National Drought Early Warning System in South Korea

19th August 2023

Woosung Nam (wsnam@kwater.or.kr)
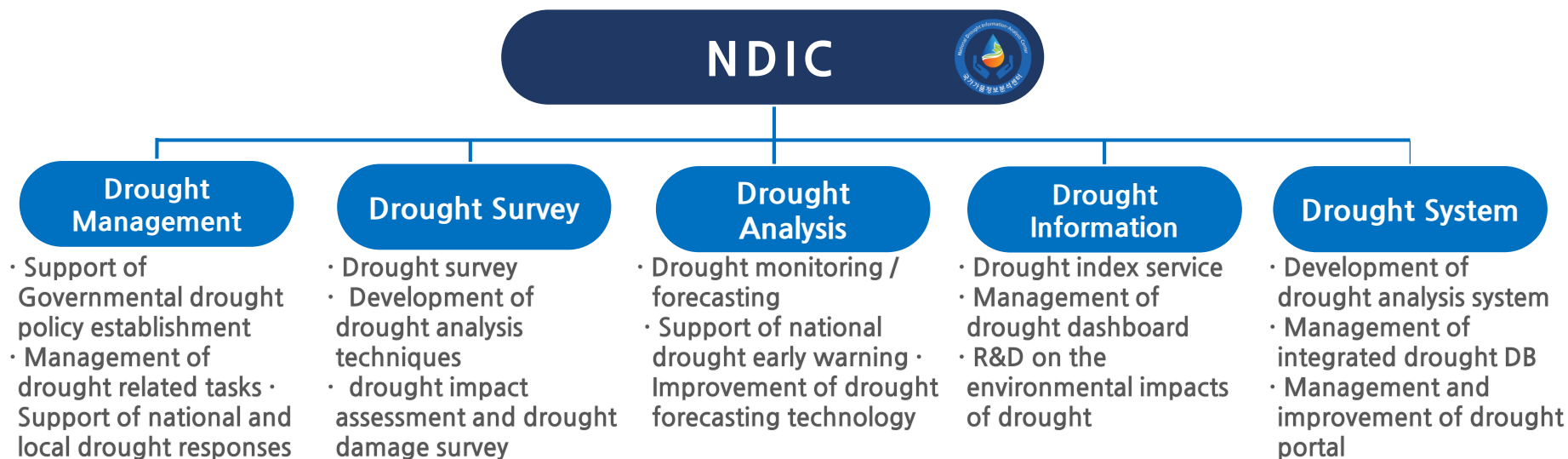
Yutae Lee (ytl1124@kwater.or.kr)

National Drought Information Analysis Center
K-water

Our History

- '14~ '15 : Extreme drought in the mid-western region of South Korea

- '15. 9 : National Policy Coordination Meeting

    1) Implementation of national drought early warning service

    2) Decision on the Establishment of NDIC for technical support

- '15. 11 : Establishment of NDIC (National Drought Information analysis Center)

NDIC

Drought Management	Drought Survey	Drought Analysis	Drought Information	Drought System
· Support of Governmental drought policy establishment · Management of drought related tasks · Support of national and local drought responses	· Drought survey · Development of drought analysis techniques · drought impact assessment and drought damage survey	· Drought monitoring / forecasting · Support of national drought early warning · Improvement of drought forecasting technology	· Drought index service · Management of drought dashboard · R&D on the environmental impacts of drought	· Development of drought analysis system · Management of integrated drought DB · Management and improvement of drought portal

