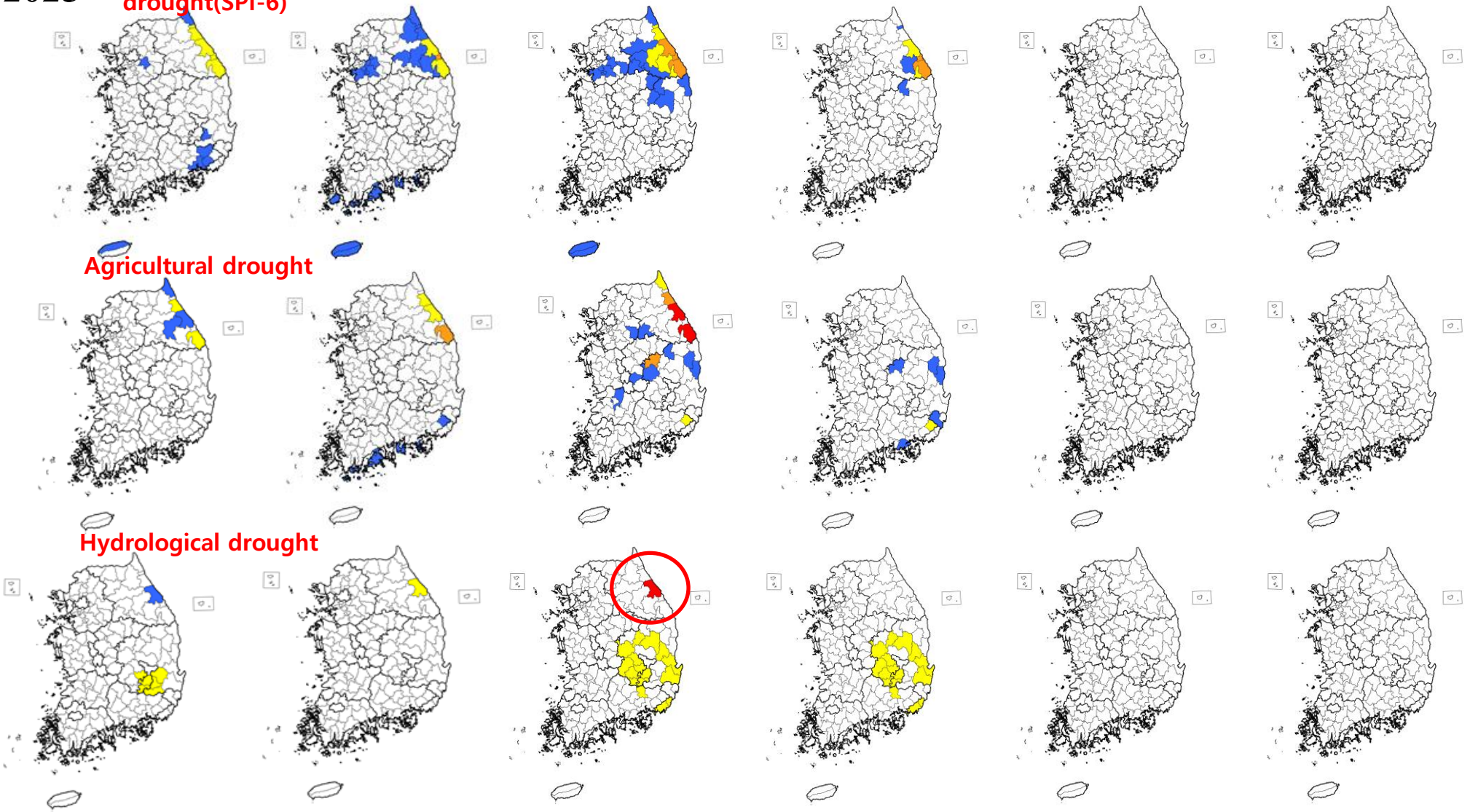
Severe drought events in the Gangneung, Gangwon Province(2025)

<2025>

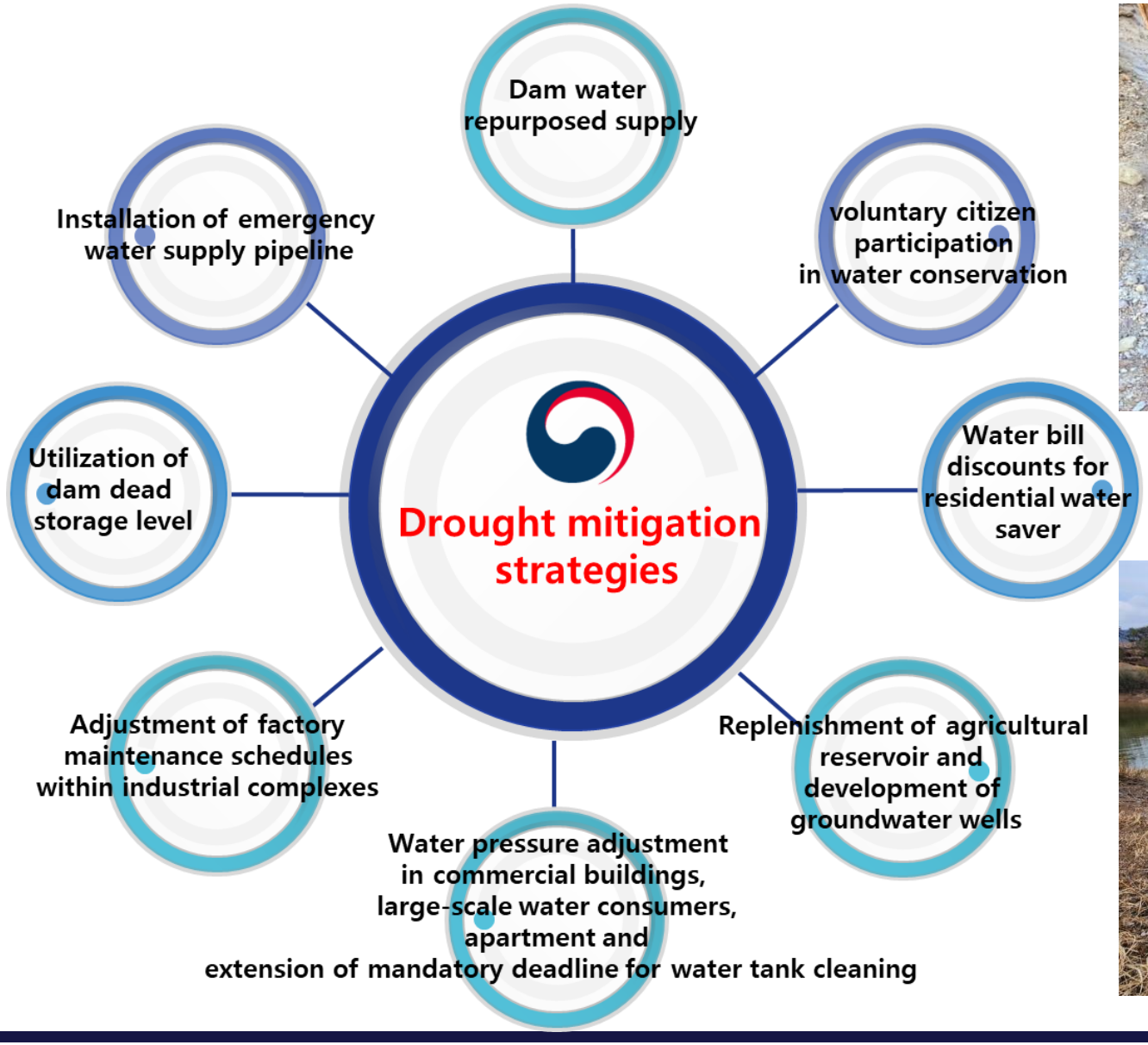
Meteorological drought(SPI-6)

