



Policies to Manage Agricultural Groundwater Use

KOREA

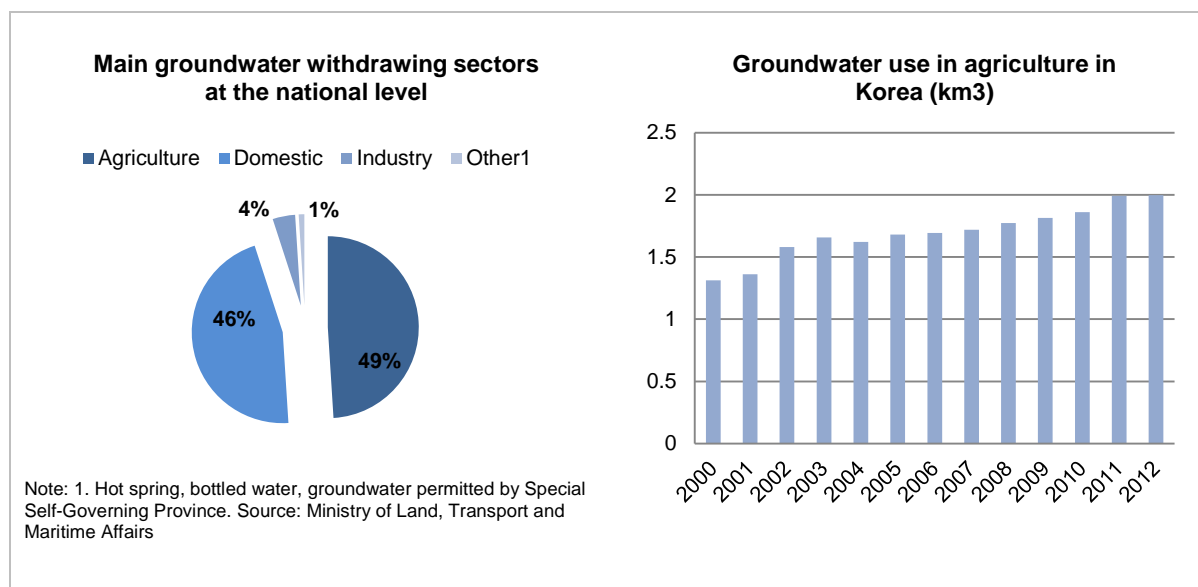
The Republic of Korea is one of the top ten OECD countries in groundwater use for agricultural irrigation. Even if surface water irrigation is used at a much larger scale, groundwater is used relatively intensively in specific regions. National policies managing groundwater are largely focusing on regulatory instruments, with additional programs and some collective management schemes. The case of Jeju Volcanic Island, where agriculture relies solely on groundwater, shows that additional management approaches are used in complement at a lower spatial level.

1. Main national governmental agency responsible for quantitative management of groundwater

Institution	Role
Korea Institute of Geoscience and Mineral Resource (KIGAM)	Assessment and prediction of groundwater resource according to climate change. Securing groundwater resource through aquifer artificial recharge on water curtain cultivation areas.
Korea Rural Community Corporation (KRC)	To carry out preliminary feasibility tests, the designing and the administration of irrigation and drainage facilities and groundwater development in rural region with the intent to share our advanced agricultural techniques and experience concerning water resource development. Performance of various groundwater resources management projects: Rural groundwater management sub-project, etc.
Korea Water Resources Corporation (K-water)	Development of water supply using sustainable aquifer management. A feasibility study of energy utilization using geo-thermal energy of alluvium and riverbed. Risk assessment and removal techniques of contaminated groundwater/soil in the submerged dam reservoir area.
Integrated Groundwater Information Service (GIMS)	Collection, management, analyse of groundwater information, developments and maintenance of the groundwater database and computer system, standardization of groundwater information, support and distribution of information regarding regulations and policies to the national and local governments.

2. Status and use of groundwater resources

- Annual groundwater recharge: 18.4 km³ in 2012.
- Annual groundwater use: 3.7 km³ in 2012.
- Groundwater withdrawals for irrigation: 1.998 km³ in 2012.



