

# Creation of Manual for Supplying Minimum Quantity of Water in Emergency (drought, etc.)



Choi Tae-Yong, Ph.D  
Korea Water & Wastewater Works Association



## CONTENTS



### 01/ Overview

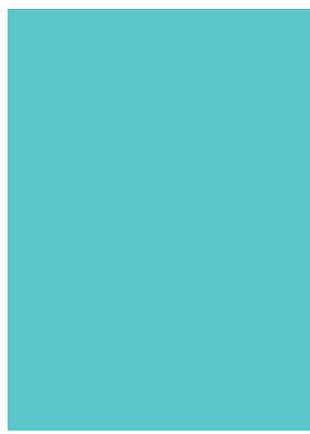
- Definition and Scope of Emergency
- Current Droughts in Korea

### 02/ Prior Study Review

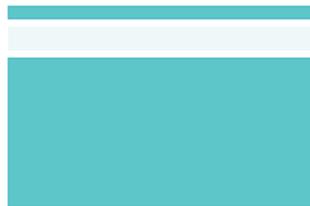
- Adaptation to Drought in Water Supply for Everyday Life
- Assessment of Vulnerability to Drought and Creation of Guideline for Limited Water Supply

### 03/ Manual for Limited Water Supply System for Each Stage

- Regulation Improvement Planning
- Plan Regulation Improvement
- Suggest plan for reducing water demand



# 01. Overview



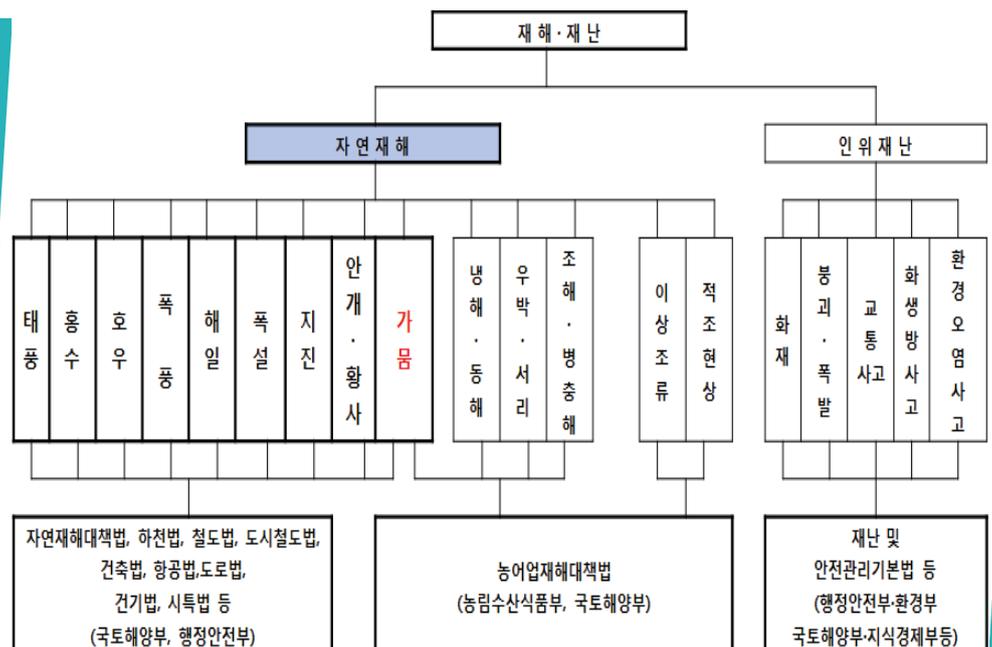
## 01. Overview / Definition and Scope of Emergency

### What is an Emergency

The period when impossible to supply basic necessities due to disasters and extreme weather events

### Scope of Emergency

Strategy for supply minimum quantity of water in droughts



Source : Disasters by Structure and Vehicles and Strategy for Coping with Disasters , 2003