Agricultural drought

Hydrological drought



Countermeasures to overcome the recent severe droughts



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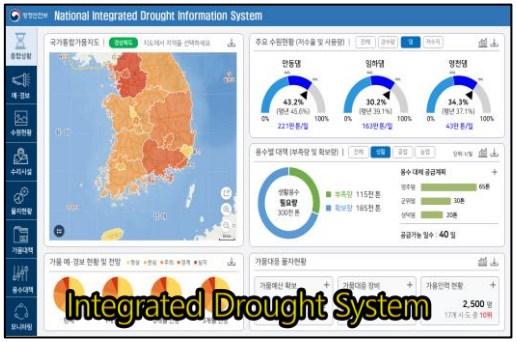
Introduction to National Integrated Drought Center(NID

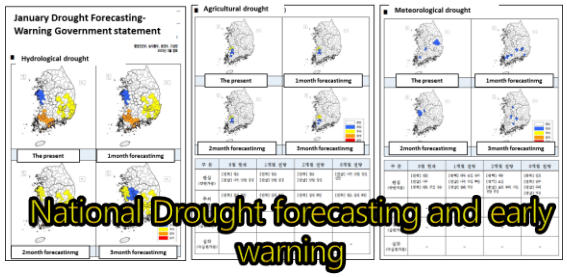
- **Policy & Governance**
  - Developing drought policies and providing technical assistance for central and local governments
- **Operational Early Warning**
  - Technical support for the National Drought Forecasting and Early Warning System.
- **Data Informatics & Systems**
  - Developing and managing the National Integrated Drought Information System (NIDIS).
  - Publishing authoritative national drought information and statistics.
- **Monitoring & Innovation**
  - Implementing sensor-based drought monitoring technologies.
  - Leading specialized R&D for drought disaster mitigation.

rought policy and technical support for central ·local gov.

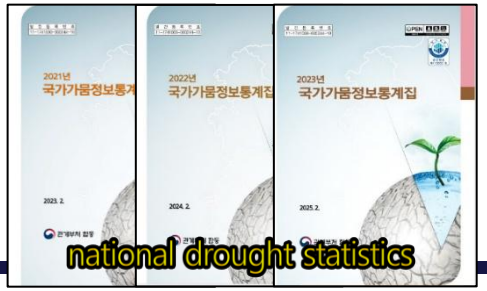


Integrated Drought System

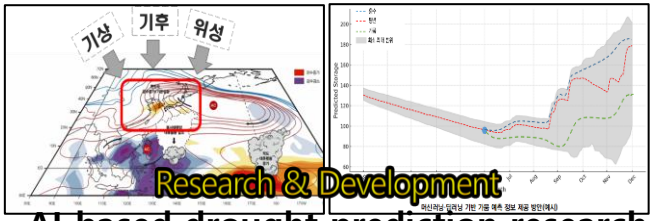
Sensing-based drought monitoring



National Drought forecasting and early warning



national drought statistics



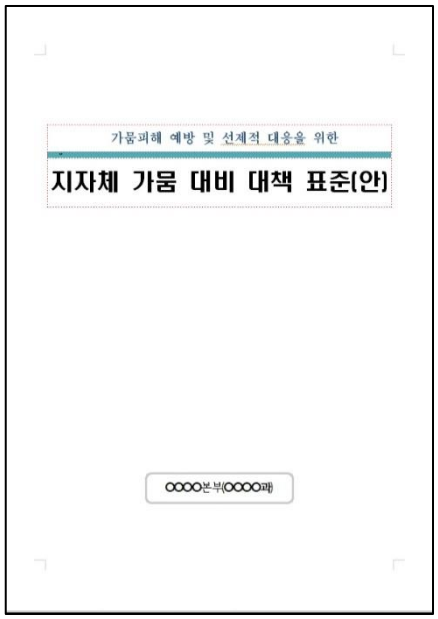
Research & Development

AI based drought prediction research

Establishment of Drought preparedness plan by local gov.

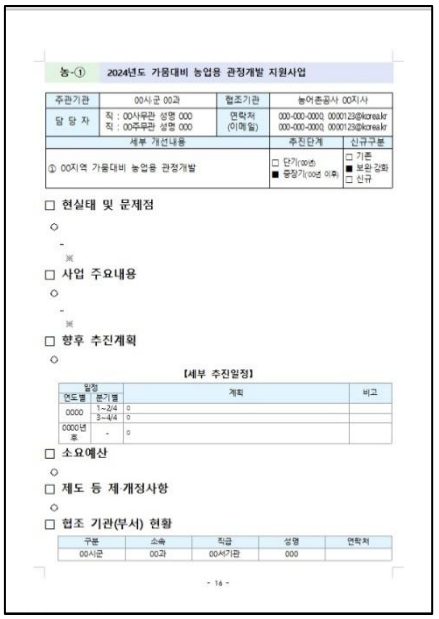
✓ **Amendment to the ‘COUNTERMEASURES AGAINST NATURAL DISASTERS ACT’**

Article 32-2 (Drought Preparedness Measures by Local Governments)
The head of a local government shall formulate regional drought preparedness measures, which include matters prescribed by Presidential Decree, such as securing equipment for drought response and cooperating with neighboring local governments, and shall take necessary actions to implement such measures.(’25.1.7.)


