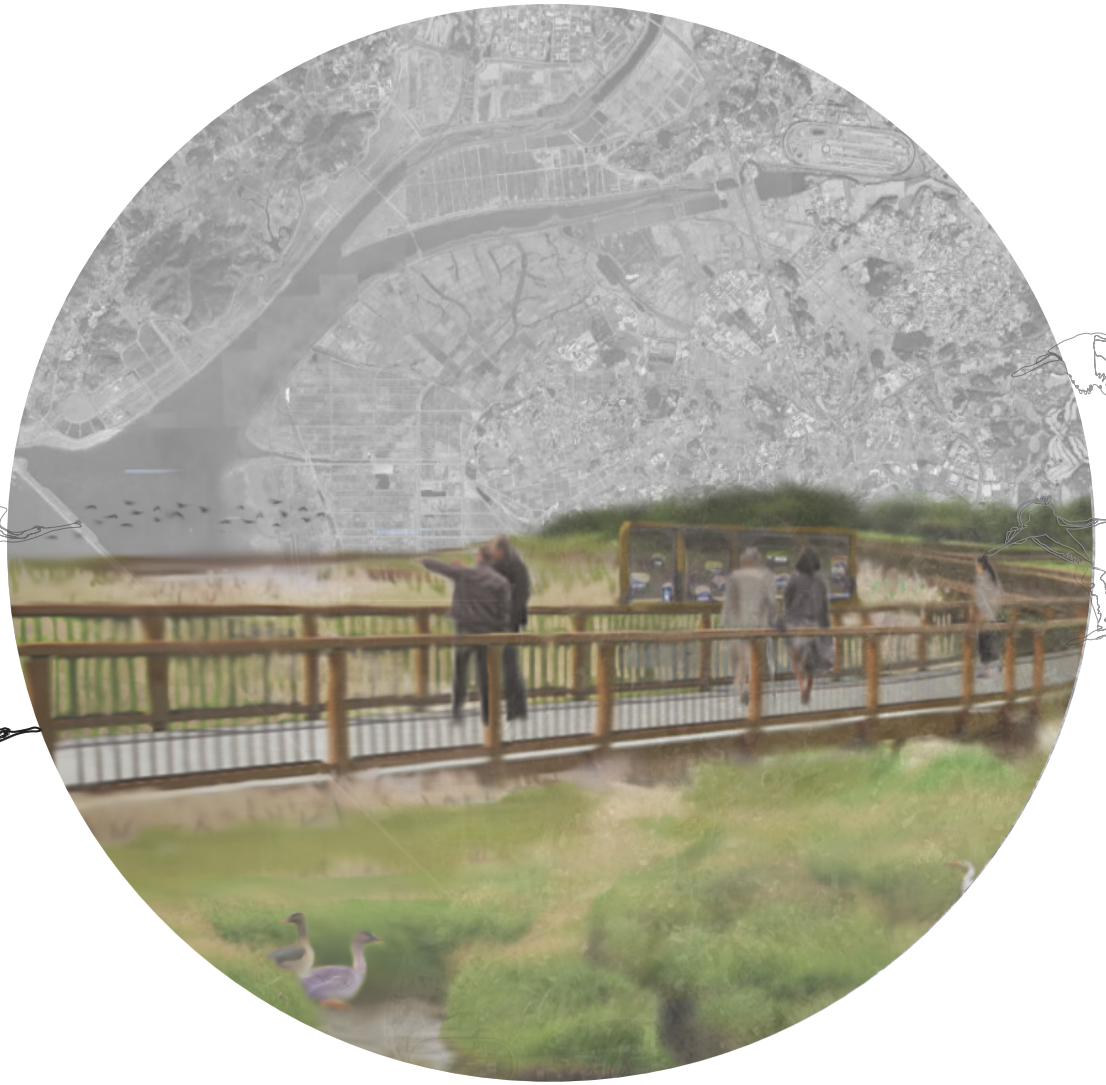
A Vision for Hwaseong Wetlands

World Heritage Site Proposal and Tourism Management Strategies



October 29, 2022

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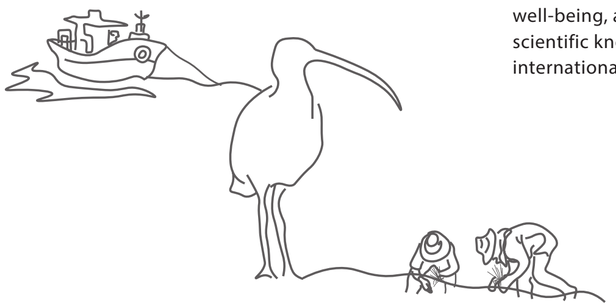
Goal of This Document

The goal of this document is to present a summary of the findings and conclusions about the unique and essential natural values that the Hwaseong Wetlands contribute to the Getbol Korea Tidal Flats World Heritage program. It addresses the ways these wetlands expand the value of the Phase One Getbol, the scientific basis for a proposed boundary for Hwaseong Wetlands should it become a World Heritage site, and visualization of how facilities could be designed appropriately for use by local people, visitors, and researchers. It is intended to add to the considerable work already done by others to encourage the conservation of Hwaseong Wetlands.

The goals for Hwaseong Wetlands as a World Heritage site include:

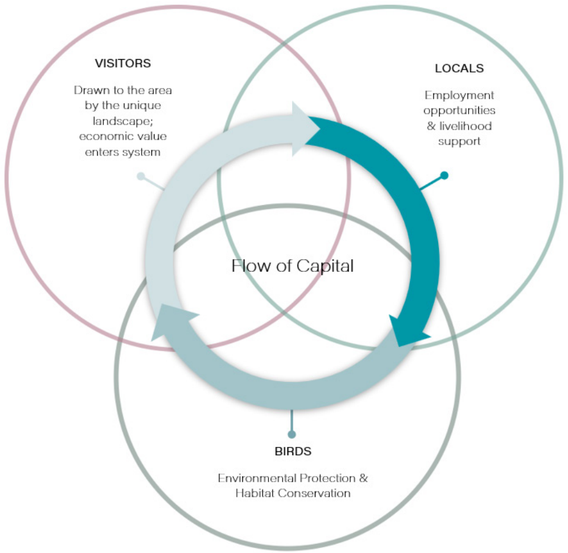
1. Provide protection for the ecological systems, processes, and habitats upon which the Outstanding Universal Value (OUV) of the wetlands depend, expressly its biodiversity, the endangered species, expansive congregations of species, fisheries, and tidal ecosystem functions.
2. Support and expand diverse economies based on the unique natural values that benefit local residents and businesses nearby the wetlands and in the already robust regional economy.
3. Create a contextually- and scale-appropriate soft infrastructure of visitor centers with ecological and cultural education to show the mindful tourist the interdependence of ecosystem and community well-being, as well as to support advancement of scientific knowledge and the sound management of international natural treasures.



Hwaseong Wetlands by the Numbers

150,000	birds counted in 2020
1500	ha active rice fields
113	waterbird species
35	nationally or globally threatened bird species
25	fishing villages
19	National Natural Monuments bird species
16	waterbird species in internationally important concentrations
9	landscape types

FOSTERING GRASSROOTS ECONOMIES



TOP LEFT- Figure 1: Hwaseong Wetlands by the Numbers.
BOTTOM LEFT- Figure 2: Birdwatching in the wetlands.
RIGHT- Figure 3: Fostering Grassroots economies related to the flow of capital.

Vision Statement

This research led to a statement expressing the distinctiveness of the Hwaseong Wetlands in both natural and cultural terms that is not only ecologically sound but also poetic enough to capture the unmatched qualities of the Hwaseong coast. The area is unique for many reasons. It has a distinctive variety of water habitats, from freshwater ponds to a brackish mouth and an extensive tidal flat that provide habitat for endangered species, seasonal birds from the entire East Asian-Australasian Flyway (EAFF), and fisheries. It has a rich and poignant history of war and peace. The city proper boasts a diverse, adaptable, and sustainable economy.

The vision should inspire local, national, and international stewardship. For generations, local people have read the seasons and tides daily. A visitor should sense a different pace of life here that is both timeless as the seasons and dynamic as the tidal change. These are essential lessons that Hwaseong can teach through science and through experiences that fill the senses.

Hwaseong Time

Curlew

Flying

A seasonal sky

Mullet

Following the tiger moon

Fishermen ride

A homegoing tide.

Context

Twice a year migratory birds set out to travel between their summer breeding grounds and winter retreat. They can travel thousands of miles during this journey, stopping only several times along the way to rest, refuel, and seek shelter for a few days. They do this in what is known as a stopover site. Along the EAFF, birds of many species and in great numbers stop at the same time in the same spot if it offers the right conditions: habitat that provides the proper waters and land, bountiful food, and safety from predators and disturbance.

The EAAF has the highest number of migratory waterbird species threatened with extinction, the highest diversity of migratory species, and the highest overall number of birds among the world's eight major flyways. The Republic of Korea (ROK) is one of the 22 countries which span the flyway. Hwaseong Wetlands, located on the ROK's northwest coast in Gyeonggi Bay, is considered one of the most productive and critical stopovers along the EAAF. It is also one of Korea's most contested wetlands. It has been diked and reclaimed for two decades. There are factories located at its edge. Between 1991 and 2002 the central government built a 9.81km-long seawall, which cut off 6,400ha of tidal flats and shallows from the sea. While the ROK acceded to the Ramsar Convention in 1997, and Korean wetlands have been protected since the passage of the Wetland Conservation Act in 1999, the City of Hwaseong continues to entertain development plans for the wetlands area. The Kia plant, which already produces 563,000 vehicles per year, will expand in 2023 with the goal of producing and additional 150,000 purpose-built vehicles annually. Despite having recently built a Peace Park at the edge of the wetlands, there is a proposal to build an airbase that would reactivate use of the area as a military site. A 10+ story hotel has been put forward by private development interests that would locate next to the most fragile part of the wetland.