## 01. Overview / Current Droughts in Korea

### Current Droughts in Korea



5

## 01. Overview / Current Drought in Korea

### ► Damages by droughts in Korea

M = million

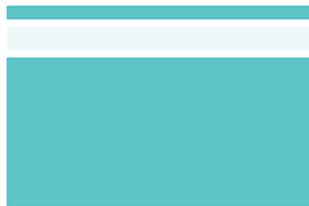
Year of droughts		Damages
1967 to 1968	1967	Drought area 420,547ha / damage 551 M USD
	1968	Drought area 470,422ha / damage 616 M USD
1981 to 1982	1981	Drought area 145,457ha / damage 191 M USD
	1982	Drought area 231,244ha / damage 303 M USD
1994 to 1995		Drought area 173,269ha (86 cities)
2001 to 2002	2001	Limited water supply to 304,815 people (86 cities)
	2002	Limited water supply to 92,838 people (23 cities)
2008 to 2009		Limited water supply to 228,068 people (77 cities)

Drought Report (1995, 2002), 2008 to 2009 Adaptation to Drought Progress Report (2009)

6



## 02. Prior Study Review



### 02. Prior Study Review / Adaptation to Drought in Water Supply for Everyday Life, Ministry of Environment (2007)

Stage 1-1  
10% less water  
supply

- Supply water by transportation to highlands and areas of poor water supply
- Conduct public relations for water saving public by broadcasting and campaigns
- Strengthened management of drinking water quality

Stage 1-2  
10 to 30% less  
water supply

- Operate emergency water supply team for each local government
- Reduce business hours or conduct temporary closure of businesses using a large quantity of water
- Strengthen drinking water quality management
- Encourage people to save water at home and in large buildings and further expand water saving campaign
- Further encourage people to save public water and recycle water

## 02. Prior Study Review / Adaptation to Drought in Water Supply for Everyday Life, Ministry of Environment (2007)

Stage 2  
30 to 50% less water supply

- Neighboring local governments support each other for emergency water supply
- Businesses using a large quantity of water close their business voluntarily

Stage 3-1  
50 60% less water supply

- Supply water for 3 to 5 days depending on situations
- Shorten and stop industrial water supply

Stage 3-2  
At least 60% less water supply

- Supply a minimum quantity of water for everyday life

Stage 4  
Suspended water supply

- Provide bottled drinking water, and execute drinking water supply system for supplying minimum quantity of water
- Share private wells

9

## 02. Prior Study Review / Assessment of Vulnerability to Drought and Creation of Guideline for Limited Water Supply , Ministry of Environment (2016)



- Estimate the volume to be reduced in each drainage zone for each local government in limited water supply
- Examine poor water flow and suggest action plan in limited water supply
- Calculate peak load rate based on drainage runoff
- Control valve opening to simulate limited water supply (use US EPANet)
- Control valve opening with the drainage location as a starting point to control overall water pressure





# 03. Manual for Limited Water Supply System for Each Stage



## 03. Manual for Creating Limited Water Supply System in Each Stage/ Regulation Improvement Planning

Suggest improvement plan for effective limited water supply

### STEP 01 Awareness (Blue)

Existing Action Guideline	Proposal
	<ul style="list-style-type: none"> <li>▶ Check and correct drought strategies in area where droughts are predicted and take water saving measures.</li> </ul>
<ul style="list-style-type: none"> <li>• Inspect and repair drought-fighting equipment in area where droughts are predicted</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Limit use of water in gardens (trees, shrubs, flowering plants)</b> <ul style="list-style-type: none"> <li>– Recommend water cans and water sprinklers to water plants in gardens for voluntary water saving</li> </ul> </li> </ul>
<ul style="list-style-type: none"> <li>• Promote water saving strategy</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Limit other use of water than at home (fountains, water features, etc.)</b> <ul style="list-style-type: none"> <li>– Permit for fountains and water features for decoration : Promote voluntary water saving.</li> <li>– Permit for use of water for dust control in construction sites and commercial car wash : recommend voluntary water saving.</li> </ul> </li> </ul>
<ul style="list-style-type: none"> <li>• Take measures to prevent water contamination incidents in water shortage</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Limit use of water in commercial districts and public authorities (parks, shops, public institution, etc.)</b> <ul style="list-style-type: none"> <li>– Encourage people to save water voluntarily.</li> </ul> </li> </ul>
<ul style="list-style-type: none"> <li>• More water supply facilities constructed in islands, rural districts and fishing villages</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Use of water in facilities in urban areas and public facilities (parks, public swimming pools)</b> <ul style="list-style-type: none"> <li>– Park : Plan management and recommend 5% of water saving during drought period.</li> <li>– Public swimming pool: Recommend covers in leak repair or when not used</li> </ul> </li> </ul>
	<ul style="list-style-type: none"> <li>• <b>Use of water indoors and for other purposes (humidifier, air conditioning outdoor unit, etc.)</b> <ul style="list-style-type: none"> <li>– Encourage people to save 5% of water usage.</li> </ul> </li> </ul>