가뭄피해 예방 및 선제적 대응을 위한

지자체 가뭄 대비 대책 표준(안)

OOOO본부(OOOO과)


농-① 2024년도 가뭄대비 농업용 관정개발 지원사업

주관기관	OO시군 OO과	협조기관	농어촌공사 OO지사
담 당 자	직 : OO사무관 성명 000 직 : OO주무관 성명 000	연락처 (이메일)	000-000-0000, 0000123@korea.kr 000-000-0000, 0000123@korea.kr
세부 개선내용		추진단계	신규구분
① OO지역 가뭄대비 농업용 관정개발		□ 단기(00년) ■ 중장기(00년 이후)	□ 기존 ■ 보완·강화 □ 신규

□ 현실태 및 문제점

○

-

※

□ 사업 주요내용

○

-

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□ 향후 추진계획

○

【세부 추진일정】

연도별	분기별	계획	비고
0000	1~2/4	○	
	3~4/4	○	
0000년 중	-	○	

□ 소요예산

○

□ 제도 등 제·개정사항

○

□ 협조 기관(부서) 현황

구분	소속	직급	성명	연락처
OO시군	OO과	OO서기관	000	

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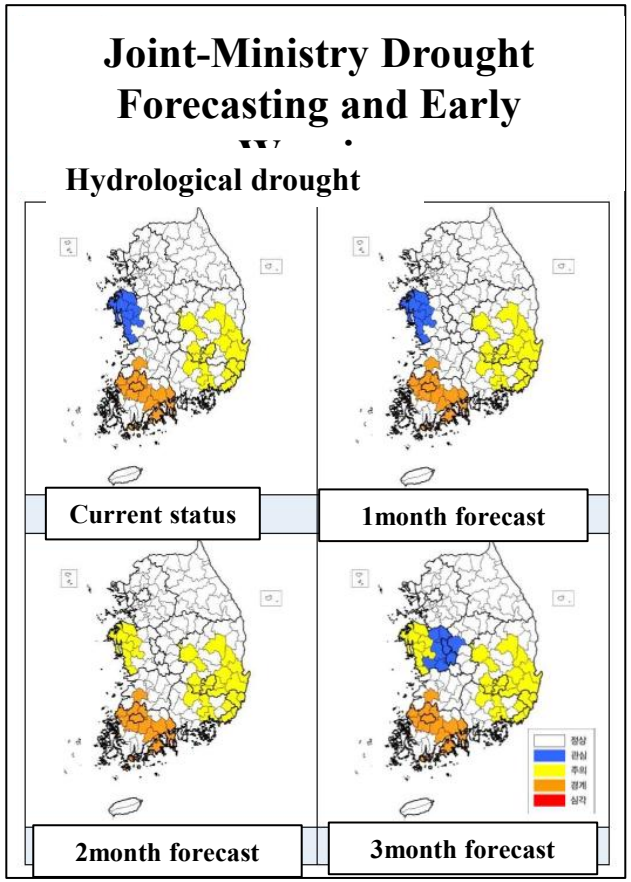
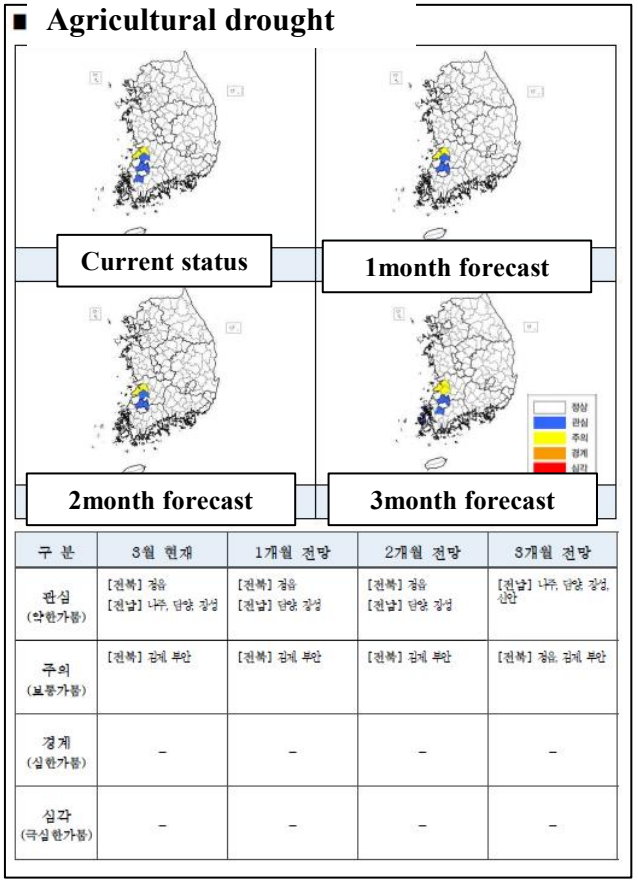
<Guideline Preparation>

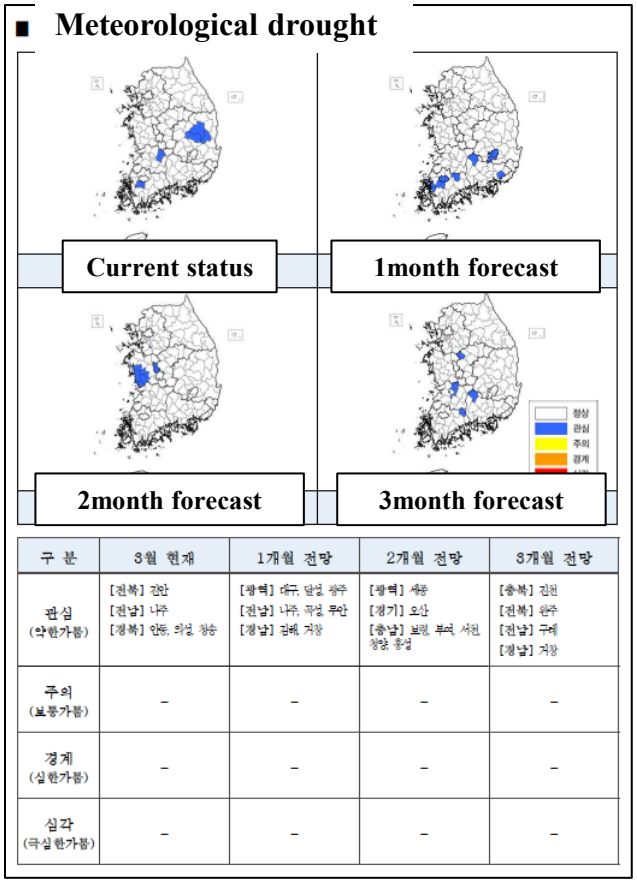
<Consulting and meetings with local Gov.>