At the same time, Hwaseong Wetlands is a potential World Heritage site. The four sites of the Phase One Getbol Korea Tidal Flats World Heritage site inscribed in 2021 support a tremendous number of avian and invertebrate species that use the Yellow Sea, the world's largest and one of the most productive and species-diverse intertidal ecosystems. Hwaseong would extend the Outstanding Universal Values (OUVs) of the Phase One Getbol further north up the coast, adding habitats that meet World Heritage goals. Today estimated at 7,301ha, it provides both tidal foraging and elevated habitats needed by shorebirds at high tides. It supports more than 20,000 birds regularly, and upwards of 150,000 waterbirds annually, some of which migrate the entire length of the EAAF, estimated at 13,000km. In 2020, 113 species of waterbirds were recorded, 19 in concentrations of 1% or more of their global population represented. The wetlands and Gyeonggi Bay resources also support a vibrant local fishing industry. In 2019, fishing production in Gyeonggi Province engaged 2,700 people from 35 fishing villages, 2,100 of whom lived in 25 fishing villages in Hwaseong.

Conservation of Hwaseong Wetlands has been a goal for over 30 years. Recognized as being an internationally important habitat for migratory waterbirds in the EAAF, the wetlands were listed in the EAAFP Flyway Site Network in 2018 (site EAAF142). In 2021, the Ministry of Oceans and Fisheries designated Maehyangri Wetland, 1,408ha of tidal flats and sea shallows, as a national Wetland Protection Area. The plan presented in this report advances the goal of permanently protecting the entirety of Hwaseong Wetlands. If this plan were to be enacted, it would help to support local livelihoods, contribute to Hwaseong City's and Gyeonggi Province's global brand, conserve biodiversity, and help to reduce the city's carbon footprint.

Determining the World Heritage Boundary

Hwaseong Wetlands by the Numbers

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Overview

Adjacent to a thriving city, Hwaseong Wetlands has tremendous potential for human-nature interaction and the opportunity to demonstrate to the public ways to resolve urban-nature conflicts. Essential to this is an identified core boundary and buffer for the wetlands, with uses and development that would provide long-term protection for its Outstanding Universal Values. The core is based on traditional uses such as fishing and farming, and a series of scientifically based field studies and GIS mapping that document factors such as biodiversity, key habitat and landscape types, the areas used by unique and threatened species as well as birds in high concentrations, water quality, and tidal fluctuation. A two-tiered buffer is based on factors which impact these species' well-being such as noise and light pollution and human disturbance. Together the core and buffer provide the necessary protections while inviting visitors to experience Hwaseong Wetlands.

Factors

This section presents a series of maps that summarize key factors researched to determine a core boundary and buffer for the proposed World Heritage site. They are largely focused on UNESCO's OUVs IX and X:

IX To be outstanding examples representing significant on-going ecological and biological processes in the evolution and development of terrestrial, fresh water, coastal, and marine ecosystems and communities of plants and animals.

X To contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation.

Figure 4 - Waterbirds in the Hwaseong Wetlands.

WETLAND LANDSCAPE HABITATS OF TARGET SPECIES

Figure 7 delineates the wetland habitats that are essential to the OUV. In spite of the seawall, which considerably altered tidal action, changed thousands of hectares of tidal flat, saltmarsh, and shallow inshore waters, and caused a precipitous decline in the fishery, the emergent reclaimed landscape continues to form a single wetland system which is connected hydrologically and ecologically. To delineate the habitats ESA WorldCover land cover dataset and Sentinel-2 land cover dataset by ESRI / Microsoft / Impact Observatory were used to define land cover classes (salt marsh, agriculture, etc.) and were combined with habitat data from the 2020 Hwaseong Wetlands Wise Use Report.

The habitat mosaic includes four wetland types important to waterbirds: tidal flats and shallow marine waters outside the seawall, the Hwaseong Reclamation Lake, rice-fields, and freshwater wetlands created through the reclamation process. The tidal flats and salt marshes provide fundamental support for the biological functions of animal species throughout the region. Additionally, reclamation of land and introduction of a sea wall have created a new set of managed tidal processes which provide safe roosting at high tides and controlled aquaculture and irrigation of agricultural land used by the bean goose. However, water levels in the lake are maintained too high to allow shorebirds to roost in it. Sources: 2020 Wise Use Report, Landsat-8 multispectral and Sentinel 1-SAR imagery.

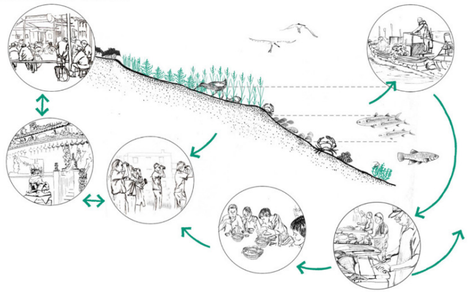


Figure 5: Multiple benefits of the wetlands.

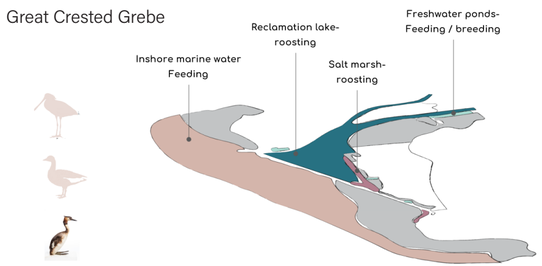


Figure 6: Target species distribution in the wetlands.

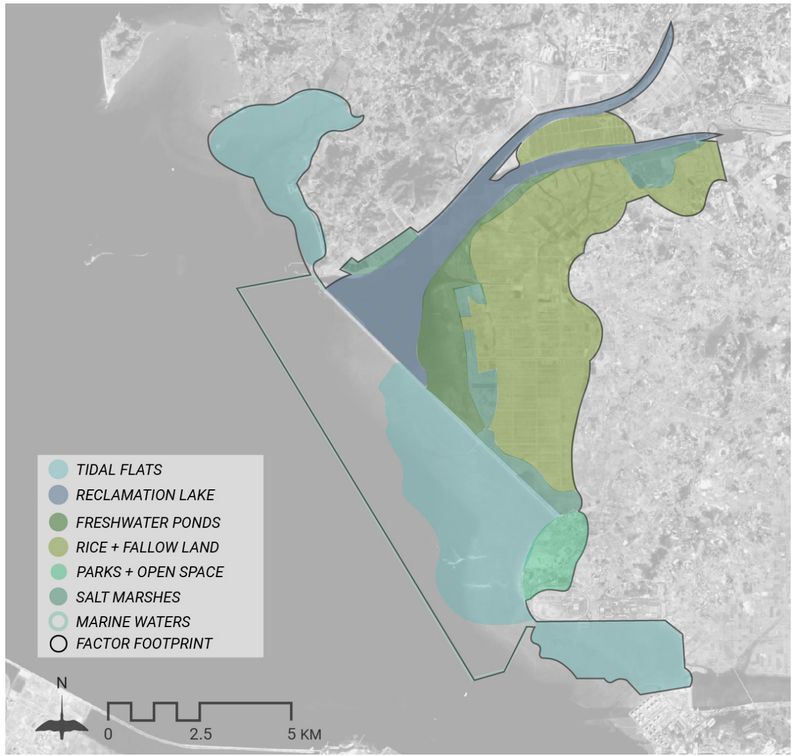


Figure 7: Hwaseong Wetland Habitat Types.

FIELD SIGHTINGS OF TARGETED AVIAN SPECIES

Figure 10 locates where the four target species underlying the OUV have been sighted (Far Eastern Curlew, Black-Faced Spoonbill, Tundra Bean Goose, and Great Crested Grebe). To spatialize this factor, sightings documented by volunteers in eBird were placed as points on a map and interpolated to represent each species' range in the Hwaseong Wetlands. While only four species are represented, the conservation of their combined ranges encompasses protection for other plants and animals as well, including 10s of 1000s of migratory birds and the endangered Narrow-ridged Finless Porpoise. Sources: 2020 Wise Use Report, eBird, and The Hwaseong Wetlands Reclamation Area and Tidal Flats, Republic of Korea: a case of waterbird conservation in the Yellow Sea.

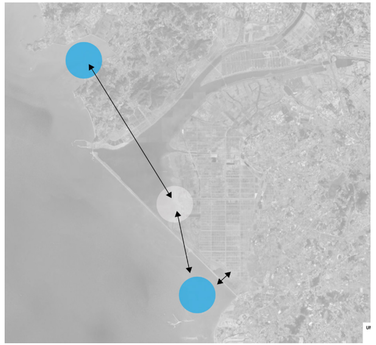


Figure 8:
Movement of Far Eastern Curlew, low to high tide.

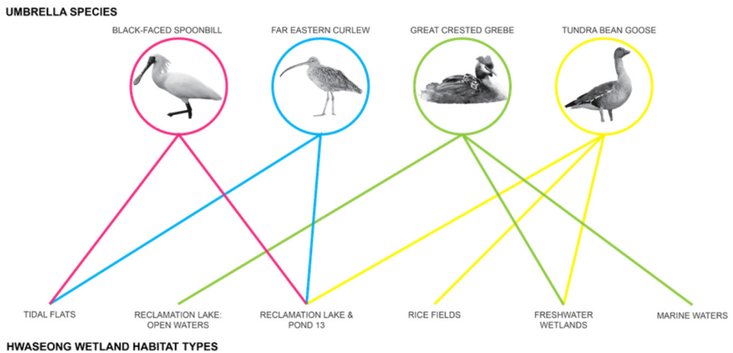


Figure 9: Diagram of waterbird species distribution according to habitat types of Hwaseong Wetlands.

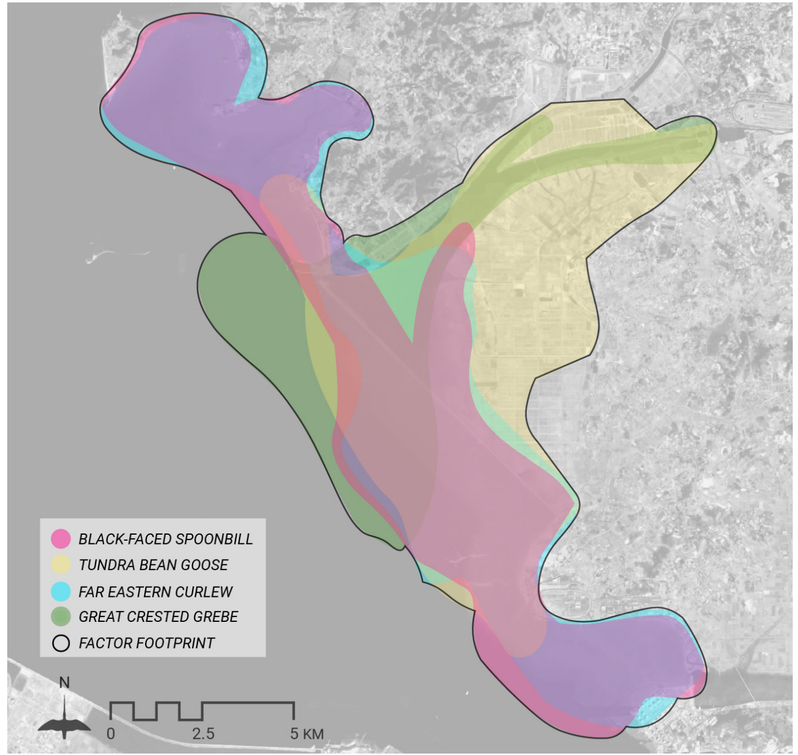


Figure 10: Field Sightings of target avian species in the Hwaseong Wetlands.