Drought Monitoring

Drought Index

- SPI (Precipitation)
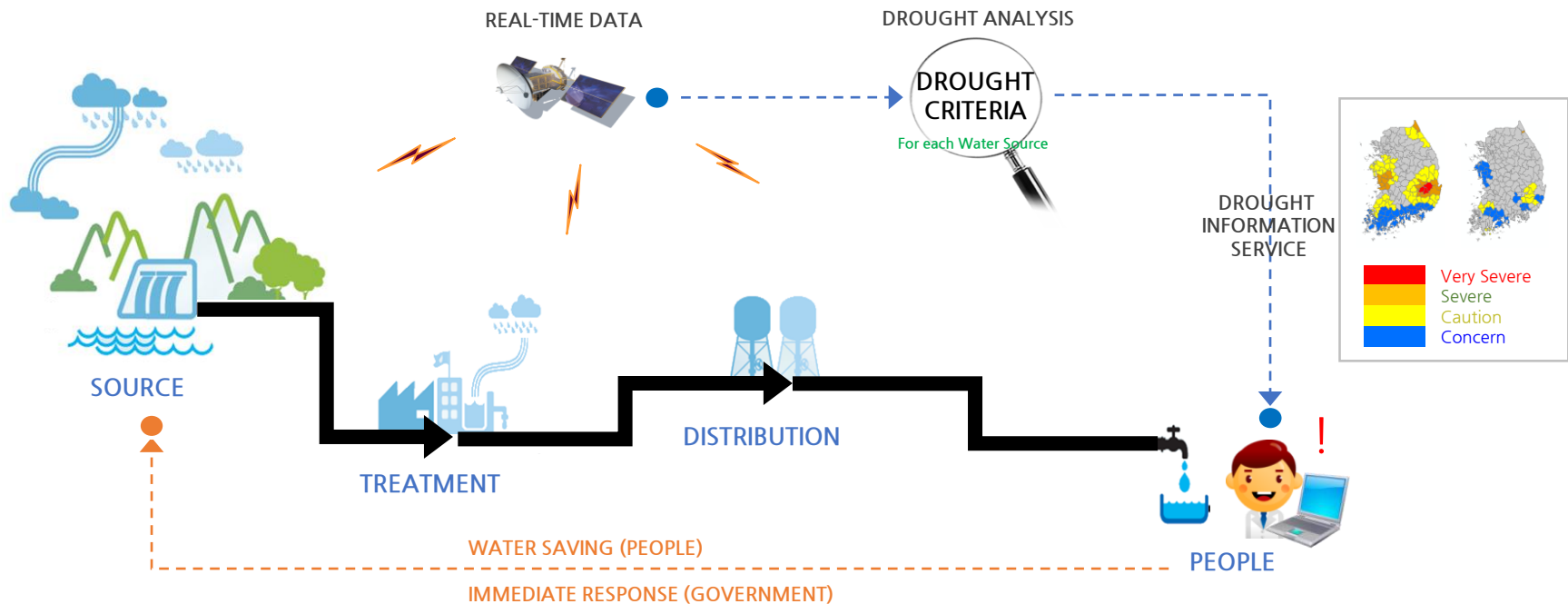- PDSI (Temp., Evaporation..)
- SMI (Soil Moisture)

Water Resources Assessment

- Water sources monitoring in near real time
- Water resources assessment

People can't recognize drought

People can recognize drought

REAL-TIME DATA

DROUGHT ANALYSIS

DROUGHT CRITERIA

For each Water Source

DROUGHT INFORMATION SERVICE

Very Severe
Severe
Caution
Concern

SOURCE

TREATMENT

DISTRIBUTION

PEOPLE

!

WATER SAVING (PEOPLE)

IMMEDIATE RESPONSE (GOVERNMENT)

K water

Drought Monitoring

In Real time

Data Collecting

- Ministry of Environment
- Ministry of Agriculture, Food and Rural Affairs
- Ministry of the Interior and Safety
- Korea Meteorological Administration
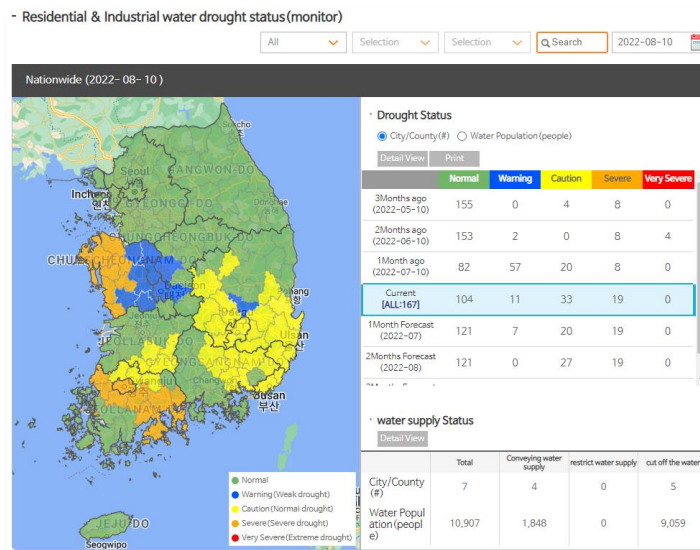
Sharing

