



Ramsar Information Sheet

Published on 1 February 2024

Republic of Korea Mungyeong Doline Wetland



Designation date	2 February 2024
Site number	2540
Coordinates	36°42'16"N 128°13'29"E
Area	49,40 ha

Color codes

Fields back-shaded in light blue relate to data and information required only for RIS updates.

Note that some fields concerning aspects of Part 3, the Ecological Character Description of the RIS (tinted in purple), are not expected to be completed as part of a standard RIS, but are included for completeness so as to provide the requested consistency between the RIS and the format of a 'full' Ecological Character Description, as adopted in Resolution X.15 (2008). If a Contracting Party does have information available that is relevant to these fields (for example from a national format Ecological Character Description) it may, if it wishes to, include information in these additional fields.

1 - Summary

Summary

Mungyeong Doline Wetland is located near the peak of Mountain Gulbong in Gyeongsanbuk-do Mungyeong-si of Korea. It was first reported by Mungyeong-si and the ecological research team at the National Institute of Environmental Research (NIER) in 2007. In 2017, the Ministry of Environment designated it as a Wetland Reserve to protect its unique topography and prevailing biodiversity, which includes endangered wildlife. The Site is formed in the Doline topography, a plate-shaped structure created by the weathering of calcium carbonate (main component of a limestone rich landscape), through precipitation and groundwater discharge. Typically, a Doline topography does not accumulate surface water because it has pores in the carbonate rocks. However, the Doline topography at this Site maintains a constant water level throughout the year unlike a typical Doline topography, due to the sedimentation of Terrarosa, a weathered limestone soil that impedes water drainage. The accumulated water on this unique geological structure provides sufficient water for paddy cultivation at an altitude of 300 meters above sea level. Therefore, the wetland is important from topographical, hydrogeological, and agricultural perspectives.

A total of 932 species of wildlife have been recorded in the Site including 583 species of vascular plants and five species of calciphytes (limestone plants) which are endemic to Korea. The Site provides habitat for various animals which are of high conservation value including, 9 species of threatened wildlife such as, *Lutra lutra*, *Pitta nympha*, and *Prionailurus bengalensis*. Due to the presence of forest and agricultural lands in the surroundings of the Site, numerous migratory birds and other small forest-dwelling resident birds breed and winter in the Site. The agricultural lands also provide favourable habitats for terrestrial animals as there are minimal human disturbances and the environment is conducive to their survival.

2 - Data & location

2.1 - Formal data

2.1.1 - Name and address of the compiler of this RIS

Responsible compiler

Institution/agency	Nature and Ecology Policy Division, Nature Conservation Bureau, Ministry of Environment
Postal address	Government Complex-Sejong, 11, Doum 6-Ro, Sejong-si, 30103, Republic of Korea

National Ramsar Administrative Authority

Institution/agency	Nature and Ecology Policy Division, Nature Conservation Bureau, Ministry of Environment
Postal address	Government Complex-Sejong, 11, Doum 6-Ro, Sejong-si, 30103, Republic of Korea

2.1.2 - Period of collection of data and information used to compile the RIS

From year	2007
To year	2022

2.1.3 - Name of the Ramsar Site

Official name (in English, French or Spanish)	Mungyeong Doline Wetland
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2.2 - Site location

2.2.1 - Defining the Site boundaries

b) Digital map/image

<1 file(s) uploaded>

Former maps	0
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Boundaries description

The Site is located at 36° 41' 58.67"N ~ 36° 42' 33.46"N, 128° 13' 16.84" E ~ 128° 13' 44.70"E. It has been legally established as a national wetland protected area by the wetland management authorities; the boundaries of Site and the nationally protected area are the same. Current Site boundaries are established along the catchment areas. As the Site is a national wetland protection area, the Ministry of Environment is responsible of its management. The local government of the Mungyeong City also conducts some tasks related to the conservation and management of the Site.

The land within the boundaries is owned by both the government and private individuals, and the government is continuously trying to purchase the privately owned land. There are isolated areas within the Site boundaries that are not part of the Site (as shown in the map). These areas are owned by private individuals, who have not yet agreed to include their land as part of the Site. These privately-owned areas are also managed, as similar to that the surrounding protected area.

The closest town to the Site is Ugok-li, where apples and rice are cultivated. An information centre has been established in the Site after it was designated as a national wetland protection area.