BIODIVERSITY LEVELS OF INTERNATIONALLY IMPORTANT SPECIES

The complexity of Hwaseong Wetlands habitat types provides essential resources for endangered terrestrial species in addition to birds. Figure 12 shows areas of high to extremely high biodiversity based on internationally important species. For this factor habitat types of Hwaseong Wetland were ranked based on noted capacity for biodiversity and the number of endangered and/or vulnerable animal species dependent on each habitat. Source: 2020 Wetlands Wise Use Report, The Hwaseong Wetlands Reclamation Area and Tidal Flats, Republic of Korea: a case of waterbird conservation in the Yellow Sea.

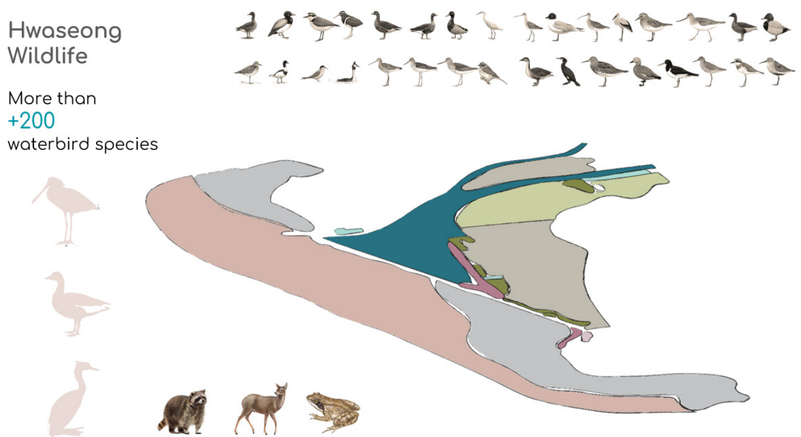


Figure 11: Biodiversity of Hwaseong Wetlands across species.

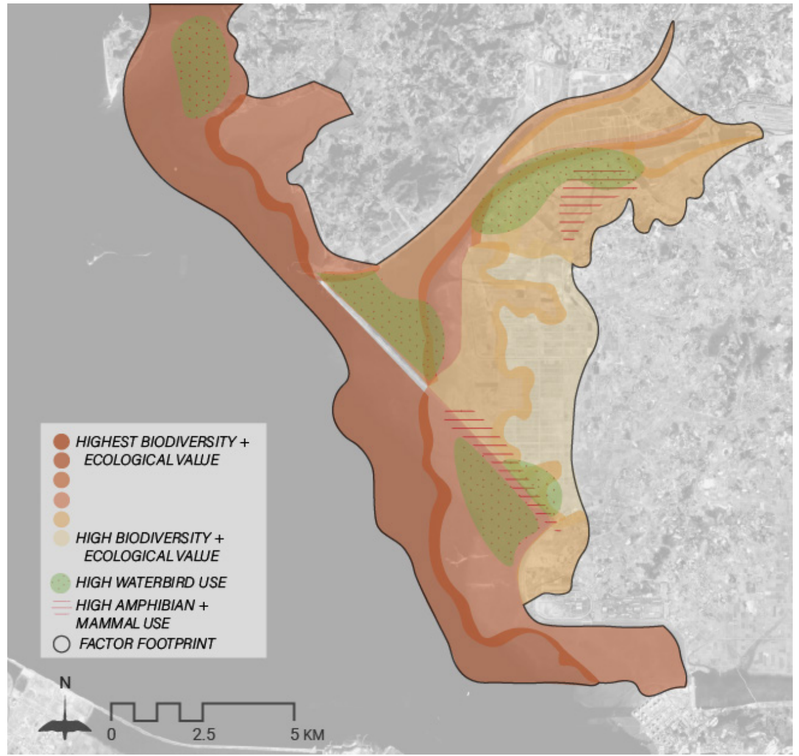


Figure 12: Relative biodiversity and ecological value of the habitats of Hwaseong Wetlands.

TIDAL INUNDATION

Figure 15 was created using remote sensing data. It shows the distinct habitats that are created by tidal inundation and freshwater processes. The extensive area of inundation is due to historic geomorphic processes. The cycle of inundation and availability of water and mud dictates which land is suitable for each species and ecological process. However, today both tidal animal species and rice production practices rely on the unique tidal processes of Hwaseong Wetlands. Protection of these inundation processes, and hydrological complexity, ensure that current animal populations are able to survive, and population growth is possible. Of critical importance are the tidal habitats that are changed as sea level rises. Sources: ESA WorldCover land cover dataset, Sentinel-2 land cover dataset by ESRI / Microsoft / Impact Observatory.

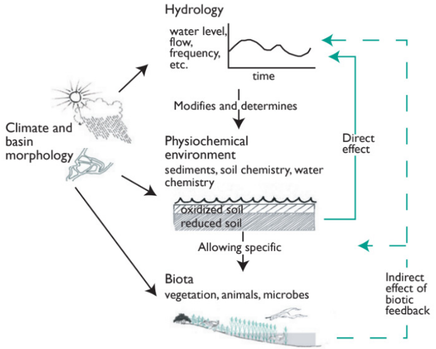


Figure 13: Diagram of Wetland Hydrology.

Figure 14: Far Eastern Curlew Feeding at Low Tide.

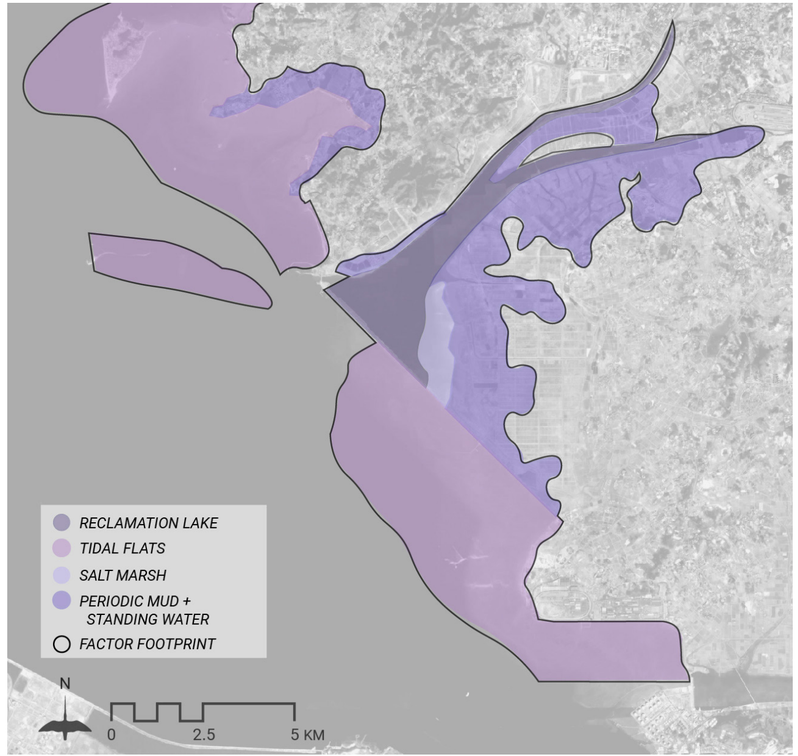


Figure 15: Tidal inundation in Hwaseong Wetlands.

WATER QUALITY WITHIN THE WATERSHED

The water quality of the reclaimed lake and marine waters, as well as the health of the overall watershed, is crucial not only to the species and processes of the OUVs but also to fisheries and farmland upon which the OUVs depends. The two primary tributaries of fresh water as well as land uses within the subbasin create a unique but fragile balance indicated in Figure 17. It has been determined that water quality in the lake is too low for use in agriculture to support farming however some measures such as the creation of water treatment ponds have already been taken with positive results. Source: 2020 Wise Use Report.

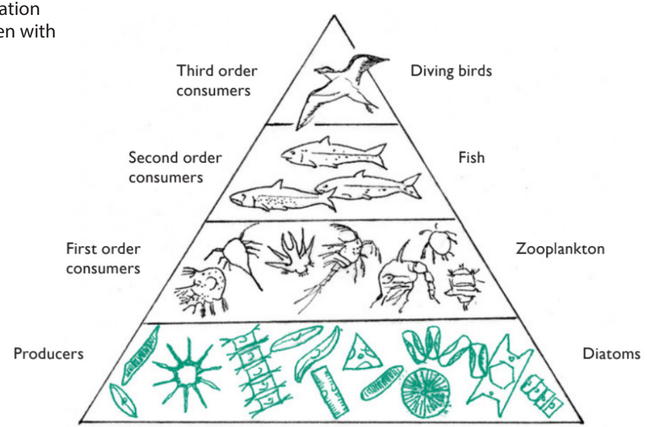


Figure 16: The food pyramid of a wetland is a complex system determined by the hydrologic cycle.