### 03. Manual for Creating Limited Water Supply System in Each Stage/ Regulation Improvement Planning

Suggest improvement plan for effective limited water supply

#### STEP02 Alert (Yellow)

Existing Action Guideline	Proposal
	▶ Water saving campaign through local media
• Water saving campaign through local media	<ul style="list-style-type: none"> <li>• <b>Limit use of water for landscaping (trees, shrubs, flowering plants)</b> <ul style="list-style-type: none"> <li>– Grass : Recommend watering once or twice/week.</li> <li>– Recommend no transplanting or new planting,</li> </ul> </li> </ul>
• Continue to check areas where droughts are predicted to occur	<ul style="list-style-type: none"> <li>• <b>Limit other use of water than at home (fountains, water features, etc.)</b> <ul style="list-style-type: none"> <li>– Permit for fountain and water features for decoration : Permit use of water for small fountains and ponds, Limit use of water for big fountains with no water recirculation.</li> <li>– Permit for use of water for dust control in construction sites and car wash : Recommend best management practice for specific industry to reduce 14% of annual usage of water, Recommend car wash once per month.</li> </ul> </li> </ul>
• Continue to examine regional rainfalls, and water storage of reservoirs for farming	<ul style="list-style-type: none"> <li>• <b>Limit use of water in commercial districts and public institutions (factories, shops, public institutions, etc.)</b> <ul style="list-style-type: none"> <li>– Recommend best management practice to reduce water usage</li> <li>– Restaurant : Recommend to reduce the number of dishes to be washed</li> </ul> </li> </ul>

13

### 03. Manual for Creating Limited Water Supply System in Each Stage/ Plan Regulation Improvement Regulation Improvement Planning

#### STEP03 Warning (Orange)

Existing Action Guideline	Proposal
• Operate disaster control headquarter in concerned area	▶ Operate disaster control headquarters in concerned area.
• Conduct step-by-step limited water supply in concerned area (transportation) and report situation	<ul style="list-style-type: none"> <li>• <b>Limit use of water for landscaping (trees, shrubs, flowering plants, etc.)</b> <ul style="list-style-type: none"> <li>– Recommend regular watering grass once or twice per week, trees and shrubs at least once/month.</li> <li>– Recommend no transplanting or new planting.</li> </ul> </li> </ul>
• Utilize alternative water resources, e.g., rainwater using facilities installed before	<ul style="list-style-type: none"> <li>• <b>Limit other use of water than at home (fountains, water features, etc.)</b> <ul style="list-style-type: none"> <li>– Prohibit use of fountains and water features for decoration.</li> <li>– Permit for use of water for dust control in construction site and commercial car wash : Recommend best management practice for specific industry to reduce 22% of annual water usage, Use water not more than 150L for car wash and limit car wash once per 6 weeks by manager's approval.</li> </ul> </li> </ul>
• Perform limited water supply strategies in farming, water supply service and industry	<ul style="list-style-type: none"> <li>• <b>Limit use of water in commercial districts and public institutions (factories, shops, public institutions, etc.)</b> <ul style="list-style-type: none"> <li>– Recommend best management practice for reducing water usage</li> <li>– Restaurant : Recommend to reduce the number of dishes to be washed</li> </ul> </li> </ul>
• Water saving campaign through local media	

14

# 03. Manual for Creating Limited Water Supply System in Each Stage/ Plan Regulation Improvement Regulation Improvement Planning