Announcement of Joint-Ministry Drought Forecasting and Early Warni





구 분	3월 현재	1개월 전망	2개월 전망	3개월 전망
관심 (약한가뭄)	[전북] 정읍 [전남] 나주, 담양 장성	[전북] 정읍 [전남] 담양 장성	[전북] 정읍 [전남] 담양 장성	[전남] 나주, 담양 장성, 신안
주의 (보통가뭄)	[전북] 김제 부안	[전북] 김제 부안	[전북] 김제 부안	[전북] 정읍, 김제 부안
경계 (심한가뭄)	-	-	-	-
심각 (극심한가뭄)	-	-	-	-



구 분	3월 현재	1개월 전망	2개월 전망	3개월 전망
관심 (약한가뭄)	[전북] 전안 [전남] 나주 [경북] 안동, 의성, 청송	[광역] 대구, 달성, 청주 [전남] 나주, 곡성, 부안 [경남] 김해, 거창	[광역] 세종 [경기] 오산 [충남] 보령, 부여, 서천 청양, 홍성	[충북] 진천 [전북] 완주 [전남] 구례 [경남] 거창
주의 (보통가뭄)	-	-	-	-
경계 (심한가뭄)	-	-	-	-
심각 (극심한가뭄)	-	-	-	-

[announcement] The Ministry of Interior and Safety

[announcement cycle] Every month

[target region] 167 cities and counties

[division] Meteorological, Agricultural, hydrological drought

[contents] Current status, 1 · 2· 3 month forecast

[level] 4 stage(Attention(Blue), Caution(yellow), Alert(Orange), Severe(Red))

Joint-Ministry Drought Task Force Governance

Participated Ministries in Drought TF

Meteorological Drought — Korea Meteorological Administration

Agricultural Drought — Ministry of Agriculture, Food and Rural Affairs

Hydrological Drought — Ministry of Environment

Social-Economical Drought — Ministry Of the Interior and Safety

Composition of Drought TF Organization

TF Coordinator (MOIS)
Director General for Disaster Response Policy

Blue House
Prime Minister

Central Government

- **General Management** (MOIS)
  Climate Disaster Response Division
- **Agriculture Management** (MAFRA)
  Rural Infrastructure Division
- **Living water Management** (ME)
  Water Resources Development Division
- **Weather information** (KMA)
  Climate Extreme Analysis and Assessment Team

NDMI — Analyze information
National Integrated Drought Center

FCO — River, Groundwater information
Flood Control office

Local Governments & Public Enterprise

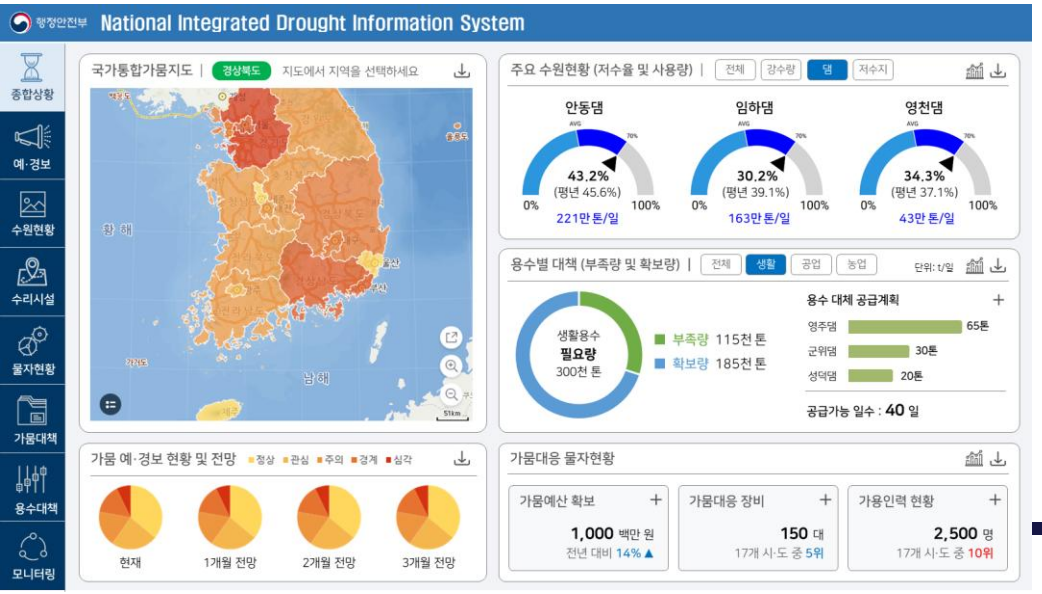
- **167 Local Governments**
  Local Water Supply management
- **Korea Rural community Corporation**
  Reservoir for agriculture management
- **K-water Coporation**
  Dam for living water management

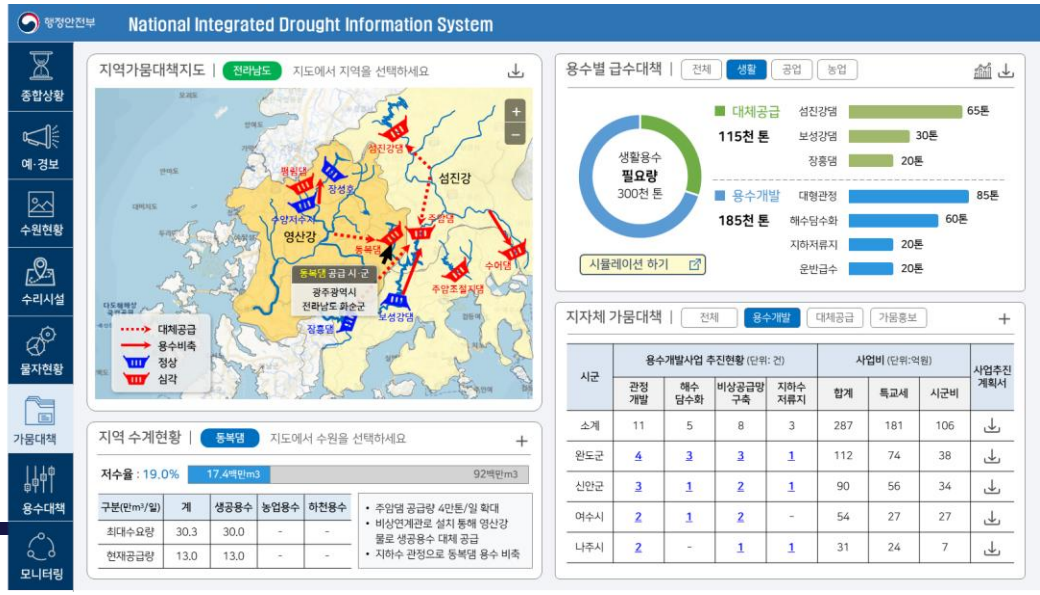
Construction of NIDIS (Presidential Agenda 51)