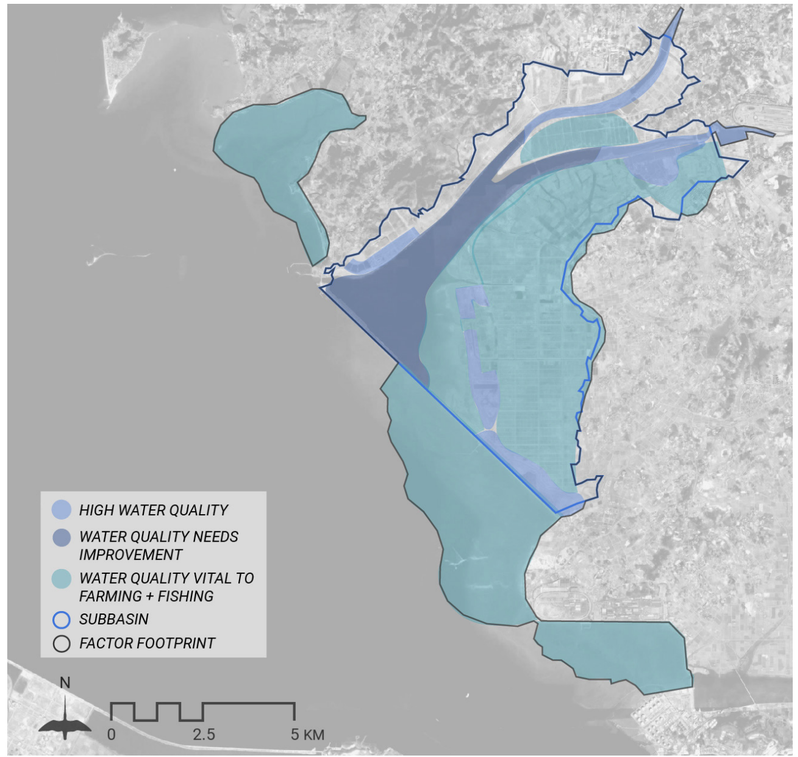


Figure 17: Water quality in Hwaseong Wetlands.

Identifying the Core Boundary

The geographic extent of the five factors—Wetland Landscape Habitats of Species Defining OUVs, Field Sightings of Targeted Avian Species Underlying OUV, Biodiversity Levels of Internationally Important Species, Tidal Inundation, and Water Quality within the Watershed—carve out a justified scientific basis for delineating a core boundary for Hwaseong Wetlands. Figure 18 shows an overlay of all factors; Figure 19 shows the resulting core boundary for the proposed World Heritage site.

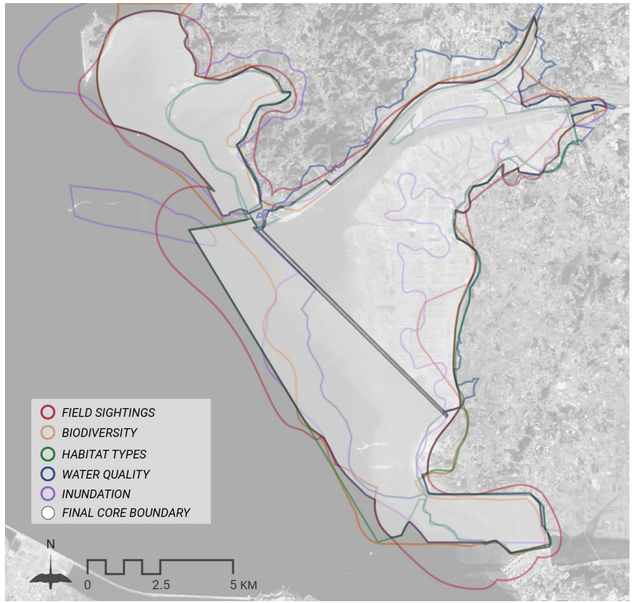


Figure 18: Overlay of all factors analyzed used to inform the Core Boundary.

The core boundary would include the feeding, breeding, and roosting areas for endangered species and migratory birds, including: tidal flats, foraging and roosting, rice fields, marshlands, reclamation land, the reclamation lake, freshwater ponds, salt marsh, marine waters, fallow lands, parks, local access farm roads, the seawall, and gate. Allowable uses would include fishing, farming, boating lanes, maintenance of the seawall, public utilities and roads, research monitoring, and habitat improvements. Access for tourists would be restricted to trails, camouflaged bird-watching hides, and viewing towers but allow seasonal events and tours led by trained and employed local guides.

Figure 19: FInal proposed Core Boundary for Hwaseong Wetlands.

Avian Disturbance

Recurrent and prolonged disturbances are greatly detrimental to animal species, and mitigating these will ensure the lasting viability of the Hwaseong Wetlands as a diverse, unique ecosystem. Factors considered include disturbances from visual stimuli and human activity, stress from prolonged noise pollution, and ecological disruption from prolonged light pollution.

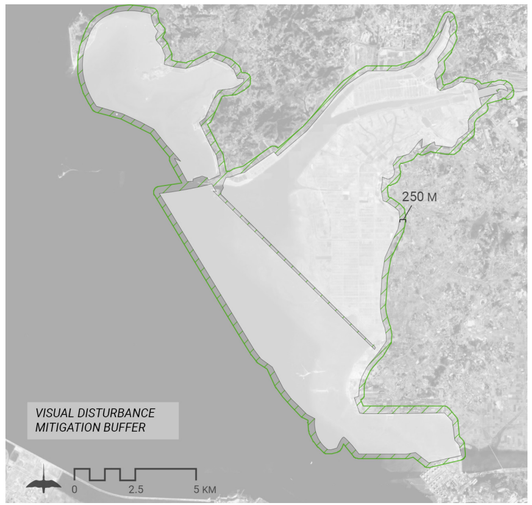


Figure 20: Visual disturbance distance of 250m.

DISTURBANCE DISTANCE: VISUAL STIMULI & HUMAN ACTIVITY

Although shorebirds are sensitive to disturbance throughout their lifecycle, they are especially vulnerable at stopover sites where refueling in a timely manner is most critical to surviving migration. Several of the celebrated shorebird species found in the Hwaseong Wetlands are extremely sensitive to disturbances caused by visual stimuli from human activity near habitats. Vehicular and pedestrian movement, dogs, and boats can prevent birds from feeding and resting, or scare them off entirely. When birds stop feeding and/or initiate flight to move away from a disturbance, they expend energy and become stressed, undermining the wetlands' stopover function. A buffer around the core must be substantial enough to protect from this kind of disturbance—a 250m buffer for the Far Eastern Curlew.

Source: 2020 Wise Use Report, "Effect of traffic noise on black-faced spoonbills in the Taipa-Coloane Wetland Reserve."

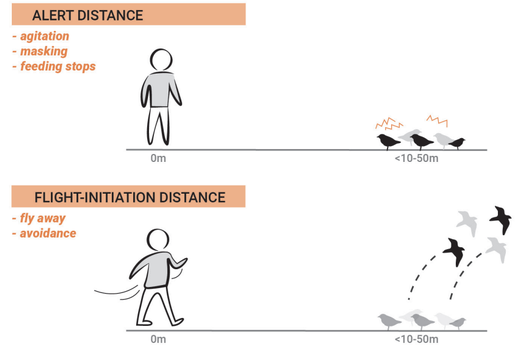


Figure 21: Flight initation distance.

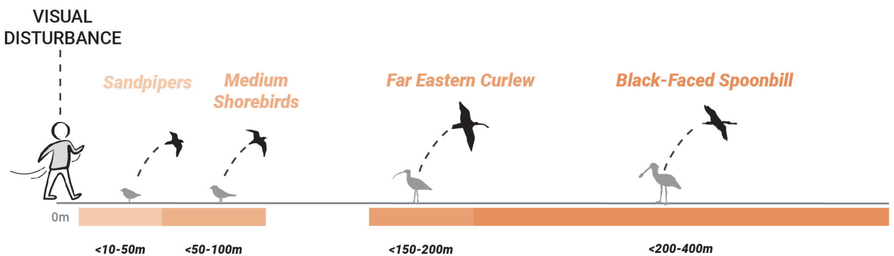


Figure 22: Visual Disturbance and Flight Initiation Distance of different waterbird species.

DISTURBANCE DISTANCE: NOISE POLLUTION

Sudden, repeated, and/or prolonged noise disturbances near roosting and feeding sites can push birds away from their essential resources. Loud traffic and other noises from urban and industrial activities can initiate flight. This stress can lead to lower migration and breeding success and lifespan. To avoid these disturbances a buffer distance of 370m to areas with noise levels less than 47 decibels is required for Black-faced Spoonbill resting and roosting. Several places of excessive noise may need to be mitigated for the OUVs to be protected in the future.

Sources: "Effects of noise pollution on birds: a brief review," and "Effect of traffic noise on black-faced spoonbills in the Taipa-Coloane Wetland Reserve."

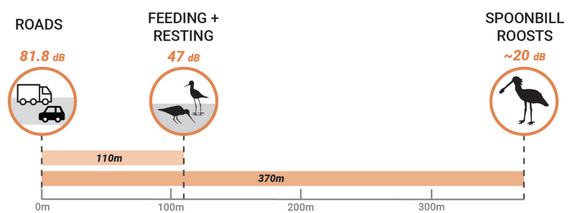


Figure 23: Relationship between proximity of roads and traffic to feeding, resting, and roosting sites.

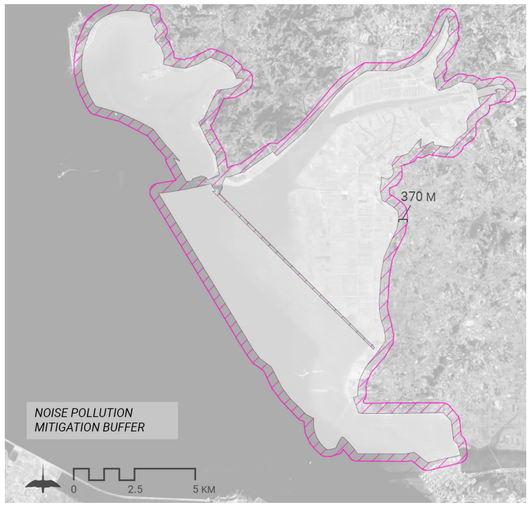


Figure 24: Noise pollution disturbance distance of 370m.

DISTURBANCE DISTANCE: LIGHT POLLUTION

Light pollution disrupts biological and behavioral processes of many animals, but especially migratory birds. The spatial navigation of migratory species is affected by artificial light, which can lead birds astray from instinctive flyways or confuse them during stopover rests. Shorebirds need a distance of 3km removed from a light radiance level of 10nW/sr*cm^2. Areas unaffected by light pollution must be protected, and excessive artificial lighting must be mitigated in the buffer from the core habitat.