WINS
(Water Information Network System)

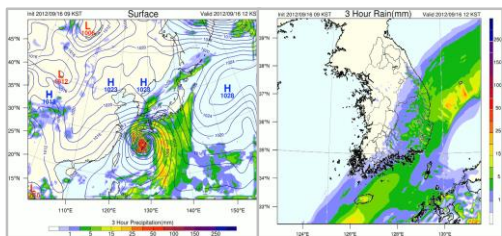## Saving

K-water Server

Drought Criteria
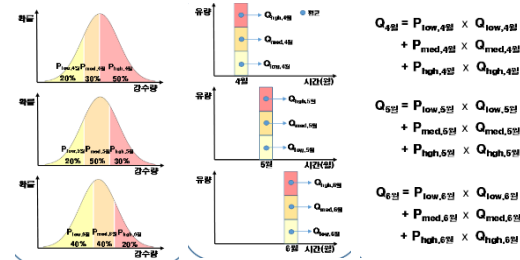For Each Water Source

Drought Monitoring

- Residential & Industrial water drought status (monitor)

All | Selection | Selection | Search | 2022-08-10

Nationwide (2022-08-10)

Drought Status

City/County (#) ○ Water Population (people)

Detail View | Print

	Normal	Warning	Caution	Severe	Very Severe
3Months ago (2022-05-10)	155	0	4	8	0
2Months ago (2022-06-10)	153	2	0	8	4
1Month ago (2022-07-10)	82	57	20	8	0
Current [ALL:167]	104	11	33	19	0
1Month Forecast (2022-07)	121	7	20	19	0
2Months Forecast (2022-08)	121	0	27	19	0

water supply Status

Detail View

	Total	Conveying water supply	restrict water supply	cut off the water
City/County (#)	7	4	0	5
Water Population (people)	10,907	1,848	0	9,059

Legend:
- Normal
- Warning (Weak drought)
- Caution (Normal drought)
- Severe (Severe drought)
- Very Severe (Extreme drought)

K water

Drought Forecasting

Weather Forecast

Korea Meteorological Administration

Sharing

WINS

Analysis
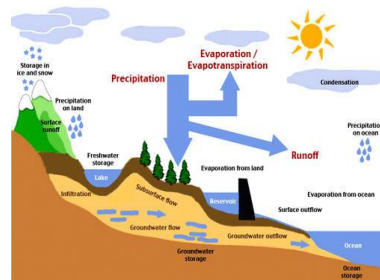
Direct Runoff Modeling

$$Q_{4월} = P_{low,4월} \times Q_{low,4월} + P_{med,4월} \times Q_{med,4월} + P_{high,4월} \times Q_{high,4월}$$

$$Q_{5월} = P_{low,5월} \times Q_{low,5월} + P_{med,5월} \times Q_{med,5월} + P_{high,5월} \times Q_{high,5월}$$

$$Q_{6월} = P_{low,6월} \times Q_{low,6월} + P_{med,6월} \times Q_{med,6월} + P_{high,6월} \times Q_{high,6월}$$

ESP (Ensemble Streamflow Prediction)

Drought Early Warning Service

- 2022. 07 Agricultural Water (Location)

- 2022. 07 Weather (Location)

Drought Criteria

For Each Water Source

Portal & Dashboard

English

Drought Portal
(http://drought.go.kr)