2.2.2 - General location

a) In which large administrative region does the site lie?	Gyeongsangbuk-do, Republic of Korea
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b) What is the nearest town or population centre?	Sanbuk-myeon, Mungyeong-si, Gyeongsangbuk-do
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2.2.3 - For wetlands on national boundaries only

a) Does the wetland extend onto the territory of one or more other countries? Yes No

b) Is the site adjacent to another designated Ramsar Site on the territory of another Contracting Party? Yes No

2.2.4 - Area of the Site

Official area, in hectares (ha):	49.4
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Area, in hectares (ha) as calculated from
GIS boundaries

49.346

2.2.5 - Biogeography

Biogeographic regions

Regionalisation scheme(s)	Biogeographic region
Freshwater Ecoregions of the World (FEOW)	Southeastern Korean Peninsula (ID 639)

3 - Why is the Site important?

3.1 - Ramsar Criteria and their justification

Criterion 1: Representative, rare or unique natural or near-natural wetland types

Hydrological services provided

Mungyeong Doline Wetland is located on a limestone mountain in a doline topography, which is a plate-shaped structure created by the weathering of calcium carbonate (main component of a limestone rich landscape), through precipitation and groundwater discharge. Typically, a doline topography does not accumulate surface water because it has pores in its carbonate rock structure. However, the doline topography at this Site maintains a constant water level throughout the year unlike a typical doline topography, due to the sedimentation of Terrarosa, a weathered limestone soil that impedes water drainage, which is unique to the biogeographical region. The Site also maintains stable levels of groundwater, which supports various wetland habitats and provides domestic water supply for local residents. 47.8% of the total precipitation in the Site evaporates while the remaining 52.2% accumulates on the surface or seeps underground to recharge the aquifer.

Other ecosystem services provided

In this Site, the land use types are forests (65%), farms (25%) and wetlands (10%), which provide a range of habitat for various wildlife. The Site also supports the biodiversity in the surrounding forest area where water resources are limited. Although the Site is located in a mountain area at an altitude of 300m above sea level and disconnected from a riverine system, the accumulated water on this unique geological structure provides sufficient water for paddy cultivation throughout the year. Other crops such as apples and magnolia berries are also grown here. Recently, the Site has been highly valued for its cultural services as it provides opportunities of ecological tourism.

Other reasons

The soil in the Site is high in pH and are formed in single-grain structure due to high prevalence of calcium carbonate. Many plants that grow in this soil differ from the plants found in non-limestones rich areas and are quite rare to find in this biogeographical region. Therefore, most of the limestone areas in Korea that have sedimentary rocks formed from calcium carbonate, are ecologically important as they harbour a unique vegetation type, unlike other volcanic rock, granite rock areas and metamorphic rock areas.

Criterion 2 : Rare species and threatened ecological communities

Optional text box to provide further information

The organisms are adapted to the fluctuating environmental conditions as the Site maintains a relatively stable water level throughout the year. However, some seasonal differences in the aquatic environment exists, especially in the extent of the seasonally flooded area. As the Site is situated in a mountainous area with limited water resources, it provides important habitat for rare and endangered species, including the following species:

1. Listed in CITES : *Lutra lutra* (Appendix I), *Pitta nymphaa* (Appendix II), *Prionailurus bengalensis* (Appendix II)
2. Listed as Nationally Threatened Species : *Lutra lutra* (Appendix I), *Elaphe schrenckii* (Appendix II), *Cybister (Cybister) chinensis* (Appendix II), *Accipiter soloensis* (Appendix II), *Pitta nympha* (Appendix II), *Martes flavigula* (Appendix II), *Prionailurus bengalensis* (Appendix II), *Pteromys volans aluco* (Appendix II).

Criterion 3 : Biological diversity

Despite being disconnected from the river water system and lying near the top of Mountain Gulbong, the Site supports a unique coexistence of wetland, grassland, and terrestrial ecosystems. This is made possible by the topographical and hydro-geological features of the area, which also helps in providing abundant water all year round to the biodiversity. As there is no other water source, the wetland works like an oasis for many animals and plants. The Site provides drinking water and habitat for oviposition for some wildlife. In spring, amphibians such as toads which fall in the intermediate positions in the wetland's trophic level, engage in a large-scale mating and lay eggs in the Site. The limestone formation allows high proportion of endemic plants that are calciphytes in nature including, *Buxus sinica*, *Buxus sinica* var. *insularis*, *Heteropappus meyerendorffii*, *Saussurea odontolepis* [Sch. Bip. ex Maxim], *Anemarrhena asphodeloides*, and *Epipactis papillosa*.