✓ Project Overview: National Integrated Drought Information System (NIDIS)

- Project Overview: National Integrated Drought Information System (NIDIS)
- Period: July 2026 – December 2027
- Objectives:
  - Provide comprehensive and accessible drought information to the central and local government, and the general public.
  - Support the formulation of policies and strategic project plans.
  - Enhance efficiency in drought management and emergency response when severe droughts occur.
- Key contents

Integrated Drought Forecasting & Warning | **Long-term Drought Monitoring Information** | **Integrated Drought Situation Board (Dashboard)** | **Fundamental Drought Data & Historical Records** | **Real-time Drought Damage & Impact Status**





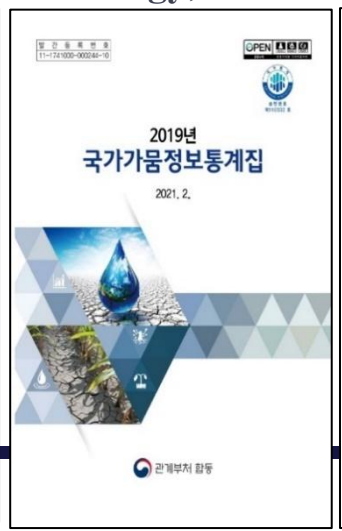
National Drought Statistics

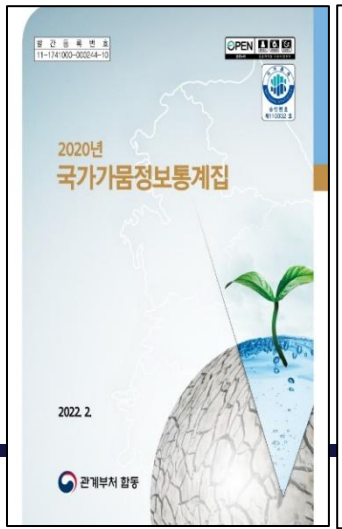
Objective of Statistical Publication

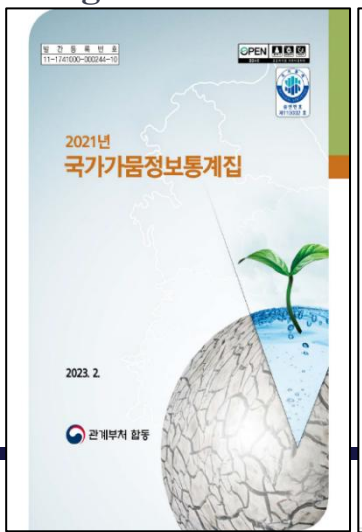
- **Policy & Strategic Support**: To assist central and local governments in formulating drought-related policies and strategic project plans
- **Public Awareness & Transparency**: To enhance public understanding of drought and provide accurate, reliable information.
- **Data Continuity & Openness**: To secure data continuity by identifying and disclosing previously non-public internal data from relevant ministries

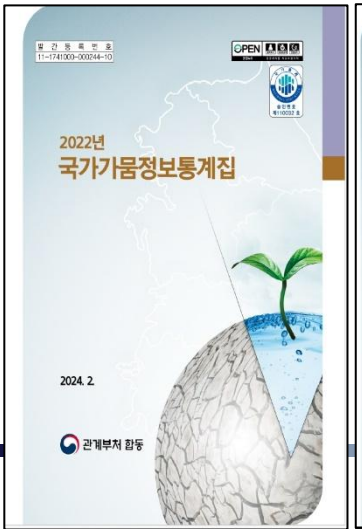
Overview

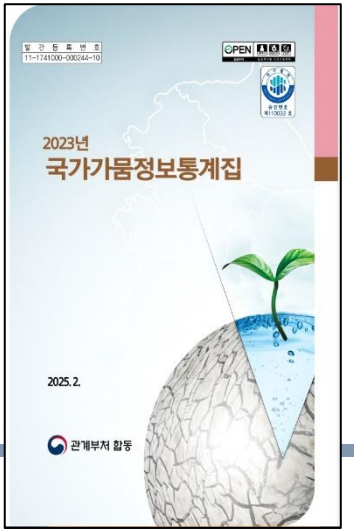
- (Collection Procedure) **Local Governments · Related public organization → Participating Ministries → NIDC**
- (Target region) **167 Provinces**
- (publication Cycle) **Annually** in February
- (Participating Ministries) Ministry of the **Interior and Safety**, **Agriculture-Food and Rural Affairs**, **Trade-Industry and Energy**, **Environment**, **Korea Meteorological Administration**





