# Drought Resilience +10 – Geneva 30<sup>th</sup> Sep 2024



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# **Drought Monitoring Framework for Assessing Drought Impact and** Damage at the Government Level in South Korea

Drought policy focus is shifting from post-response measures, such as short-term response and recovery support, to a pre-planning and prevention-centered approaches with the increase in localized extreme droughts caused by climate change. It is necessary to conduct monitoring and assessments of drought impacts due to the limited information on the current status of drought damage. This will help gather essential data and enable more systematic monitoring, which is crucial for effective drought response and policy development. The Korean government has been implementing drought investigation and monitoring since the establishment of a joint comprehensive drought response plan in 2017, following the severe drought damage in 2014–2015. However, the current drought impact and damage survey lacks sufficient scope and specificity regarding the areas where drought conditions are investigated. This study aims to identify investigation items related to the social, economic, and environmental impacts of drought, as well as direct and indirect damages. It focuses on the drought situation, drought situation, drought impacts, and the series of processes leading to drought damage, with the goal of establishing drought monitoring frameworks and protocols.

### **International Drought Monitoring**

Since 1999, NOAA (CPC, NCDC, WRCC), USDA, and NDMC in an EQUAL partnership have produced a weekly composite drought map "the U.S. Drought Monitor" with input from numerous federal and non-federal agencies



#### **Drought Monitoring in South Korea**

- In South Korea, terms are defined by categorizing them into drought conditions, drought impact, and water shortage damages
- Drought conditions should be monitored in real-time, while the drought impact indicators • require at least monthly assessments. Additionally, assessments of water shortage damages need to be conducted immediately after the end of a drought

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| Division             | Drought situation | Drought impact              | Water shortage damage           |  |  |
|----------------------|-------------------|-----------------------------|---------------------------------|--|--|
| Investigation period | _                 | Monthly                     | _                               |  |  |
| Invoctigation Timing | _                 | Dogular                     | Investigation immediately after |  |  |
|                      |                   | regulai                     | damage                          |  |  |
| Time concept         | Real-time         | Quasi-real-time             | Confirmed value                 |  |  |
|                      |                   | Impact level classification | Classification of damage level  |  |  |
| Phase distinction    | -                 | based on typology           | is unnecessary                  |  |  |

Table 1. Study on drought situation, impact and damage in South Korea

### Agricultural Drought Impact Index (ADII)

- In South Korea, the drought index is used to analyze drought conditions, and the agricultural drought impact is being developed to analyze the impact of agricultural drought
- Additionally, an agricultural damage index will be developed to analyze agricultural damage

#### **Drought Impact Reporter (DIR)**

- National Drought Mitigation Center (NDMC) in the U.S. classified drought impacts using 10 factors, including 9 big data sources and 1 media source
- Using legends and color icons for each factor, the drought impacts are scored and reflected on the map



| All States   09-06-2021 - 10-06-2021 | • | ٠ | $\diamond \blacklozenge$ | <b></b> | $\diamond \diamond$ | $\diamond$ | $\diamond$ | 13 | ≜ 1 | 8 🗊 | (*) | <b>@</b> | ) |
|--------------------------------------|---|---|--------------------------|---------|---------------------|------------|------------|----|-----|-----|-----|----------|---|
|--------------------------------------|---|---|--------------------------|---------|---------------------|------------|------------|----|-----|-----|-----|----------|---|

| Inty Impacts   All States  |    |      | 106                            |    |
|----------------------------|----|------|--------------------------------|----|
| Agriculture                | 37 | I BI | usiness & Industry             | 6  |
| Energy                     | 6  | 🔶 Fi | re                             | 3  |
| Plants & Wildlife 2        |    | 🤶 Re | elief, Response & Restrictions | 79 |
| Society & Public Health 14 |    | 🔶 то | ourism & Recreation            | 21 |
| Water Supply & Quality 89  |    |      |                                |    |

| Imp           | act Counts Impacts List   Pa    | age 1/11 | Report Counts | Reports List   Page 1   | /116 |  |  |
|---------------|---------------------------------|----------|---------------|-------------------------|------|--|--|
| Coun          | ty Reports   All States         |          | 1157          |                         |      |  |  |
|               | gory<br>General Awareness       | 994      | ٠             | Agriculture             | 588  |  |  |
| ě.            | Business & Industry             | 91       | $\diamond$    | Energy                  | 94   |  |  |
| ٠             | Fire                            |          | <b></b>       | Plants & Wildlife       | 950  |  |  |
| $\diamond$    | Relief, Response & Restrictions |          | •             | Society & Public Health | 133  |  |  |
| $\diamond$    | Tourism & Recreation 177        |          | <b></b>       | Water Supply & Quality  | 400  |  |  |
| Report Source |                                 |          |               |                         |      |  |  |
| 15            | Media                           | 50       | ď             | CoCoRaHS                | 1107 |  |  |
|               |                                 |          |               |                         |      |  |  |