Justification A total of 932 species are found in the Site. Among them nine species are designated as nationally threatened by the Ministry of Environment. A study conducted between 2011 to 2020 found a total of 583 plant species. At least five others are endemic to this region. There are 60 species of birds including *Pitta nympha* and *Accipiter soloensis*, and two other species are nationally listed in endangered wildlife (II) while 8 species are designated as national natural monuments. There are six species of reptiles including *Elaphe schrenckii* - which is classified nationally as an endangered wildlife(II), seven species of amphibians, 22 species of benthic invertebrates and 17 species of mammals. A study conducted in 2020 recorded 354 species of land insects, including nationally endangered wildlife(II) - *Cybister chinensis*. Similarly, 26 other species could be endemic and 35 species belonged to the class that require approval for foreign export.

(National Institute of Ecology, 2020)

3.2 - Plant species whose presence relates to the international importance of the site

Phylum	Scientific name	Criterion 2	Criterion 3	Criterion 4	IUCN Red List	CITES Appendix I	Other status	Justification
Plantae								
TRACHEOPHYTA/ LILIOPSIDA	<i>Anemarrhena asphodeloides</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>		Superlative - most calciphilous plants, endemic species
TRACHEOPHYTA/ MAGNOLIOPSIDA	<i>Buxus sinica</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	LC	<input type="checkbox"/>		Superlative - most calciphilous plants, endemic species
TRACHEOPHYTA/ LILIOPSIDA	<i>Epipactis papillosa</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>		Comparative - more calciphilous plants, endemic species
TRACHEOPHYTA/ LILIOPSIDA	<i>Goodyera repens</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>		It is a rare species, native to Korea
TRACHEOPHYTA/ MAGNOLIOPSIDA	<i>Heteropappus meyerendorffii</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>		Comparative - more calciphilous plants, specially adapted to this geomorphology of the wetland.
TRACHEOPHYTA/ PINOPSIDA	<i>Juniperus chinensis chinensis</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	LC	<input type="checkbox"/>		It is a rare species, native to Korea.
TRACHEOPHYTA/ MAGNOLIOPSIDA	<i>Salix koriyanagi</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>		Endemic species specifically adapted to certain habitat/conditions provided by the wetland
TRACHEOPHYTA/ MAGNOLIOPSIDA	<i>Saussurea odontolepis</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>		Endemic calciphyte
TRACHEOPHYTA/ MAGNOLIOPSIDA	<i>Utricularia aurea</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	LC	<input type="checkbox"/>		Distribution rare species/specifically adapted to certain habitat/conditions provided by the wetland

3.3 - Animal species whose presence relates to the international importance of the site

Phylum	Scientific name	Species qualifies under criterion				Species contributes under criterion				Pop. Size	Period of pop. Est.	% occurrence 1)	IUCN Red List	CITES Appendix I	CMS Appendix I	Other Status	Justification
		2	4	6	9	3	5	7	8								
Others																	
ARTHROPODA / INSECTA	<i>Cybister chinensis</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					<input type="checkbox"/>	<input type="checkbox"/>	Nationally Endangered Wildlife II	
CHORDATA / REPTILIA	<i>Elaphe schrenckii</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				LC	<input type="checkbox"/>	<input type="checkbox"/>	National Red List (EN) / Endangered Wildlife II	
CHORDATA / MAMMALIA	<i>Lutra lutra</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				NT	<input checked="" type="checkbox"/>	<input type="checkbox"/>	National Red List (VU) / Endangered Wildlife I	
CHORDATA / MAMMALIA	<i>Martes flavigula flavigula</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				LC	<input type="checkbox"/>	<input type="checkbox"/>	National Red List (VU) / Endangered Wildlife II	
CHORDATA / MAMMALIA	<i>Prionailurus bengalensis euphilurus</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				LC	<input type="checkbox"/>	<input type="checkbox"/>	National Red List (VU) / Endangered Wildlife II	
CHORDATA / MAMMALIA	<i>Pteromys volans</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				LC	<input type="checkbox"/>	<input type="checkbox"/>	National Red List (VU) / Endangered Wildlife II	
Birds																	
CHORDATA / AVES	<i>Accipiter nisus</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				LC	<input type="checkbox"/>	<input type="checkbox"/>	National Red List (VU) / Endangered Wildlife II / Natural Monument	
CHORDATA / AVES	<i>Accipiter soloensis</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				LC	<input type="checkbox"/>	<input type="checkbox"/>	National Red List (VU) / Endangered Wildlife II	
CHORDATA / AVES	<i>Asio flammeus</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				LC	<input type="checkbox"/>	<input type="checkbox"/>	Natural Monument	Wetlands provide stable foraging grounds for apex predators
CHORDATA / AVES	<i>Buteo buteo</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				LC	<input type="checkbox"/>	<input type="checkbox"/>	National Red List (LC)	Wetlands provide stable food grounds for apex predators
CHORDATA / AVES	<i>Falco tinnunculus</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				LC	<input type="checkbox"/>	<input type="checkbox"/>	Natural Monument	Wetlands provide stable food grounds for apex predators
CHORDATA / AVES	<i>Ninox scutulata</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				LC	<input type="checkbox"/>	<input type="checkbox"/>	Natural Monument	Wetlands provide stable food grounds for apex predators
CHORDATA / AVES	<i>Otus sunia</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				LC	<input type="checkbox"/>	<input type="checkbox"/>	Natural Monument	Wetlands provide stable food grounds for apex predators
CHORDATA / AVES	<i>Pitta nympha</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				VU	<input type="checkbox"/>	<input type="checkbox"/>	National Red List (RE) / Endangered Wildlife II	