Login required
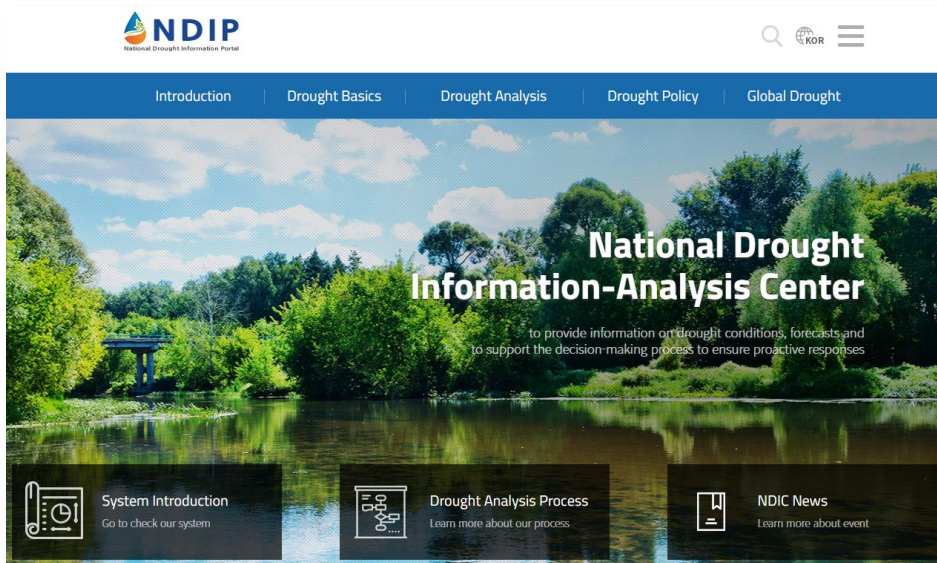
Drought Portal - Dashboard
(http://drought.go.kr)

Drought Portal

⮕ **Address** : https://www.drought.go.kr (launched in 2016)

⮕ **Language** : **Korean, English** (a few page available)

⮕ **Purpose**

  - To provide information on drought conditions and forecasts
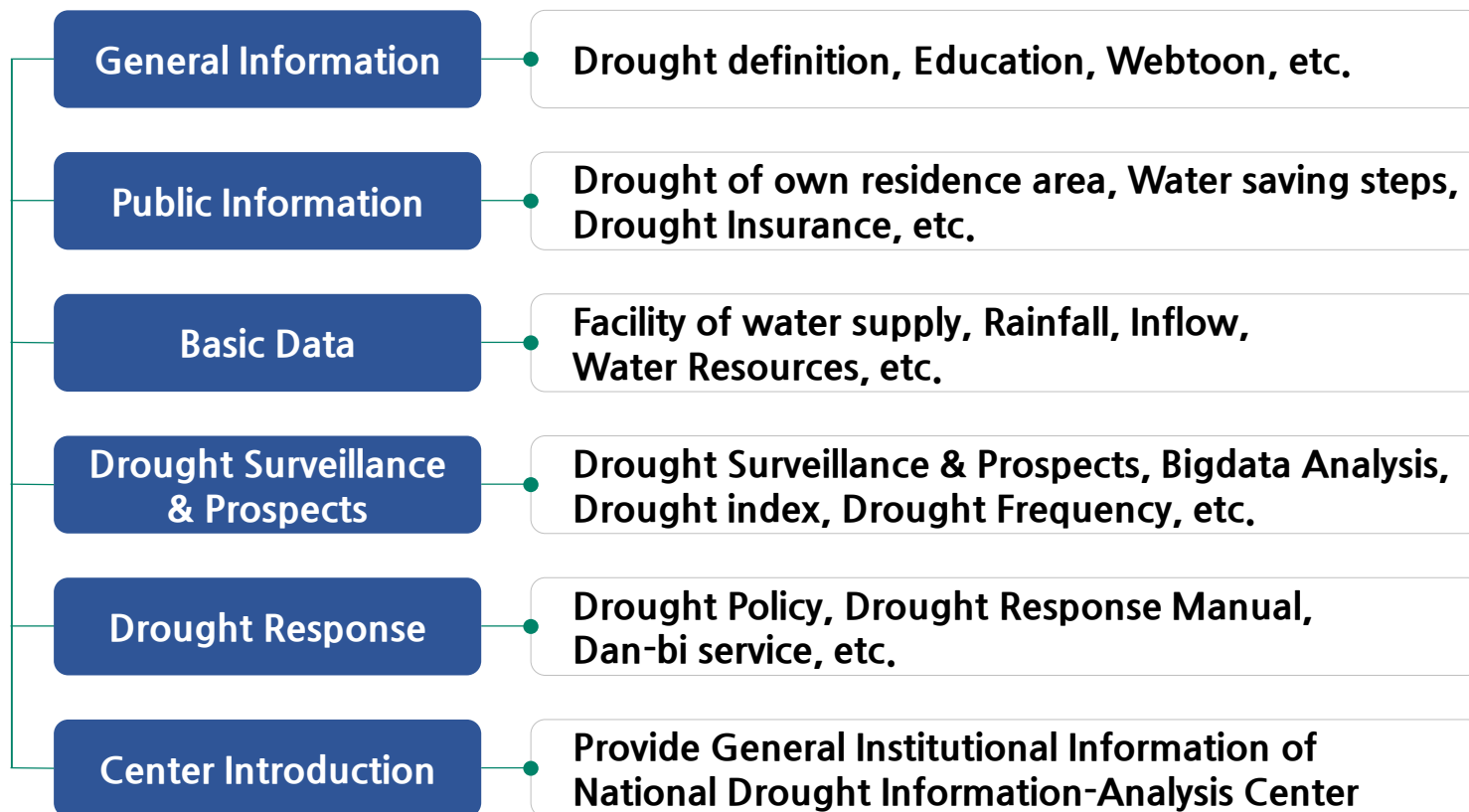 - To support the decision-making process to ensure proactive response