3. Inventory of national policies affecting agricultural groundwater use

Recent groundwater management reforms

Reforms	Year	Scope and objective	Degree of implementation
Rationalization plan for agriculture water use by Ministry of Agriculture, Food and Rural Affairs	2014	--Preparation of an optimal distributional plan of water resources including groundwater against future water shortage in rural regions. --Preparation of a plan to meet the demands for the multi-functional water use with considering climate change.	Complete

Core groundwater management approaches at national level

Groundwater ownership	▶ Private and public
Groundwater entitlement characteristics	▶ Permanent, temporary, linked to land rights and transferable
Beneficiaries of entitlement	▶ Individuals
Groundwater entitlement allocation doctrine	▶ Reasonable use

Main types of instruments used to manage groundwater use in agriculture

Regulatory approaches

Groundwater management plans

- ▶ Mandated

Coordination with surface water management

- ▶ Limited

Regulations on wells

- ▶ Approval of new wells
- ▶ With environment impact assessment
- ▶ Groundwater withdrawal restrictions

Regulations on irrigated land

- ▶ Regulations on irrigated areas
- ▶ Regulation on the expansion of irrigated areas
- ▶ Irrigated land buyout

Mandated metering or monitoring system for groundwater

- ▶ Mandated metering for agricultural and other users (644 monitoring wells)

Collective management approaches

Collective management schemes

- ▶ Voluntary (self-regulation)

Other policies and programs affecting agricultural groundwater use

Agriculture water conservation programs

- ▶ Subsidies

Land policies with implications on groundwater use

- ▶ Zoning with restriction on groundwater use

Climate change adaptation programs

- ▶ Investment in agriculture and groundwater R&D
- ▶ Groundwater modelling and data development

Watershed conservation programs

- ▶ Exclusion zone for conservation area
- ▶ Limits of groundwater use close to protected areas
- ▶ Acquired groundwater entitlements for water conservation

Supply side management approaches

Programs supporting the development alternative water supplies

- ▶ Surface water reservoir expansion
- ▶ Rainwater harvesting
- ▶ Recycled water

4. Agricultural groundwater use at the regional level

Jeju volcanic Island

Agro-climatic zone	Climate change prospective (2030-2050)	Is groundwater expected to be significantly affected by climate change in 2030-2050?	Surface Irrigation
Temperate	Wetter, hotter, more frequent droughts	yes	Surface water is not available and not used for irrigation

Characteristics of the main aquifers in the regional unit

The Jeju Island, the largest volcanic island in Korea, is 73 km in length and 32 km in width and the topographic elevations are distributed in a centric shape around the Mt. Halla located in the center of the island. Streams, which are developed in topographically steep N-S direction, run only after the heavy rainfall with 50~80 mm/day. Rainfalls easily and rapidly infiltrate into the subsurface due to the high permeable layers such as clinker, cinder cone, and lava tunnel originated from volcanic rocks. Average values of hydraulic conductivity and transmissivity of the permeable layers are 234 m/day and 6,904 m²/day, respectively.

Type of aquifer	Geological type	Area	Groundwater reserve	Groundwater recharge rate	Groundwater quality concerns
Mixed	Volcanic	1 848.85 km ² (2012)	0.52483 km ³ (2012)	44.5% (2012)	Growing The main type is nitrate

	Volume	Area	Number of farms
Groundwater irrigation	0.319044 km ³ (2012)	403.51 km ² (2012)	37 893 households (2012)
Trends	Steady	Increasing	Diminishing

	Total number	Increase in the past 10 years	Average	Range	Variance
Estimated number of agricultural wells	3 316 (2012)	Slow			
Evolution of the depth of the water table (trend in the past 10 years)			Lowering	Increasing	Steady

Period of intense groundwater development

► 1990s

Other uses of groundwater

	Minor	Major	Diminishing	Steady	Increasing
Domestic		✓		✓	
Industry	✓			✓	
Energy	✓				✓