1) Percentage of the total biogeographic population at the site

The Government of the Republic of Korea provides information on population of each species to IUCN and uses the Red List in its classification of threatened wildlife species.

Classification in the Korean Red List of Threatened Species uses outcome of various research projects and takes into account the following criteria:

1. Population: Assess how small the population is. Species of smaller populations are more exposed to the risks of extinction.
2. Distribution range: Assess how limited the geographical range of the habitats are. Smaller range of habitats could be a higher risk of extinction.
3. Ecological roles: Assess the roles of species in the ecosystem. The risk is higher for the ecosystems if the species who play important roles in the ecosystems go extinct.
4. Changes to habitats: Assess negative impacts of habitat degradation on the species. Bigger impact could mean higher risk of extinction.
5. Biological characteristics: Assess biological patterns and breeding patterns and determine the level of extinction risk from those patterns.
6. External factors: Assess how external factors such as the climate change and environmental pollutions affect the species.

3.4 - Ecological communities whose presence relates to the international importance of the site

<no data available>

4 - What is the Site like? (Ecological character description)

4.1 - Ecological character

Mungyeong Doline Wetland is located at an altitude of 270 to 320m above sea level in a sub-montane zone. The centre of the Site is very flat but its periphery is steep with slopes that reach up to 51°. In the 1950s, the centre of the Site which is lower than the point of the outlet, was mainly used for paddy cultivation, whereas the periphery which is higher than the outlet point, was used for other agricultural purposes. The size of the field increased until 1988, but as the fields were left uncultivated, the wetted wetland area started becoming bigger from 1991. After 1995, small sized reservoirs for agricultural water storage were built around the groundwater outlets. Since 2009, the periphery of the wetland started harbouring vegetation through natural succession.

The main water sources of the Site are precipitation and groundwater, and there is enough water available for paddy farming. During the rainy season or localized torrential downpours, the wetted area of the wetland increases due to higher inflow of groundwater from three inlets. Other small inlets are distributed on the slopes of mountains and cultivated lands, but these inlets are seasonal and become functional only after a rainfall has occurred. The stored water in the lake flows to the aquifer between the limestone rocks through a sinkhole. It flows out to the wetland's southwest part and converges with the branch of the Gado-cheon.

The Site is important from a topographical and hydro-geological perspective due to its doline formation which influences the seasonal changes of the vegetation and the aquatic environment. Hence, an unique ecosystem that is adapted to the re-occurring seasonal changes in the water level has developed in the Site. The Site is ecologically valuable because of its rich biodiversity and the functional habitats that depend on these seasonal changes.

4.2 - What wetland type(s) are in the site?

Inland wetlands

Wetland types (code and name)	Local name	Ranking of extent (1: greatest - 4: least)	Area (ha) of wetland type	Justification of Criterion 1
Fresh water > Lakes and pools >> Tp: Permanent freshwater marshes/ pools	Mungyeong Doline Wetland	1	2.0115	Unique
Fresh, saline, brackish or alkaline water > Subterranean >> Zk(b): Karst and other subterranean hydrological systems	Mungyeong Doline Wetland	4	0.01	Unique

Human-made wetlands

Wetland types (code and name)	Local name	Ranking of extent (1: greatest - 4: least)	Area (ha) of wetland type
2: Ponds	Reservoir	3	0.144
3: Irrigated land	Drainage cut	3	0.0967
4: Seasonally flooded agricultural land	Paddy field	2	0.3757

Other non-wetland habitat

Other non-wetland habitats within the site	Area (ha) if known
Forest	27.6822
Orchard	7