⮕ **Target**

  - Korean General public, Experts, Governments, Local Governments, public decisions

⮕ **Visitors** : 603,639 persons(2022)

Drought Portal

General Information	Drought definition, Education, Webtoon, etc.
Public Information	Drought of own residence area, Water saving steps, Drought Insurance, etc.
Basic Data	Facility of water supply, Rainfall, Inflow, Water Resources, etc.
Drought Surveillance & Prospects	Drought Surveillance & Prospects, Bigdata Analysis, Drought index, Drought Frequency, etc.
Drought Response	Drought Policy, Drought Response Manual, Dan-bi service, etc.
Center Introduction	Provide General Institutional Information of National Drought Information-Analysis Center

Drought Dashboard

➲ **Address** : **https://www.drought.go.kr (launch : 2018 ~)**
   〈login required〉

➲ **Language** : **Korean**

➲ **Purpose**

   - **To support the decision-making process to ensure proactive response**

➲ **Target**

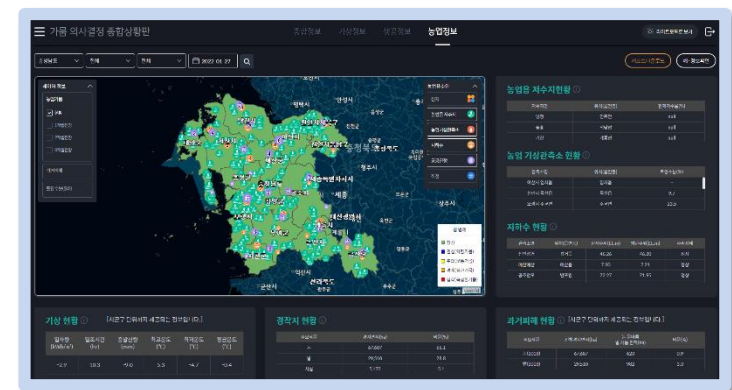   - **Korean Governments**
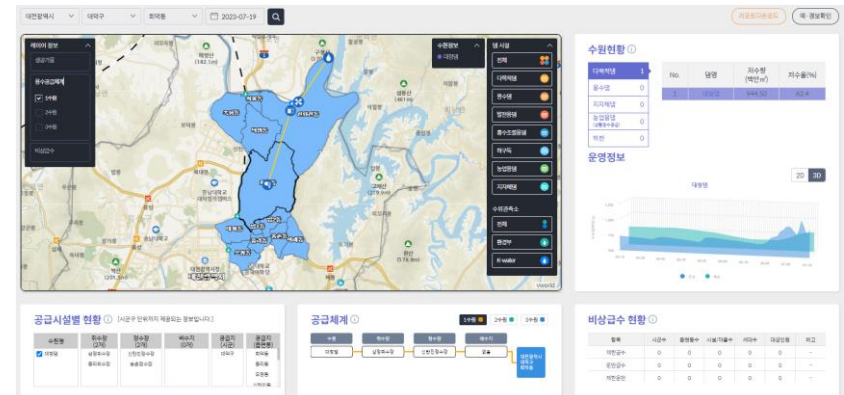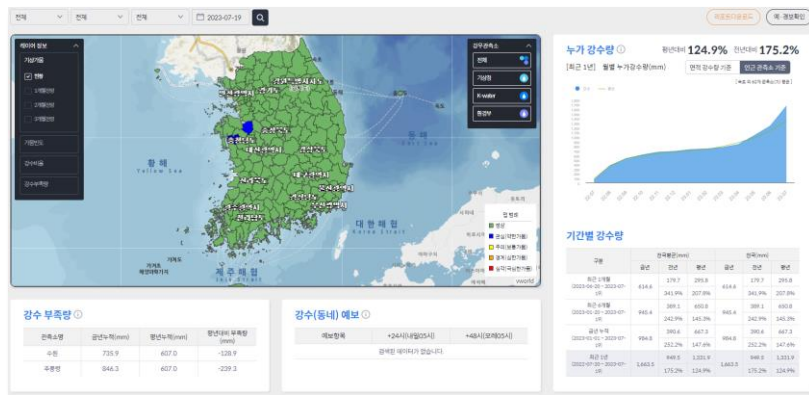
Portal & Dashboard