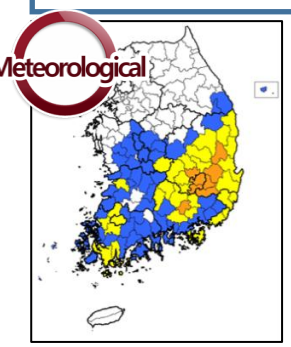


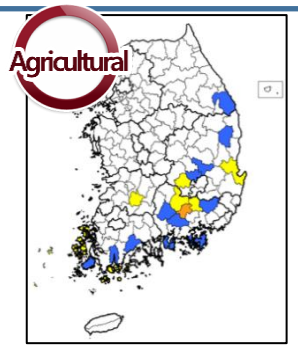


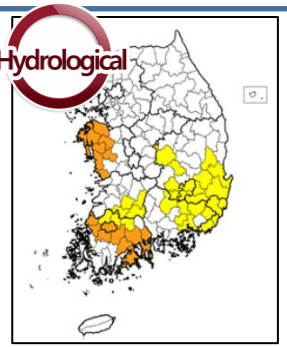


(R&D 1) Integrated Early Warning: Technology & Governance

Primary Indicators (3): Drought Forecasting and Warning by TF

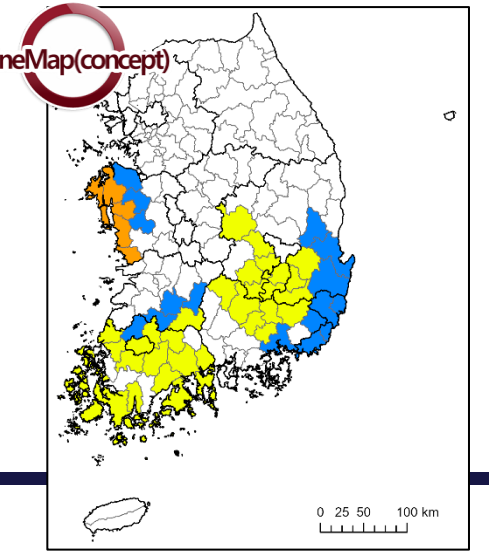




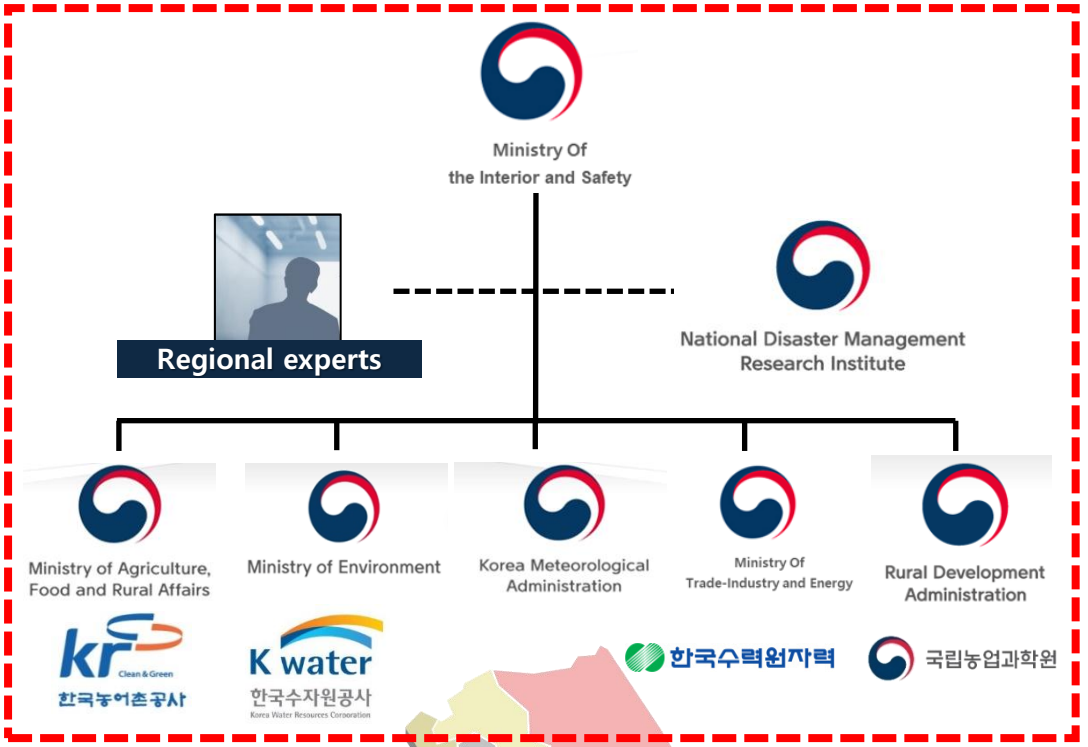


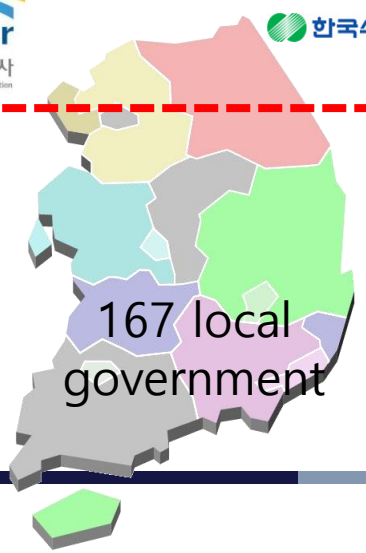
Supplemental indicators(6):

SPI12	SRSI(H)	SRSI(A)
Ground water	Soil Moisture	Actual Water Consumption



National Drought Management Committee (tentative)

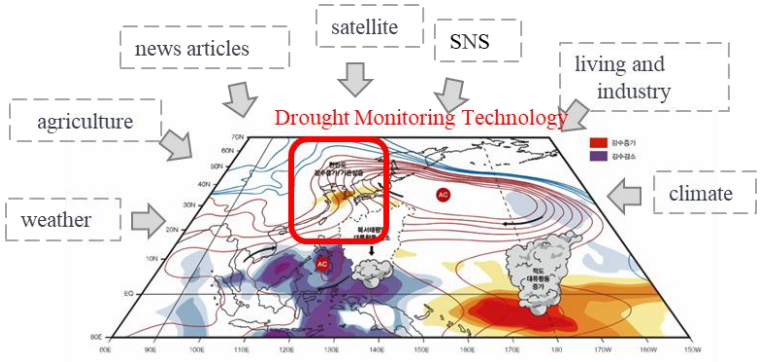


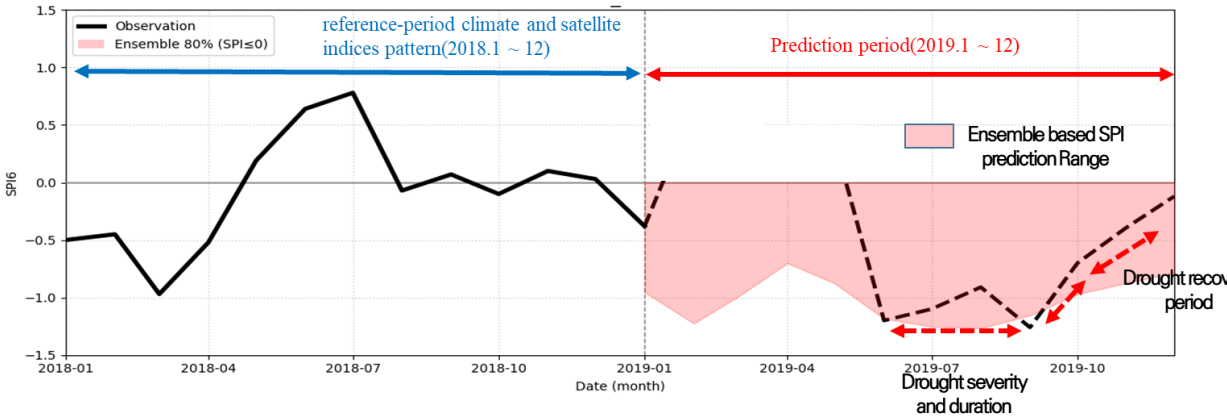


(R&D 2) Development of Big Data and AI-Based Technology for Full-Cycle Drought Forecasting