4.3 - Biological components

4.3.1 - Plant species

Other noteworthy plant species

Phylum	Scientific name	Position in range / endemism / other
TRACHEOPHYTALILIOPSIDA	<i>Carex dimorpholepis</i>	Species that represent the habitat of the wetland core area
TRACHEOPHYTALILIOPSIDA	<i>Eleocharis valleculosa</i>	Species that represent the habitat of the wetland core area
TRACHEOPHYTALILIOPSIDA	<i>Miscanthus sacchariflorus</i>	Species that represent the habitat of the wetland core area
TRACHEOPHYTAMAGNOLIOPSIDA	<i>Salix pierotii</i>	Species that represent the habitat of the wetland core area
TRACHEOPHYTAMAGNOLIOPSIDA	<i>Salix subfragilis</i>	Species that represent the habitat of the wetland core area
TRACHEOPHYTALILIOPSIDA	<i>Typha angustifolia</i>	Species that represent the habitat of the wetland core area
TRACHEOPHYTALILIOPSIDA	<i>Zizania latifolia</i>	Species that represent the habitat of the wetland core area

Invasive alien plant species

Phylum	Scientific name	Impacts
TRACHEOPHYTA/MAGNOLIOPSIDA	<i>Humulus scandens</i>	Actual (minor impacts)
TRACHEOPHYTA/MAGNOLIOPSIDA	<i>Sicyos angulatus</i>	Actual (minor impacts)
TRACHEOPHYTA/MAGNOLIOPSIDA	<i>Symphytotrichum ericoides</i>	Actual (minor impacts)

4.3.2 - Animal species

Other noteworthy animal species

Phylum	Scientific name	Pop. size	Period of pop. est.	% occurrence	Position in range /endemism/other
CHORDATA/AVES	<i>Aix galericulata</i>				Species that represent the habitat of the wetland core area
CHORDATA/MAMMALIA	<i>Apodemus agrarius</i>				Species that represent the habitat of the wetland core area
CHORDATA/AVES	<i>Ardea cinerea</i>				Species that represent the habitat of the wetland core area
CHORDATA/AVES	<i>Butorides striata</i>				Species that represent the habitat of the wetland core area
ARTHROPODA/INSECTA	<i>Cloeon dipterum</i>				Species that represent the habitat of the wetland core area
ARTHROPODA/INSECTA	<i>Ischnura asiatica</i>				endSpecies that represent the habitat of the wetland core areaemism
CHORDATA/REPTILIA	<i>Lycodon rufozonatus</i>				Species that represent the habitat of the wetland core area
CHORDATA/REPTILIA	<i>Oocatochus rufodorsatus</i>				Species that represent the habitat of the wetland core area

Invasive alien animal species

Phylum	Scientific name	Impacts
ARTHROPODA/INSECTA	<i>Pochazia shantungensis</i>	Actual (minor impacts)

Optional text box to provide further information

Oocatochus rufodorsatus is an indicator species that represents the wetland, while Dinodon rufozonatum ("Lycodon rufozonatus") is an environmental indicator species of the forest. The emergence of both species at Mungyeong Doline Wetland at the same time is noteworthy. Additionally, water birds such as Aix galericulata, Butorides striata, and Ardea cinerea are recognized as indicators of the existence of wetland ecosystems in forest ecosystems. Apodemus agrarius plays a crucial role as prey for upper-level predators in terrestrial ecosystems, helping to maintain the food chain. Meanwhile, Cloeon dipterum and Ischnura asiatica serve as primary consumers and upper predators, respectively, helping to maintain the food chain in aquatic ecosystems.

4.4 - Physical components

4.4.1 - Climate

Climatic region	Subregion
D: Moist Mid-Latitude climate with cold winters	Dwa: Humid continental (Humid with severe, dry winter, hot summer)

4.4.2 - Geomorphic setting

a) Minimum elevation above sea level (in metres)

a) Maximum elevation above sea level (in metres)

Entire river basin

Upper part of river basin

- Middle part of river basin
- Lower part of river basin
- More than one river basin
- Not in river basin
- Coastal

4.4.3 - Soil

- Mineral
- Organic
- No available information

Are soil types subject to change as a result of changing hydrological conditions (e.g., increased salinity or acidification)? Yes No

Please provide further information on the soil (optional)

The soil of the Site is composed of terrarossa made up of weathered limestones. Some limestones are found un-weathered and exposed in different parts of the Site.