Sources: "Artificial lighting in night estuaries – implications from individual ecosystems," "GPS tracking for mapping seabird mortality," and "Radiance light trends map – global radiance levels."

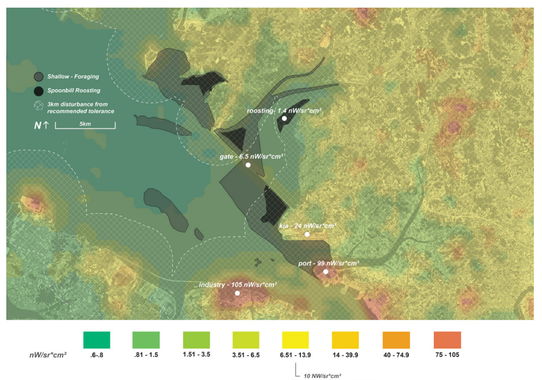


Figure 25: Light pollution mapping in Hwaseong Wetlands.

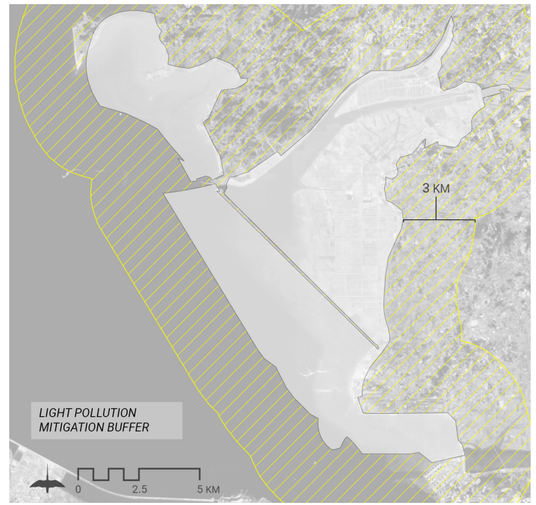


Figure 26: Light pollution disturbance distance of 3km.

The Buffer

A two-tiered buffer is recommended to create a transition from the urban areas to the core of the wetlands in order to protect the OUVs. The buffers are based on the disturbance tolerance of target avian species that underlie the OUVs—the Far Eastern Curlew, Black-faced Spoonbill, Tundra Bean Goose, and Great Crested Grebe. The outer 370m buffer addresses the disturbance distance of the spoonbill, as it prefers a resting distance from noise levels over 47 decibels. The inner buffer (250m) is based on the disturbance tolerances of the Far Eastern Curlew, the Hwaseong City bird.

All uses allowed in the core are allowed in the inner buffer zone. No other visitor uses are permitted between the core boundary and the 250m boundary. In the 120m zone between 250m and 370m, additional visitor-oriented uses may be appropriate subject to review and approval by the proposed Hwaseong Wetland Management Committee outlined in Section 8, Informed Decision-Making. Appropriate uses might include boardwalks, bird-watching hides, nature interpretation, and occupied structures no higher than 7m provided that light, noise, and water quality standards outlined for the core are met. Because the target species occupy different habitats and are present at different seasons, some areas beyond 250m may be open to visitors at appropriate seasons. Further, in several areas of the wetland that are particularly sensitive, additional buffer may be required.

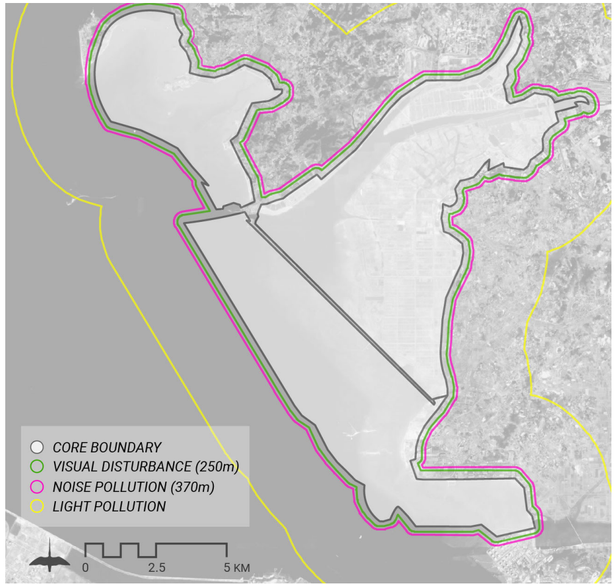


Figure 27: Overlay of visual disturbance, noise disturbance, and light pollution.

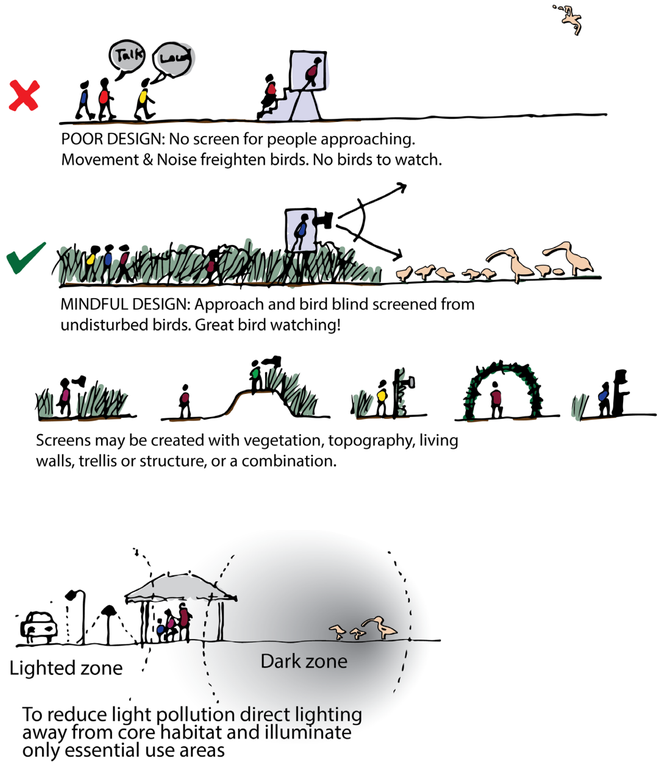


Figure 28: Mindful design for human activity-related disturbances.

Master Plan

Designation of the wetland as a World Heritage site can protect the natural coast that tourists seek, and inspire the development of high-quality facilities that become landmarks for the city, stimulate economic development, entrepreneurial advancement, and jobs. It can amplify local identity and pride in the place. The Hwaseong Wetlands Master Plan was developed to designate land uses appropriate in and outside the core boundary and buffer that provide long-term protection for the OUVs as well as existing fishing and agriculture. It provides opportunities for experiencing those economic activities and for tourists to experience and learn about the OUVs.

Showcasing Outstanding Universal Values

The plan prioritizes the OUVs of Hwaseong Wetlands as well as the local history and culture. Most visitor facilities and activities would be located outside the core buffer and would be monitored to ensure a balanced, reasonable, and healthy wetland system. Visitor activities would be concentrated at three visitor centers that would be the first points of contact with the World Heritage site; located adjacent to the northern, eastern, and southern points of the wetlands. They would provide orientation and education for tourists, serve as community centers and research hubs, create space for grassroots economic activity, and house management. OUVs would be highlighted in the workshops, displays, and viewpoints in the Visitor Centers; along hiking routes, at bird-watching hides and viewing towers, and in guided tours out in the wetlands so as to inform, awe, and beget their stewardship.

Hwaseong Wetlands by the Numbers

150,000	**birds counted in 2020**
1500	**ha active rice fields**
113	**waterbird species**
35	**nationally or globally threatened bird species**
25	**fishing villages**
19	**National Natural Monuments bird species**
16	**waterbird species in internationally important concentrations**
9	**landscape types**

Figure 29: Master Plan for management proposal in Hwaseong Wetlands.

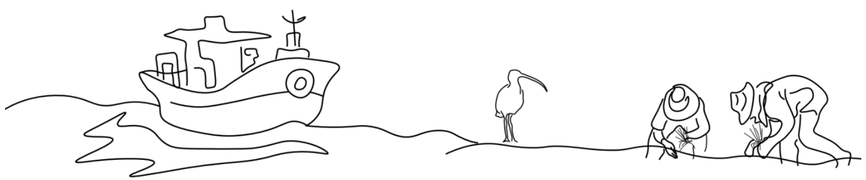
Fishing and Farming

All existing fishing, farming, and fishing port uses would be permitted by right. Traditional fishing and rice farming would continue and would be showcased with tours, educational workshops, and events. The World Heritage designation would provide an opportunity for fisherfolk and farmers to increase family income by providing educational experiences, with fishing trips, farmstays, and fish- and farm-to-table culinary experiences.

A proposed collaboration between rice farming and waterbird conservation would provide benefits to both. In addition to producing rice, rice fields would be managed to provide foraging, roosting, and nesting for birds. Farmers would be compensated for allowing seasonal flooding of rice and non-crop fields to benefit birds. The participating farmers would have exclusive rights to lead tours for rice festivals, bird watching, and tourist work vacations.

Everyday Life

Similarly, hands-on experiences, food services, shopping, and overnight accommodations would celebrate everyday life. Also located outside the core and buffer, they would offer a wide variety of types of each to meet demands of diverse visitors. Food services would focus on distinctive and seasonal dishes characteristic of the Hwaseong area. Family-operated businesses would be a priority, ranging from "catch-and-cook" boat tours to sit-down restaurants. Overnight accommodations would range from camping to homestays to high-end eco-lodges.



Transportation

The master plan proposes a regional transit system to make it easy to arrive by public transportation—a route that would connect the Suwon World Heritage site to the Hwaseong Wetlands World Heritage site. This would include a rapid bus line and combination bus and subway system. The existing highway system would lead visitors to the visitor centers from the north, east, and south. An innovative transportation system in and around the wetland would serve local and tourist needs. Visitor access would focus on biking, hiking, and a shuttle system with essential but minimal movements and stops that would be developed in conjunction with Kia to reduce tourist vehicular use around the site and in the adjacent communities, and reduce the city's carbon footprint.

There is a unique opportunity for a partnership with Kia. The master plan proposes a shuttle system of Kia vans as a major means of moving people from center to center and to attractions. The vans, small vehicles, would be the electric Purpose-Built Vehicles (PBV) which Kia will begin producing in 2023. Additional partnerships include the proposed corporate retreat and eco village in the South Visitor Center near the Kia factory.