✓ Development of Long-lead Drought Forecasting Technology in Korea Using Global Climate-Weather Pattern Reproducibility

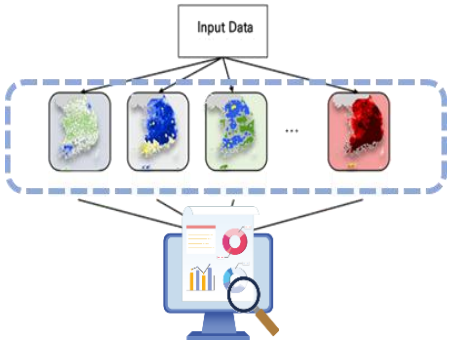
- (Study Area) South Korea

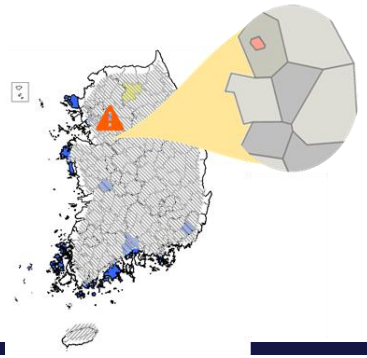


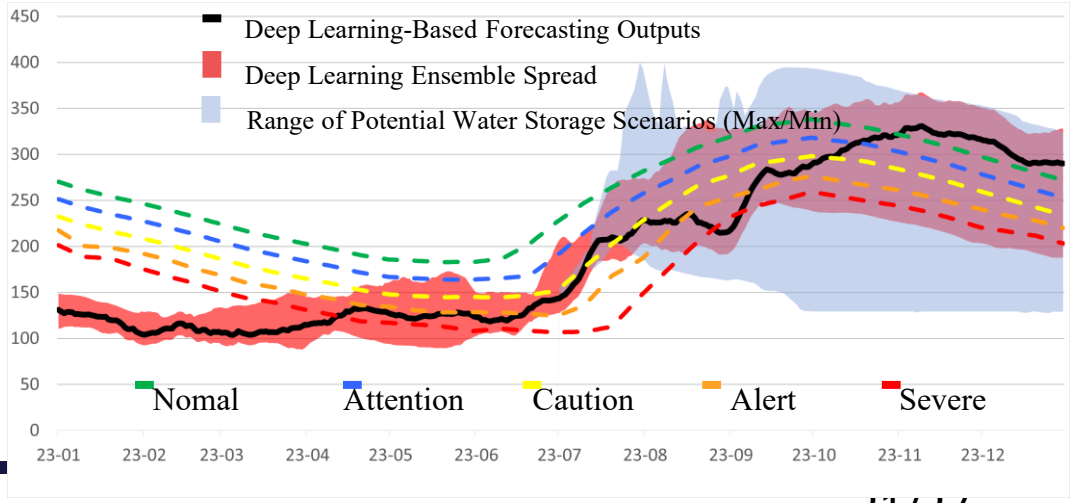


✓ AI(Machine Learning and Deep Learning)-Driven Localized Long-term Drought Forecasting for 167 Administrative Districts in Korea

- (Study Area) 167 City and country level



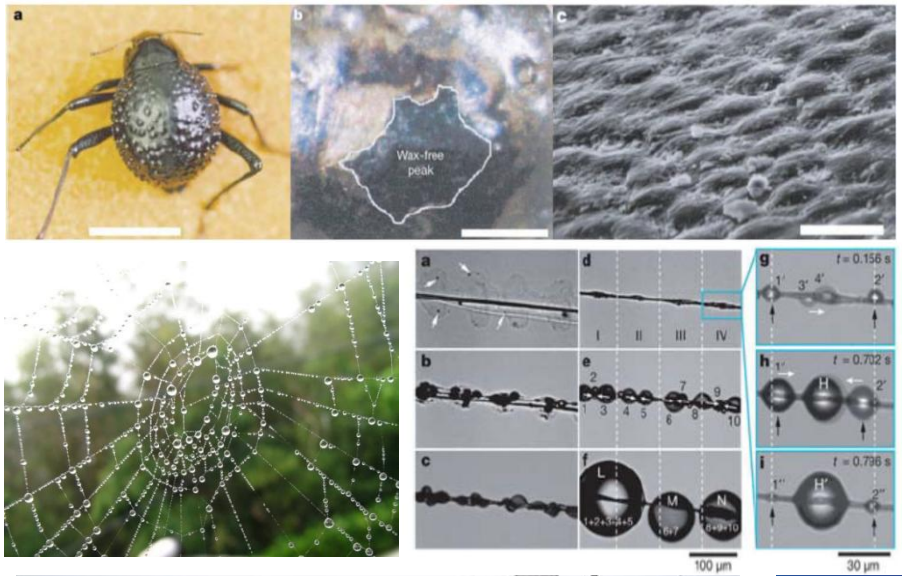




(R&D 3) Overview of the new R&D project

Research Objective: Sustainable Water Solutions for Islands via Fog & Atmospheric Water Generation