**Figure 2. Drought Impact Reporter interface** (reference – National Drought Mitigation Center)

## **Condition Monitoring Observer Reports (CMOR)**

NDMC improved the limitations of the DIR and collaborated with the National Integrated Drought Information System (NIDIS) to develop an enhanced system

To calculate the Agricultural Drought Impact Index, five key monitoring items that can be established on a monthly basis will be selected

| Division  | ivision Items                         |  | ltems                       |  |
|---|---------------------------------------|--|-----------------------------|--|
| Agricultural drought warningAgriculturalArea of paddy field water deficit |                                       |  | Emergency water development |  |
|   |                                       | Agricultural   | Reservoir pumping storage   |  |
| Drought   | Area of field withering               | Water Shortage   | Equipment support           |  |
| Impact Index  | npact Index Agricultural water supply |  | Human resources support     |  |
|   | Field drought index                   |  | Drought response costs      |  |
| Table 2. Agricul  | tural Drought Impact Index items      | Table 3. Agricultural Water Shortage Damage Index iter |                             |  |

# **Investigation of Stage Classification Methods**

Investigate various methods of classification used internationally and apply them to the Agricultural Drought Impact Index, utilizing tools such as Percentile

|    |                     | Percentile | ~Frequency                  | npact sector:<br>Jefault view is impacts from all sectors. Select a sector to see only impacts from that sector. If you choose multiple sectors, it filters by AND logic.  |  |
|----|---------------------|------------|-----------------------------|--|--|
|    | None                | 31-100     | Once per<br>1 to 3 years    | Lture Exercises & Industry Energy   (Plants & Wildlife) Society & Public Health   Tourism & Recreation Water Supply & Quality  |  |
| D0 | Abnormally<br>dry   | 21-30      | Once per<br>3 to 5 years    | Reset Filters<br>Search Results Below Q 2 -<br>Start Date & Seasons & Weeks & Sectors Historically observed impacts +  |  |
| D1 | Moderate<br>drought | 11 - 20    | Once per<br>5 to 10 years   | 2010-04-15   spring   0   Water Supply & Quality   Tennessee Valley Authority switched to conservation flows at Wheeler Dam     2010-04-15   spring   0   Water Supply & Quality   Browns Ferry Nuclear Plant prepared for low river flow     2010-04-15   spring   0   Fire   Rising fire danger prompted warning against outdoor burning in Lauderdale   Prevent | D0 D0 D0                                       |
| D2 | Severe<br>drought   | 6 - 10     | Once per<br>10 to 20 years  | 2015-10-16 fall 0 Fire 700 acre wildfire in Winston County, Alabama   2017-02-13 winter 0 Fire pought-affected trees dying in Alabama  | Meteorological drought                         |
| D3 | Extreme<br>drought  | 3 - 5      | Once per<br>20 to 50 years  | 2010-11-02fallorGrow<br>Fallcampfires prohibited outside of desginated areas in national forests in Alabama2010-09-09fallorfareDeKalb County reports over 40 wildfires since Sept. 9, 2010   | Hydrological drought                           |
| D4 | Exceptional drought | 1 - 2      | Once per<br>50 to 100 years | 2007-01-01 winter 0 Plants & Wildlife Plants & Wildlife impact from Media submitted on 10/30/2007   2007-01-01 winter 0 Casticuture Agriculture impact from Media submitted on 11/20/2007   2019-03-24 spring 0 Casticuture Fire danger warning in Alabama   | Agricultural drought<br>Socio-economic drought |

**Figure 4.** Investigation of drought stage classification

- The system collects drought impact reports based on 13 key indicators, surpassing the DIR in scope, and the system not only provides and overall representation of drought conditions but also offers independent information for each of the key indicators



Figure 3. Condition monitoring observer reports interface (reference – National Drought Mitigation Center)

#### ACKNOWLEDGMENTS



**Application of agricultural drought monitoring** 

- Established monitoring criteria for agricultural water shortage in 2016 to indicate the Agricultural Water Shortage Damage Index
- Plan to calculate the ADII by applying new classification methods in the future



Figure 5. Application of the Agricultural Water Shortage Damage Index to South Korea

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Report municipal water supply impact



Drought Risk Management Lab