The regional transit and Kia shuttle systems would serve multiple functions, one of which is to avoid tourist congestion on highway 301 crossing the seawall. To maintain easy access for local traffic and still provide areas for visitor sightseeing and bird watching, visitors would be encouraged to take Kia van. In parts of highway 301, traffic lanes would be reduced to allow Kia van stops, bicycle lanes, and vegetative buffers which would also create bird-watching areas out of the sight of shorebirds.

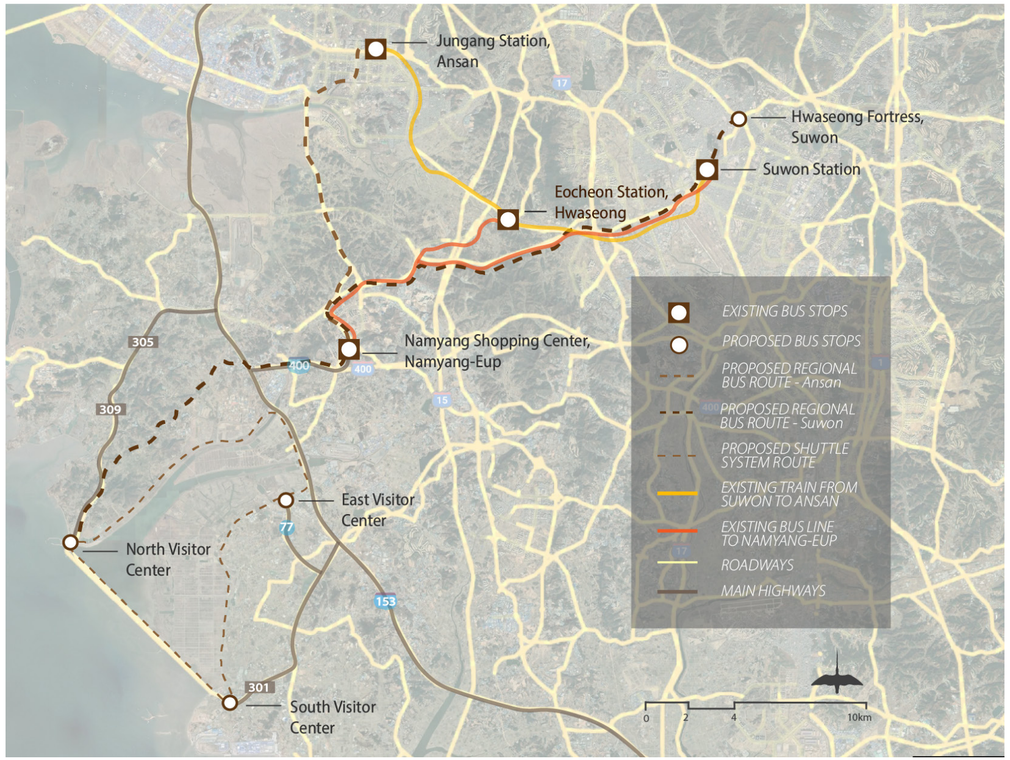


Figure 30: Regional transportation map including proposed travel routes.

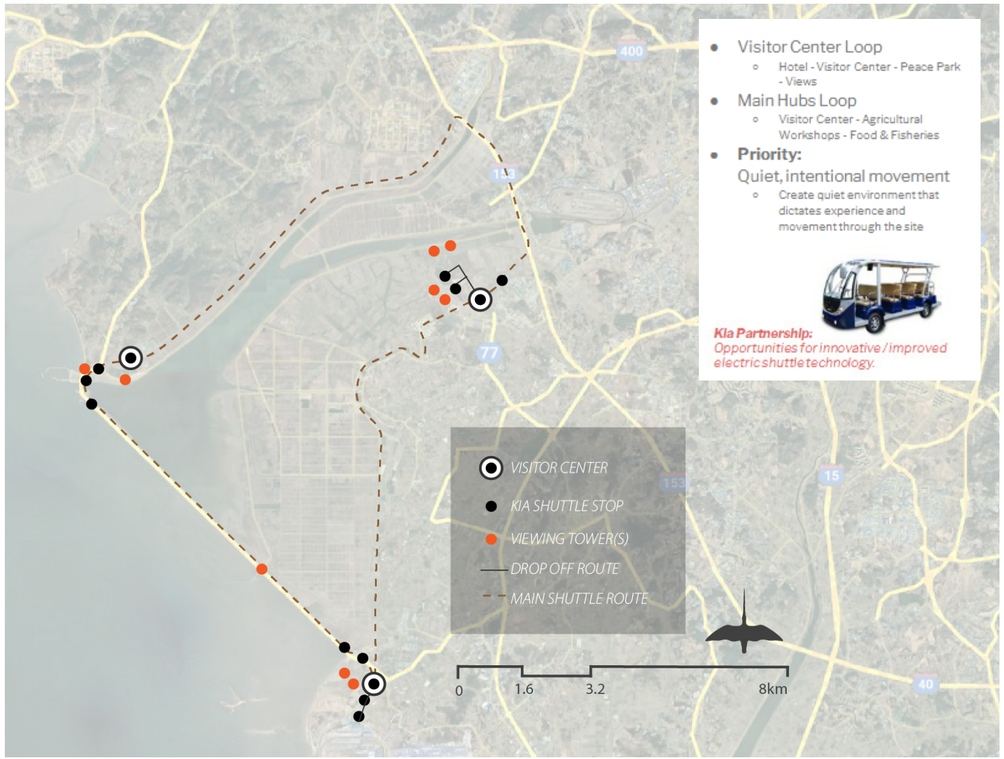


Figure 31: On-site shuttle route between visitor centers.

Area Attractions and Activities

The OUVs of Hwaseong Wetlands are the primary attraction. These include 35 nationally or globally threatened bird species, views of extraordinary tidal fluctuations, meditative wetland vegetation, and walks into nature that children of all ages will never forget.

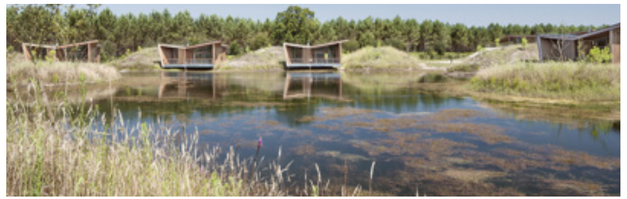
Hwaseong could also provide opportunities for multi-day trips, from Suwon to the sea and along the coast. Visitors could plan and take weekend or week-long vacations for inland or coastal highways. One suggestion for a coastal excursion could include stops at 17 different places of special interest, starting at Sudosa Temple, going north to the Kia plant, then entering the World Heritage area at the South Visitor Center, a visit to the Kooni Memorial Garden and Peace Park, staying overnight at the eco lodge for an early-morning view of the endangered Far Eastern Curlew, lunch of fresh squid (locally caught and a Hwaseong specialty). After several days here the visitors could travel north to Baekmiri Tidal Flat Eco Village, the Tando Port Walk, visit the Jebudo Island Overlook, then go to Daebu Lake, search for dinosaur fossils, or just enjoy the view. This is just one of many possibilities along the coast before heading back to Hwaseong Wetlands, where the visitors could spend a whole week and uncover only a part of the natural and cultural attractions.

TOP TO BOTTOM -
Figure 32: Example of what local markets and restaurants could look like.
Figure 33: Black-faced Spoonbill festival, celebration of waterbirds and community.
Figure 34: Community engagement and education.

Figure 35: Potential regional connectivity, coastal tourism near and in Hwaseong Wetlands.

Overnight Accommodations

If designated a World Heritage site, Hwaseong Wetlands will increasingly attract a great diversity of visitors, from international bird watchers to weekend fishing trippers. As a result, an equal variety of overnight accommodations would be required. Along the proposed bus and subway routes from Suwon Fortress to the Hwaseong Wetlands North Visitor Center there are already over 100 hotels within walking distance of the stops. These provide for hotel rooms at every budget level. Within the Hwaseong Wetland area the Master Plan proposes hotel accommodations around the South Visitor Center: 200-300 rooms at an exclusive Forest Hotel, 100-200 high-end eco lodge rooms near premier bird-watching sites, 100-150 rooms at the corporate retreat, and between 500 and 1000 rooms in hotels at major highway intersections nearby. Between 200 and 300 tent camping sites and 100-200 RV sites are proposed. For visitors wanting cultural immersion, there would be 100-200 homestay possibilities.



TOP TO BOTTOM & LEFT TO RIGHT

Figure(s) 36 & 37: Homestay and hotel examples.
Figure(s)38 &39: Overnight accomodation samples.

Visitor Centers

General locations and possible designs are provided for each center in the master plan. The North Visitor Center focuses on the power of tidal flows to shape not only tidal flats but also the entire coastal ecosystem that creates habitat needed for target species and fisheries. The East Visitor Center introduces the diverse habitats of Hwaseong Wetlands that support the OUV of extraordinary biodiversity of over 200 bird species, highlights water quality and management of the site, as well as offers the agricultural experience of the countryside and activities for each season. The South Visitor Center focuses on habitat needs of foraging and rest for each endangered species at extreme tides.

Because of the adjacency to the core and buffer boundaries, design guidelines for each center and associated development would determine materials, fenestration, height and bulk, noise and light levels. Buildings in these areas would be limited to no more than 7m. Building materials would honor existing vernacular styles but express the wetlands' unique universal values conveyed at that center. Lighting and noise guidelines would be determined to avoid disturbance to species in the adjacent wetlands.