4.4.4 - Water regime

Water permanence

Presence?	
Usually permanent water present	No change

Source of water that maintains character of the site

Presence?	Predominant water source	
Water inputs from surface water	<input type="checkbox"/>	No change
Water inputs from groundwater	<input checked="" type="checkbox"/>	No change
Water inputs from precipitation	<input checked="" type="checkbox"/>	No change

Water destination

Presence?	
To downstream catchment	No change

Stability of water regime

Presence?	
Water levels fluctuating (including tidal)	No change

Please add any comments on the water regime and its determinants (if relevant). Use this box to explain sites with complex hydrology:

Mungyeong Doline Wetland covers a basin area of 434,518m², with a wetland area of 4,430m² located in the surrounding Doline slope. This location provides an advantage in collecting water during the rainy season. The main sources of water are precipitation and groundwater, and the wetland has the unique feature of being able to collect water in the short term due to its poorly drained soil. During rainfall of over 20mm, the flooded area of the wetland expands, and the highest recorded water level based on flooded traces is 2.9m.

(ECD) Connectivity of surface waters and of groundwater	Groundwater flowing into Mungyeong Doline Wetland can be categorized into year-round and temporal inflows during rainfall. There are three year-round water inlets, and the amount of inflow varies depending on the inlet. Additionally, there are numerous s
(ECD) Stratification and mixing regime	The water circulation in Mungyeong Doline Wetland is driven by Na-HCO ₃ rainfall that infiltrates the farmlands and slopes around the wetland, dissolving NO ₃ ⁻ and CO ₃ ⁻ that have accumulated on the surface. The water then undergoes a chemical reaction with

4.4.5 - Sediment regime

- Significant erosion of sediments occurs on the site
- Significant accretion or deposition of sediments occurs on the site
- Significant transportation of sediments occurs on or through the site
- Sediment regime is highly variable, either seasonally or inter-annually
- Sediment regime unknown

(ECD) Water temperature	After conducting research in 2019, it was found that the average temperature of the Springwater (Spring1) was between 13
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4.4.6 - Water pH

- Acid (pH<5.5)
- Circumneutral (pH: 5.5-7.4)
- Alkaline (pH>7.4)

Unknown

Please provide further information on pH (optional):

In 2019, research showed that the average pH concentration of spring water in Doline wetland was between 7.1 and 7.5, while the average pH concentration of puddle and lake water ranged from 6.9 to 7.8. In the case of 2021 research, the average pH concentration of spring water is 7.5~7.7, and the average pH concentration of puddle and lake water is 7.7~8.0.

4.4.7 - Water salinity

- Fresh (<0.5 g/l)
- Mixohaline (brackish)/Mixosaline (0.5-30 g/l)
- Euhaline/Eusaline (30-40 g/l)
- Hyperhaline/Hypersaline (>40 g/l)
- Unknown

4.4.8 - Dissolved or suspended nutrients in water

- Eutrophic
- Mesotrophic
- Oligotrophic
- Dystrophic
- Unknown

(ECD) Dissolved organic carbon

As a result of the research in 2021, total organic carbon in Doline wetland is 1.8~5.1mg/L.

4.4.9 - Features of the surrounding area which may affect the Site

Please describe whether, and if so how, the landscape and ecological characteristics in the area surrounding the Ramsar Site differ from the i) broadly similar ii) significantly different site itself.

4.5 - Ecosystem services

4.5.1 - Ecosystem services/benefits

Provisioning Services

Ecosystem service	Examples	Importance/Extent/Significance
Food for humans	Sustenance for humans (e.g., fish, molluscs, grains)	High
Fresh water	Water for irrigated agriculture	High

Regulating Services

Ecosystem service	Examples	Importance/Extent/Significance
Maintenance of hydrological regimes	Groundwater recharge and discharge	High
Maintenance of hydrological regimes	Storage and delivery of water as part of water supply systems for agriculture and industry	High
Climate regulation	Regulation of greenhouse gases, temperature, precipitation and other climatic processes	Medium

Cultural Services

Ecosystem service	Examples	Importance/Extent/Significance
Recreation and tourism	Nature observation and nature-based tourism	Medium
Scientific and educational	Educational activities and opportunities	High
Scientific and educational	Major scientific study site	Medium
Scientific and educational	Important knowledge systems, importance for research (scientific reference area or site)	High

Supporting Services

Ecosystem service	Examples	Importance/Extent/Significance
Biodiversity	Supports a variety of all life forms including plants, animals and microorganisms, the genes they contain, and the ecosystems of which they form a part	High
Nutrient cycling	Carbon storage/sequestration	Medium

Within the site:

Outside the site:

Have studies or assessments been made of the economic valuation of ecosystem services provided by this Ramsar Site? Yes No Unknown

Where economic studies or assessments of economic valuation have been undertaken at the site, it would be helpful to provide information on where the results of such studies may be located (e.g. website links, citation of published literature):

Assessment of Key Ecosystem Assets and Their Services and Development of Conservation Strategies(2019, National Institute of Ecology)
<https://www.nie.re.kr/nie/bbs/BMSR00025/view.do?boardId=1650177&menuNo=200064>

4.5.2 - Social and cultural values

i) the site provides a model of wetland wise use, demonstrating the application of traditional knowledge and methods of management and use that maintain the ecological character of the wetland

ii) the site has exceptional cultural traditions or records of former civilizations that have influenced the ecological character of the wetland

iii) the ecological character of the wetland depends on its interaction with local communities or indigenous peoples

Description if applicable

Since around the 1950s, residents living in the neighbourhood of Doline wetland have been using the water from the wetland for cultivation. Considering the wetland's features, such as the expanded flooding area after rainfall, people use the central part of the wetland for paddy field and the surrounding slope for farming. Additionally, there are artificial embankments surrounding the wetlands that help maintain them even during the dry season. Moreover, residents have built three small reservoirs to store water for agricultural use.

iv) relevant non-material values such as sacred sites are present and their existence is strongly linked with the maintenance of the ecological character of the wetland

4.6 - Ecological processes

(ECD) Carbon cycling	As of 2013, the area of agricultural land within the protected area of Doline Wetland was 8.44 hectares, with a carbon storage amount of 406.1tC, showing a decrease of 61.1% from 1,044.5tC in 2007. The forested area covers 28.1 hectares and has a carbon s
(ECD) Notable species interactions, including grazing, predation, competition, diseases and pathogens	As a result of measuring changes in biodiversity, it has been increasing with a total of 516 species in 2015, 520 species in 2018, and 932 species in 2020. The number of endangered wildlife species identified was 1 in 2015, a total of 7 species were ident

5 - How is the Site managed? (Conservation and management)

5.1 - Land tenure and responsibilities (Managers)

5.1.1 - Land tenure/ownership

Public ownership

Category	Within the Ramsar Site	In the surrounding area
National/Federal government	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Private ownership

Category	Within the Ramsar Site	In the surrounding area
Other types of private/individual owner(s)	<input checked="" type="checkbox"/>	<input type="checkbox"/>

5.1.2 - Management authority

Please list the local office / offices of any agency or organization responsible for managing the site:

Daegu Regional Environmental Office / Department of Natural Environment

Provide the name and/or title of the person or people with responsibility for the wetland:

Myeong-hoon Lee

Postal address:

301, Hwaam-ro, Dalseo-gu, Daegu, Republic of Korea

E-mail address:

akdong79@korea.kr

5.2 - Ecological character threats and responses (Management)

5.2.1 - Factors (actual or likely) adversely affecting the Site's ecological character

Human settlements (non agricultural)

Factors adversely affecting site	Actual threat	Potential threat	Within the site	In the surrounding area
Tourism and recreation areas	Low impact	Low impact	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Unspecified development	Low impact	Medium impact	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Water regulation

Factors adversely affecting site	Actual threat	Potential threat	Within the site	In the surrounding area
Water abstraction	Low impact	Low impact	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Agriculture and aquaculture

Factors adversely affecting site	Actual threat	Potential threat	Within the site	In the surrounding area
Annual and perennial non-timber crops	Low impact		<input checked="" type="checkbox"/>	<input type="checkbox"/>

Human intrusions and disturbance

Factors adversely affecting site	Actual threat	Potential threat	Within the site	In the surrounding area
Recreational and tourism activities	Low impact	Low impact	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Natural system modifications

Factors adversely affecting site	Actual threat	Potential threat	Within the site	In the surrounding area
Dams and water management/use	Low impact	Low impact	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Vegetation clearance/ land conversion	Low impact	Low impact	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Invasive and other problematic species and genes

Factors adversely affecting site	Actual threat	Potential threat	Within the site	In the surrounding area
Invasive non-native/ alien species	Low impact	Low impact	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Pollution

Factors adversely affecting site	Actual threat	Potential threat	Within the site	In the surrounding area
Agricultural and forestry effluents	Medium impact	Medium impact	<input checked="" type="checkbox"/>	<input type="checkbox"/>

5.2.2 - Legal conservation status

National legal designations

Designation type	Name of area	Online information url	Overlap with Ramsar Site
Wetland Protected Area	Mungyeong Doline Wetland	https://www.gbmgo.kr/doline/	whole