Drought Dashboard

[General Information]
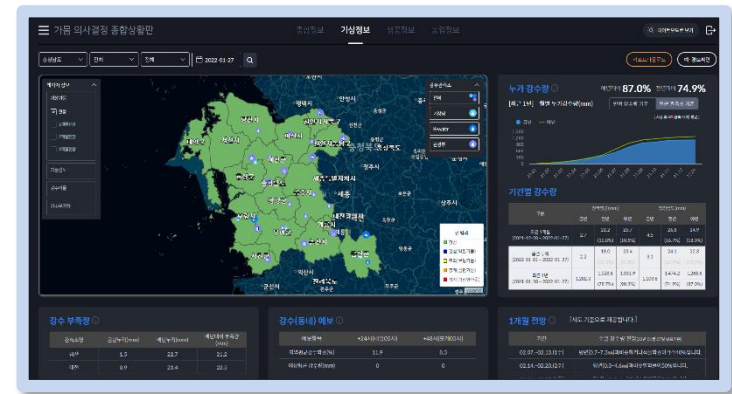
[Meteorological Drought]
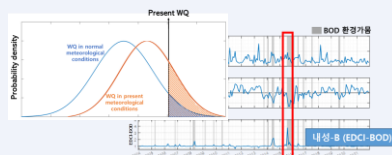

[Hydrological Drought]

[Agricultural Drought]

Development of Environmental Drought Analysis Methods ('21~'24)

PHASE 1

- Identification of Impact factors
- Development of Impact assessment methods

⬇

- The primary impact factors: **SPI**, SDI
- The secondary impact factors: **water quality** (BOD, TN, TP etc.), **vegetation, fishes**
- Assessment method: **Copula theory**

PHASE 2

- Development of classification criteria
- Development of impact assessment module
- Pilot test and feedback

⬇

- Criteria: **EDCI** (Environmental Drought Conditional Index), habitat rate
- Module based on **python**
- Testbed: Naeseong Stream (S. Korea)
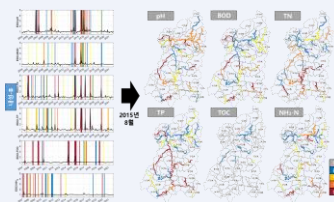
PHASE 3

- Development of environmental drought analysis methods & system
- Pilot test and feedback

⬇

- Monitoring method of environmental drought and classification criteria
- Analysis system based on python
- Pilot test: national scale

PHASE 4

- Implementation of public service
- Response of environmental drought
- Medium- and long-term roadmap of technical development

⬇

- Public service via Drought Portal
- Response against environmental drought level
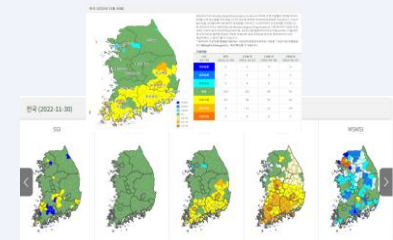
Thank you
For your attention

19th August 2023

Woosung Nam (wsnam@kwater.or.kr)
Yutae Lee (ytl1124@kwater.or.kr)
National Drought Information Analysis Center
K-water