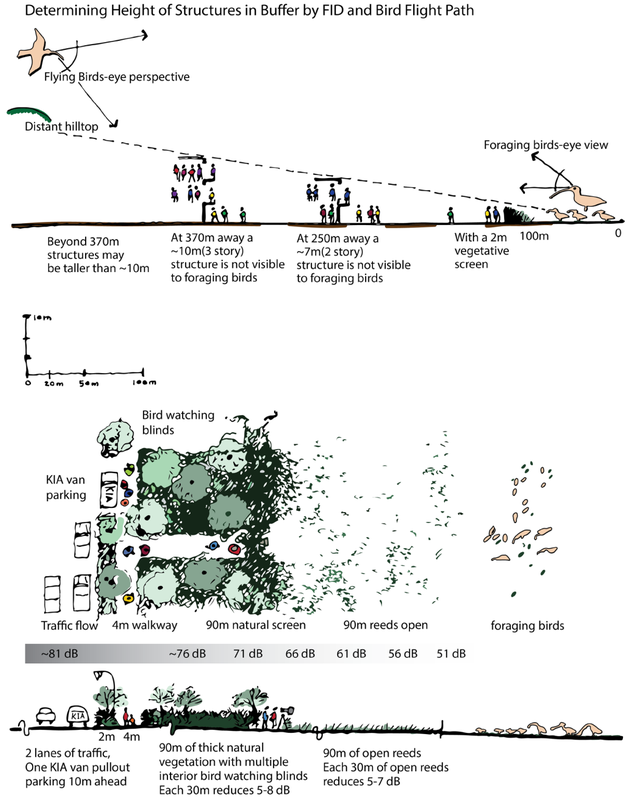


Figure 40: Structure height informed by disturbance distances. Proposed vegetation buffers for noise disturbance.

North Center

Many livelihoods in this area rely on fishing and are directly impacted by the health of the wetlands, the habitat offshore, and the Yellow Sea. This area is already developed as a visitor destination with regionally-recognized restaurants, a fishing port and market, and for-sale fish products. The adjacent beach and boardwalk in this area are already loved by residents and visitors, and expansion enhances the identity and attraction to this center. These continue deep-rooted cultural connections with the water, tidal flats, wetlands, and fishing practices reflected in mythology, beliefs, and community.

The design of the North Center acknowledges and respects such traditions. However, with concern that the site could become overcrowded, other functions, including the Visitor Center, are shifted to closer-by locations. The Sea Stewards Center, Agriculture Center, and the transportation hub are proposed to be located east of the hill, with views towards the clean water ponds, reclamation lake, and other wetlands, and call attention to the eco-greenhouse farming. A RV camp for agricultural festivals would be adjacent to the center.

Pedestrian trails would lead to the top of the hill near the shore. The hill offers panoramic views toward the sea, the entire wetland, and the abundance of birds. It also provides a unique opportunity to observe the awe-inspiring forces of the tides and teach about how the tidal flows shaped this landscape and today's entire coastal ecology. An installation of low-to-high-tide markers is proposed to dramatize the tidal processes.

The Visitor Center would include interpretive exhibits and introduce geomorphic hydrology. The featured exhibit would be a scale model of the historic and present tidal flats, showing the power of such extreme high and low tides, and the resulting habitats of universal value. The model would fill the Sea Steward Center main hall with drama and could be experienced from the edges of the model's tidal flats or from within the center of the tidal flats via a boardwalk. Local guides would lead tours to explain the role of the tides in shaping their culture.

This center would be the terminus of a regional transit system that connects Suwon Fortress and other attractions throughout Hwaseong. The transportation terminus would offer convenient regional public transit to other attractions, including the public transportation across the sea wall. It would be a place to hop on a Kia van tour.

Some of the lower-lying lands were historically wetlands. Some could be restored to wetland. Such restoration would offer more habitat for the birds at the high tide as sea level rises and places for bird resting. This is most critical to replacing present resting and roosting places that likely will be lost. The restored habitats would offer visitors a spectacular view from the visitor center.

BEFORE

AFTER

Figure 41: Before & after at the North Visitor Center, environmental education.

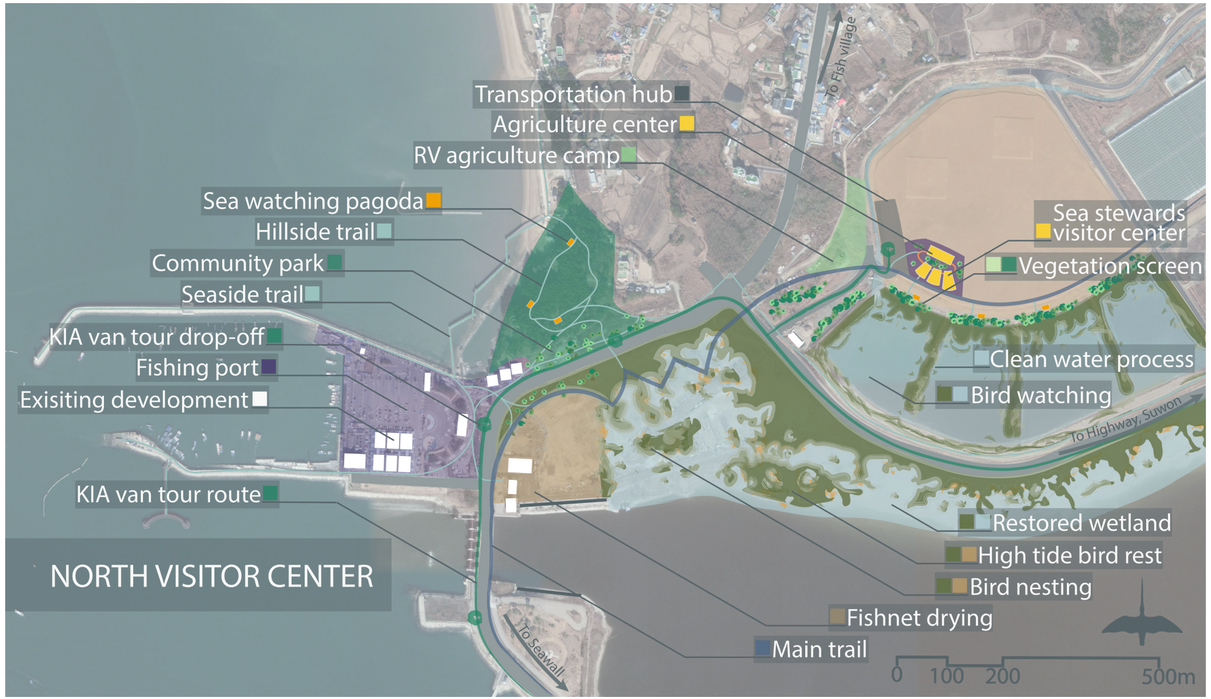


Figure 42: Plan view of proposed design for the North Visitor Center.

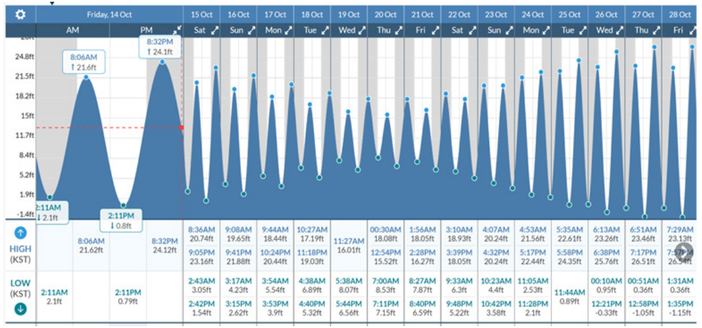


Figure 43: The October 2022 chart underscores the awe inspiring tides of Hwaseong Wetlands.

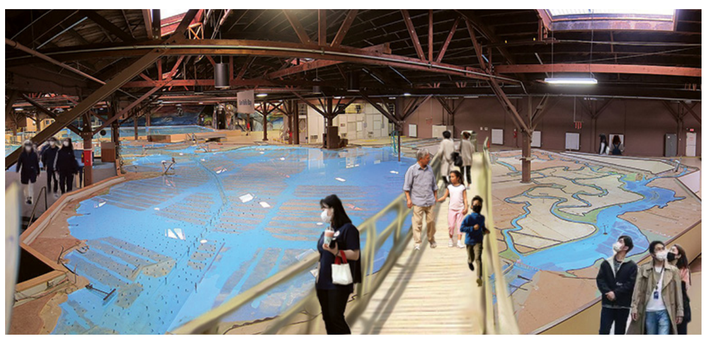


Figure 44: Visualization of interactive exhibit in the North Center.

Figure 45: Visual of North Visitor Center activities: fish markets, boardwalk, and restaurants with views of the wetlands.

East Center

The East Center is further away from the core habitat, but with more opportunities for immersion into the experience of the interdependence of people and wetlands. It offers special programs about the diverse habitats of Hwaseong Wetlands that create the OUV of biodiversity, not simply as a scientific concept, but as awe-inspiring experiences of birds foraging and in flocks of thousands on wing.

This center is designed for bird watching and hands-on water-management and agricultural experiences. The rice fields attract many species of birds including thousands of bean geese. The plan encourages traditional agricultural practices that offer educational and seasonal recreational experiences, with pathways and bike routes to visit and participate in rice planting and harvesting. Areas would be closed to visitors during seasons crucial in the birds' lifecycles to protect target species. Bird-watching hides at the confluence, freshwater ponds, and agricultural fields would offer close views of biodiversity without disturbing the birds. Guides could lead tours to the freshwater ponds which attract an unusual diversity of birds. In three smaller ponds a special exhibit would demonstrate the process that the Hwaseong City is using to increase the lake's water quality and provide habitat for endangered species.

This site is designed to evoke understanding of the ecological processes at work, with bird-watching hides camouflaged in natural materials that frame views to call attention to "invisible" processes. Because of the diverse freshwater ponds, brackish waters, and rice fields, biodiversity is readily interpreted by first-hand experience as well as exhibits demonstrating the vulnerability to population change. Workshops would show how water and soil quality influence biodiversity and create local jobs for guides and citizen science certification for visitors. This center could welcome collaborations with schools throughout the country.

Across the road from the Visitor Center, away from the core zone, are existing restaurants, businesses, and homes. Food services and overnight accommodations could flourish, particularly local organic cuisine, homestays, and eco-lodging, creating economic benefit for families nearby.