5.2.3 - IUCN protected areas categories (2008)

- Ia Strict Nature Reserve
- Ib Wilderness Area: protected area managed mainly for wilderness protection
- II National Park: protected area managed mainly for ecosystem protection and recreation
- III Natural Monument: protected area managed mainly for conservation of specific natural features
- IV Habitat/Species Management Area: protected area managed mainly for conservation through management intervention
- V Protected Landscape/Seascape: protected area managed mainly for landscape/seascape conservation and recreation
- VI Managed Resource Protected Area: protected area managed mainly for the sustainable use of natural ecosystems

5.2.4 - Key conservation measures

Human Activities

Measures	Status
Regulation/management of recreational activities	Implemented
Communication, education, and participation and awareness activities	Implemented

Other:

Non-pesticide farming, landscape forest development and management, and wetland environment purification are implemented for farmland near the wetland and a part of the paddy field by utilizing ecosystem service payment contracts.

5.2.5 - Management planning

Is there a site-specific management plan for the site? Yes

Has a management effectiveness assessment been undertaken for the site? Yes No

If the site is a formal transboundary site as indicated in section Data and location > Site location, are there shared management planning processes with another Contracting Party? Yes No

Please indicate if a Ramsar centre, other educational or visitor facility, or an educational or visitor programme is associated with the site:

There is an ecological exploration program (1 hour) accompanied by a professional nature-environment curator is offered on the Doline Wetland protected area. Since 2021, vehicle use has been restricted in the Doline Wetland protected area, providing a convenient environment for everyone to tour including infants, pregnant women, and the elderly.

URL of site-related webpage (if relevant): <https://www.gbmgo.kr/doline/>

5.2.6 - Planning for restoration

Is there a site-specific restoration plan? Yes, there is a plan

Further information

The wetland restoration plan is being carried out in stages to minimize secondary damage and impacts caused by restoration project of wetland sites. Currently, the second stage of restoration has been completed.

5.2.7 - Monitoring implemented or proposed

Monitoring	Status
Animal community	Implemented
Water regime monitoring	Implemented
Water quality	Implemented
Soil quality	Implemented
Plant community	Implemented
Plant species	Implemented
Birds	Implemented
Animal species (please specify)	Implemented

6 - Additional material

6.1 - Additional reports and documents

6.1.1 - Bibliographical references

Excavation research for outstanding Ecological and Landscape Areas (2011, National Institute of Environmental Research)

Conservation and Ecotourism Resource Plan for Mungyeong Doline Wetland (2017, Mungyeong-si)

Conservation Plan for Mungyeong Doline Wetland Protection Area (2018, Daegu Regional Environment Agency)

2018 Monitoring Ecosystem of Mungyeong Doline Wetland Protected Area (2018, Daegu Regional Environment Agency)

A Study on the Value Evaluation and Conservation of Core Ecological Assets and Ecosystem Services (2019, National Institute of Ecology)

monitoring the Ecosystem of the Doline Wetland Protected Area in 2019 (2019, Daegu Regional Environment Agency)

The 3rd Detailed Research for the Wetland Protected Area (2020, National Institute of Ecology)

2021 Monitoring Ecosystem of the Doline Wetland Protected Area (2021, Daegu Regional Environment Agency)

2022 Monitoring Ecosystem of the Doline Wetland Protected Area (2022, Daegu Regional Environment Agency)

Intensive Survey on the Inland Wetland (in Korean language) (2020, National Institute of Ecology)

6.1.2 - Additional reports and documents

i. taxonomic lists of plant and animal species occurring in the site (see section 4.3)

<1 file(s) uploaded>

ii. a detailed Ecological Character Description (ECD) (in a national format)

<no file available>

iii. a description of the site in a national or regional wetland inventory

<no file available>

iv. relevant Article 3.2 reports

<no file available>

v. site management plan

<1 file(s) uploaded>

vi. other published literature

<no file available>

6.1.3 - Photograph(s) of the Site

Please provide at least one photograph of the site:



Mungyeong Doline Wetland formed in a doline area, which is rare for wetlands (Mungyeong-si , 2021.07.08.)



Mungyeong Doline Wetland with colorful trees in autumn (Mungyeong-si , 2021.11.02.)



Mungyeong Doline Wetland with colorful rice paddy (Mungyeong-si , 2021.09.30.)

6.1.4 - Designation letter and related data

Designation letter

<2 file(s) uploaded>

Date of Designation 2024-02-02