<Nature-inspired technology>

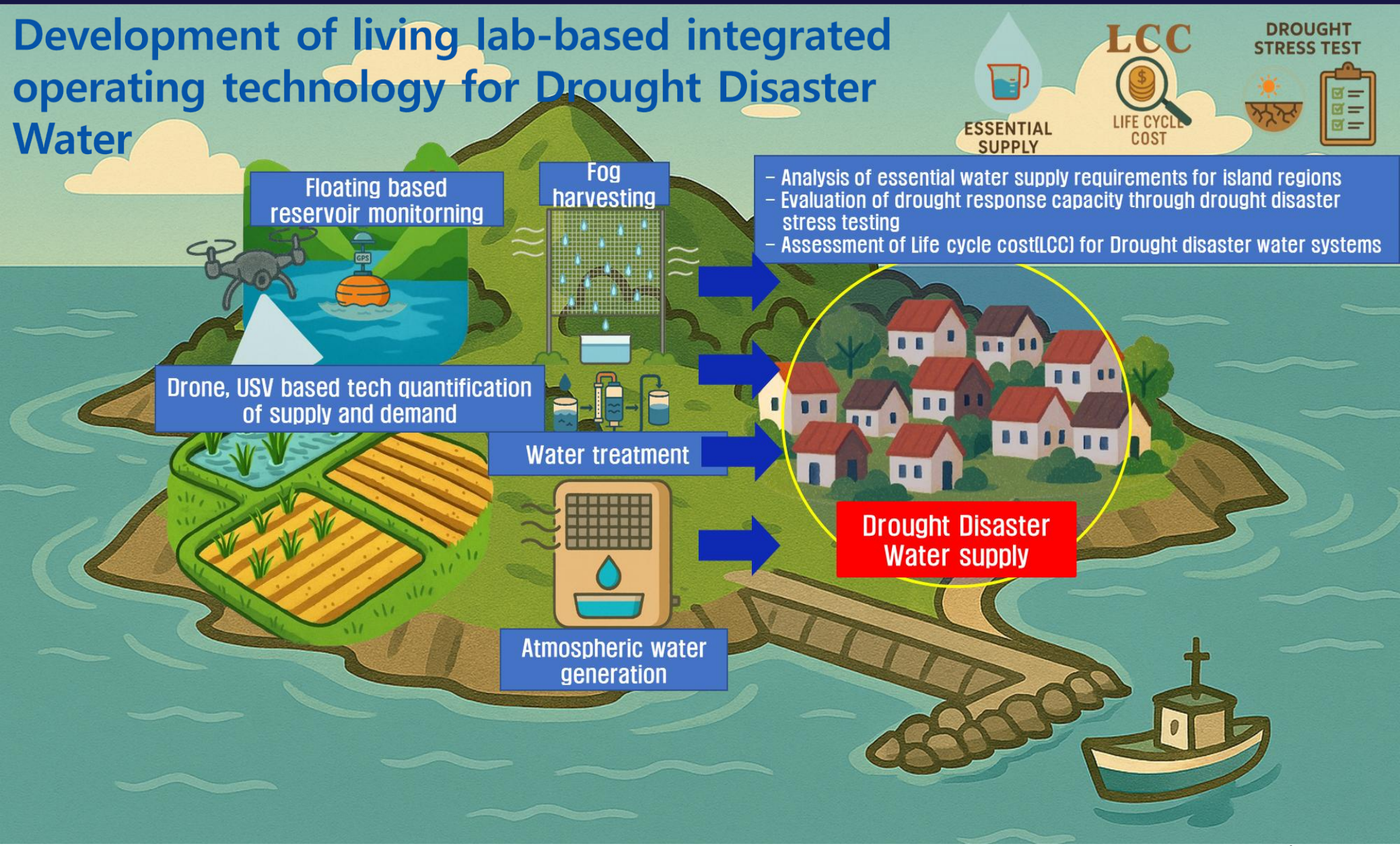


Atmospheric Water generation

<Fog harvesting>

(R&D 3) Overview of the new R&D project

Development of living lab-based integrated operating technology for Drought Disaster Water



Thank you!

Ministry of the Interior and Safety
National Disaster Management
Research Institute

Drought Forecast-Early Warning Rule(4 Level)

level	Drought forecast-warning rule
Attention (Blue)	o **Hydrological Drought**: In Cases Where Drought Measures are Needed, Such as Managing the Surplus of Domestic and Industrial Water Due to Lower River and Water Resource Facility Levels Compared to Normal Average Years for Regular Water Supply o **Agricultural Drought**: **[Paddy Fields]** When the Reservoir Rate During the Farming Season is Below 70% of the Normal Average Year, **[Fields]** When the Effective Soil Moisture Rate During the Farming Season is Below 60% o **Meteorological Drought**: Based on the accumulated Precipitation for the past 6 months, we are using the Standard Precipitation Index (SPI6) of -1.0 or lower. This represents approximately 65% or less compared to the Normal Average Years. It is expected that the meteorological drought will continue. However, it should be noted that this can reflect the rainfall characteristics of each region.
Caution (yellow)	o **Hydrological Drought**: When the water level of rivers and water resource facilities is low, causing insufficient river maintenance flow, or when restrictions are needed for supplying water for river maintenance from dams or reservoirs o **Agricultural Drought**: **[Paddy Fields]** when the storage rate during the farming season is less than 60% of the Normal average year, or when a water shortage is expected for the upcoming farming season's irrigation, **[Fields]** when the effective soil moisture content during the farming season is less than o **Meteorological Drought** : Based on the accumulated Precipitation for the past 6 months, we are using the Standard Precipitation Index (SPI6) of -1.5 or lower. This represents approximately 55% or less compared to the Normal Average Years. It is expected that the meteorological drought will continue. However, it should be noted that this can reflect the rainfall characteristics of each region.

Drought Forecast-Warning Rule(4 Level)

level	Drought forecast-warning rule
Alert (Orange)	o **Hydrological Drought**: When there is or is likely to be a shortage of domestic and industrial water in rivers and water resource facilities, and limitations are needed for the supply of water for river maintenance and agriculture o **Agricultural Drought**: **[Paddy Fields]** For paddy fields, when the storage rate during the farming season is less than 50% of the Normal Average Years, **[Fields]** when the effective soil moisture content during the farming season is less than 30% o **Meteorological Drought** : Based on the accumulated Precipitation for the past 6 months, we are using the Standard Precipitation Index (SPI6) of -2.0 or lower. This represents approximately 45% or less compared to the Normal Average Years. It is expected that the meteorological drought will continue. However, it should be noted that this can reflect the rainfall characteristics of each region.
Severe (Red)	o **Hydrological Drought** : When the shortage of domestic and industrial water in rivers and water resource facilities is expanding, and restrictions on the supply of domestic and industrial water from rivers, dams, reservoirs, etc. have occurred or are necessary o **Agricultural Drought**: **[Paddy Fields]** For paddy fields, when the storage rate during the farming season is less than 40% of the Normal Average Years, **[Fields]** when the effective soil moisture content during the farming season is less than 15% o **Meteorological Drought** : Based on the accumulated Precipitation for the past 6 months, we are using the Standard Precipitation Index (SPI6) of -2.0 or lower. This represents approximately 45% or less compared to the Normal Average Years. In the event that a meteorological drought persists for 20 days, leading to the anticipation of nationwide drought damage. However, it should be noted that this can reflect the rainfall characteristics of each region.