## STEP04 Severe Level (Red)

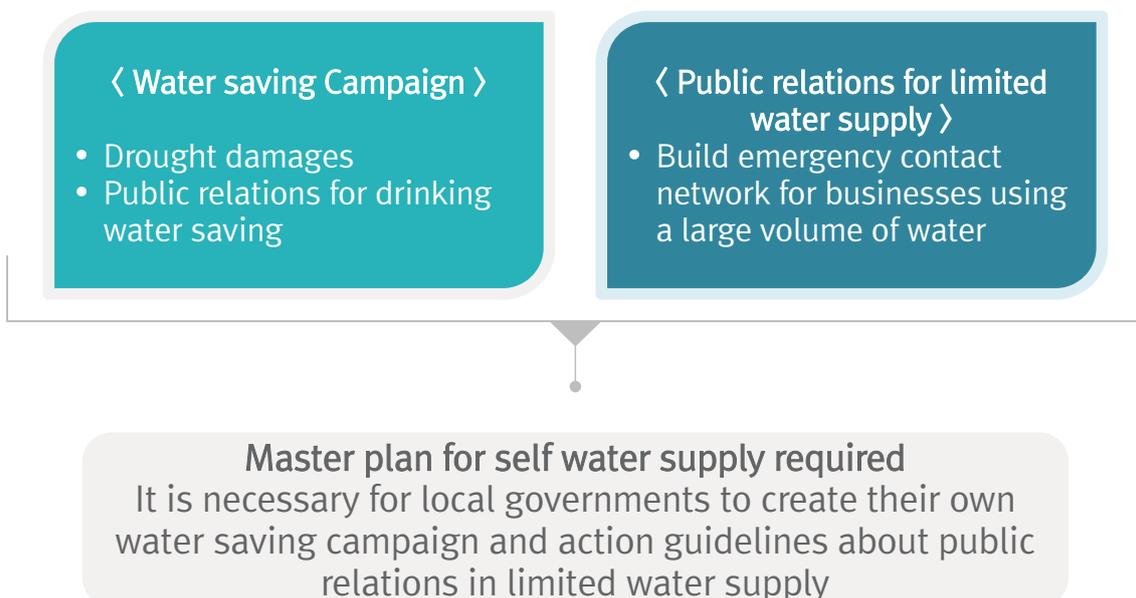
Existing Action Guideline	Proposal
<ul style="list-style-type: none"> <li>Operate disaster control headquarters in concerned area</li> </ul>	<ul style="list-style-type: none"> <li>▶ Operate disaster control headquarters in concerned area</li> </ul>
<ul style="list-style-type: none"> <li>Conduct step-by-step limited water supply in concerned area (transportation) and report situation</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Limit watering for landscaping(trees, shrubs, flowering plants, etc.)</b> <ul style="list-style-type: none"> <li>– Prohibit watering grass, and specify official days for watering trees and shrubs</li> <li>– Prohibit all new planting for landscaping</li> </ul> </li> </ul>
<ul style="list-style-type: none"> <li>Utilize alternative water resources, e.g., rainwater using facilities installed before</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Limit other use of water than at home(fountains, water features, etc.)</b> <ul style="list-style-type: none"> <li>– Prohibit use of fountains and water features for decoration.</li> <li>– Permit for use of water for dust control in construction site and commercial car wash : Recommend best management practice for specific industry to reduce 40% of annual water usage, Limit use of water not more than 55L for car wash and permit car wash by manager’s approval.</li> </ul> </li> </ul>
<ul style="list-style-type: none"> <li>Perform limited water supply strategies in farming, water supply service and industry</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Limit use of water in commercial districts and public institutions (factories, shops, public institutions, etc.)</b> <ul style="list-style-type: none"> <li>– Recommend best management practice for reducing water usage</li> <li>– Restaurant : Recommend to reduce the number of dishes to be washed</li> </ul> </li> </ul>
<ul style="list-style-type: none"> <li>Expand water saving campaign through local media</li> </ul>	

15

# 03. Manual for Creating Limited Water Supply System in Each Stage/ Suggest plan for reducing water demand

## 1) Public Relations for Water Saving and Limited Water Supply

- ▶ Master plan for drinking water supply for longer drought period by Seoul City (2015)



## 03. Manual for Creating Limited Water Supply System in Each Stage/ Suggest Method for Reducing Water Demand

### 2) Review self-regulated water supply scheme



**Forced water supply control**  
Control branching valves to reduce the volume of supplied water



**Self-regulated water supply control**  
Active water saving campaign in which residents participate voluntarily

# Thank you