Pumping related external effects

	Minor	Major	Growing	Steady	Reducing
Well yield reduction		✓			
Ingress of polluted water		✓			
Stream depletion		✓			

Main types of instruments used to manage groundwater use in agriculture

Regulatory approaches

Groundwater management plans

- ▶ Mandated

Coordination with surface water management

- ▶ Limited

Regulations on wells

- ▶ Approval of new well
 - ✓ Accounting for well space restriction
 - ✓ With environmental impact assessment

- ▶ Groundwater withdrawal restrictions

Regulation on irrigated land

- ▶ Regulations on irrigated areas
- ▶ Regulation on the expansion of irrigated areas
- ▶ Irrigated land buyout

Mandated metering or monitoring system for groundwater

- ▶ Mandated metering for agricultural and other users, 141 monitoring wells

Economic instruments

Economic instruments to regulate quantity: pricing

Charges are on pumped water in agriculture

Collective management approaches

Collective management schemes

- ▶ Voluntary (self-regulation)
- ▶ Water user associations
- ▶ District or community based initiative

Other policies and programs affecting agricultural groundwater use

Watershed conservation programs affecting groundwater use

- ▶ Limits of groundwater use close to protected areas

Energy program

- ▶ Electricity subsidies

Supply side management approaches

Aquifer recharge programs

- ▶ Aquifer storage and recovery programs

Programs supporting the development alternative water supplies

- ▶ Surface water reservoir expansion
- ▶ Rainwater harvesting
- ▶ Recycled water

5. Bibliography

Institutional websites

- www.kigam.re.kr
- www.groundwater.or.kr
- english.kwater.or.kr
- www.gims.go.kr
- www.wamis.go.kr/eng/main.aspx
- jejuwater.go.kr

Official reports

- Annual reports for seawater intrusion monitoring and groundwater management in rural region published by KRC
- Annual reports for groundwater development, utilization, and monitoring published by Ministry of Land, Infrastructure and Transport
- Annual reports for groundwater development, utilization, and monitoring published by Ministry of Construction and Transportation
- Annual reports for groundwater development, utilization, and monitoring published by Ministry of Land, Transport, and Maritime Affairs
- Annual report for groundwater development in Jeju Special Self-Governing Province(2012)
- Master plan for water resources management in Jeju Special Self-Governing Province (2012)

Additional sources

- Lee, J.Y. and Song, S.H., 2007, Evaluation of groundwater quality in coastal areas: implications for sustainable agriculture, *Environmental Geology*, 52, 1231-1242.
- Lee, J.Y., Yi, M.J., Song, S.H., and Lee, G.S., 2008, Evaluation of seawater intrusion on the groundwater data obtained from the monitoring network in Korea, *Water International*, 33, 127-146
- Park, Y., Lee, J.Y., Kim, J.H. and Song, S.H., 2012. National scale evaluation of groundwater chemistry in Korean coastal aquifers: evidences of seawater intrusion. *Environmental Earth Sciences*, 66(3), 707-718.
- Song, S.H., Um, J.Y., Kim, J.S., Choi, K.J., Yi, S.S., and Zemansky, G., 2012, Climate change impacts on the groundwater system of volcanic Jeju Island, S. Korea, The 34th International Geological Congress(IGC), Brisbane, Australia
- Song, S.H. and Zemansky, G., 2012, Vulnerability of groundwater systems with sea level rise in coastal aquifers, South Korea, *Environmental Earth Sciences*, 65, 1865-1876.

This country profile was compiled by the OECD Secretariat and reflects information obtained in a 2014 OECD questionnaire on groundwater use in agriculture. Further information and analysis can be found in OECD (2015), [Drying Wells, Rising Stakes: Towards Sustainable Agricultural Groundwater Use](#), OECD Studies on Water, OECD Publishing. The countries profiles for 16 countries of OECD are available for download at: www.oecd.org/tad/sustainable-agriculture/groundwater-use.htm