Figure 46: Before & after at the East Visitor Center, bird blinds & bird watching

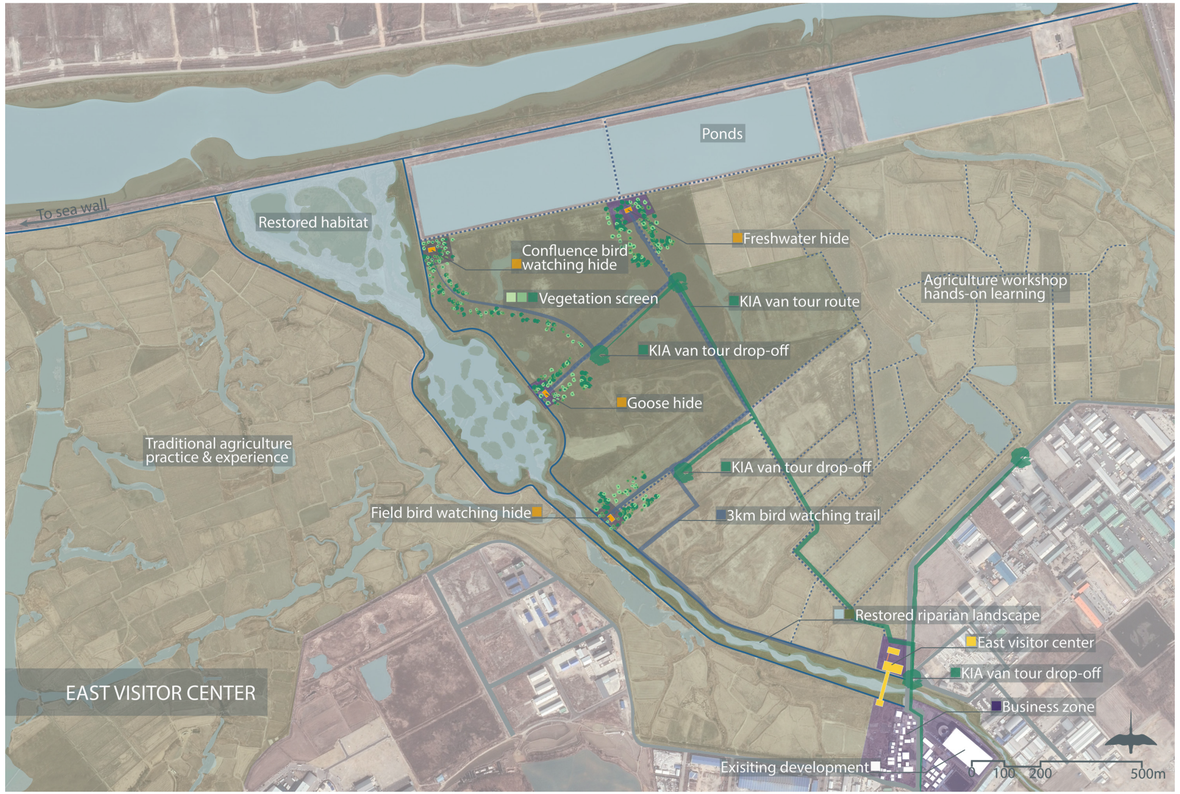
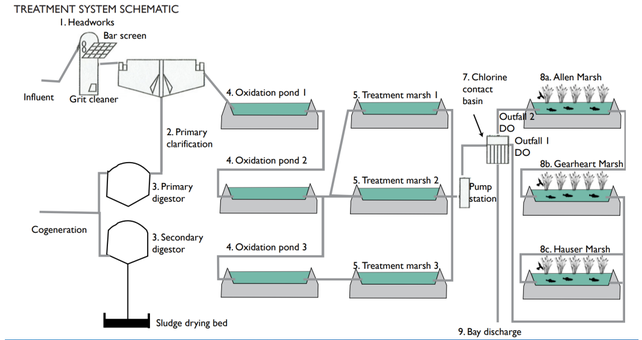
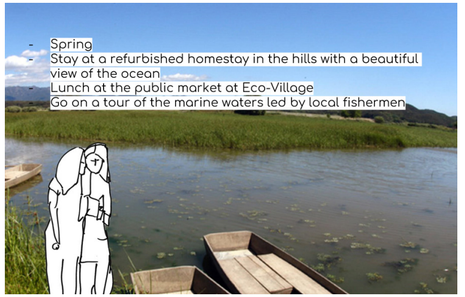
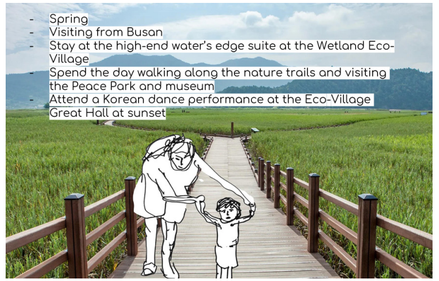


Figure 47: Plan view of proposed design for the East Visitor Center.



ABOVE- Figure 48: Sample of educational materials and exhibit for water treatment facilities.
BELOW- Figure 49: Visualization of interactive water treatment exhibit and trails at the East Center.
RIGHT- Figure 50: Visualization of site activities across seasons.





South Center

This center complex directs the visitor's visual and mental attention to the tidal flat. It carefully transitions from built to natural, from active to quiet, from closed to open. These juxtapositions heighten the sense of understanding the universal values of these wetlands. It uniquely serves tourist, scientific, and local community functions. Education at this site centers around the habitat requirements for the target species and introduces the hard truths about habitat loss, climate change-related threats, and the impact of human activity on the wetlands. At the same time, the opportunity for learning is paired with a celebration of the biological diversity and unique ecological functions of the Hwaseong Wetlands. Here the constructed wetlands demonstrate how actions can be taken to ensure sustainable populations in the future. It provides an awe-inspiring sensual experience of the expanse of the Yellow Sea, ocean smells, wind in one's face, and thousands of birds feeding or resting.

From this center short guided tours would introduce visitors to some of the target species: the Far Eastern Curlew in the reclamation lake and Pond 13; the Black-faced Spoonbill in tidal flats; the Great Crested Grebe in open waters of the reclamation lake, freshwater wetlands, and marine waters; and the Tundra Bean Goose in rice fields, the reclamation lake, Pond 13, and freshwater wetlands. These species may be spotted from the bird-watching center and along a walking trail. Certified guides could take visitors to several special viewing spots and one secret bird hide. Great flocks of migratory shorebirds would be visible from these places. Each of the bird-watching hides would demonstrate how natural local materials can create effective places to watch bird behavior up close without disturbing the birds.

This center would feature a constructed wetland that mimics the likely result of sea level rise, providing safe resting, roosting, and nesting sites at increasingly high tides—habitats that are most rapidly being lost. The created wetland and adjacent farmlands would provide excellent bird watching for beginners. To minimize disturbance to the core habitat, overnight accommodations would be set back from the core for at least 370m. The eco campus and associated buildings would be set back over 700m from the core. This would provide climate change resilience for both endangered species and expensive infrastructure investment.

Compared to the northern part of the seawall, the southern area is recently developing visitor attractions which are not organized as a whole. This visitor center would serve as a focal point for these attractions. The main complex, Eco Campus, would be located at the juncture of major local highways: one crossing the seawall to the Kia plant and all the way to the Sudosa Temple in the south; one from the national highway's intersection to the Sports Park and Peace Park. The eco campus would intermingle with the existing fabric of development, creating a symbiotic relationship between local landowners and the tourist experience. It would create a campus that provides tourist information, exhibits, and educational experiences, and a box office to purchase tickets for bird-watching tours. There would be a Great Hall for festivals and performances, a research center, and classrooms. A district would be created where local people could sell from their homes or production shops: fish and food products, hand-carved curlews and other birds, and various crafts of the area. The headquarters, conference, and meeting rooms for the local management office of the Hwaseong Wetlands World Heritage site could also be located here and provide flex space to accommodate start-up projects and innovative experiments. Because of the intermixing of local- and visitor-serving facilities, from ballfields to performance hall, this center would set precedents for future tourist development that met local needs.

The plan calls for a wide variety of food services and overnight accommodations, including luxury eco lodges, a forest hotel, a dining hall with guest rooms, private homestays, tiny cottages, a corporate retreat, and researcher housing, all removed from the core and buffer. There is an ecology camp and a peace camp for tent campers. There is also a destination hotel complex recommended 6km away at the intersection of regional roadways.

The center would serve as a transportation hub with automobile and bus parking, public transportation stops, and Kia vans for small group guided tours. Walking and biking trails would connect all of the facilities and lead to extraordinary places to view birds and tidal changes. Most visitors will walk little more than 400m from a center, so key experiences would be provided within that range. For the more adventurous, trails would lead to dozens of less-traveled points of historical, cultural, and ecological interest, including the seawall.

BEFORE

AFTER

Figure 51: Before and after visualization of birdwatching in the wetlands at the South Visitor Center.

Figure 52: Plan view of proposed design for the South Visitor Center.

Figure 53: Visualization of boardwalk, mindful distance from sensitive habitat.

Figure 54: Visualization of South Visitor Center plaza, manmade water features & educational materials that introduce the site, and transition into the wetlands.

Figure 55: Sound contours for proposed airport in Hwaseong Wetlands.

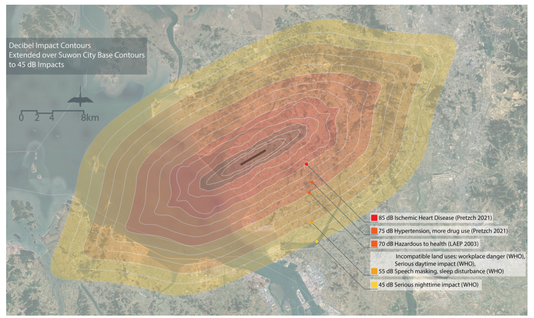


Figure 56: Zoomed-out view of decibel impacts symbolized with sound contours for proposed airport in Hwaseong Wetlands.

Issues Facing the Wetlands

This report calls for a plan to protect the wetlands and allow them to thrive. A new economic model is emerging – one that is more deeply-rooted in sustainability and in human well-being. In Hwaseong City, as around the world, more and more people want safe, green environments in which to work, rest, and raise their families. Protection and restoration of Hwaseong Wetlands would take in substantial amounts of blue carbon and would help reduce the carbon footprint. However there are threats to the biodiversity of Hwaseong Wetlands including habitat change, pollution, over-harvesting, invasive species, and climate change. Water quality has been an issue and must be carefully managed to ensure both long-term sustainability of agricultural lands and habitat health. Disturbance to waterbirds is an issue that was discussed extensively in the Wise Use Report and in previous sections in this report. Land uses must be avoided that are incompatible with the high level of bird use and the mindful tourism experience envisioned by this plan.

The largest imminent threat to the OUVs, however, is the proposed airbase. Noise impacts from an airbase likely would have detrimental health impacts on residents, fisherfolk, and farmers. Tourism economies would likely suffer from high decibel flight paths. The World Health Organization (WHO) warns about detrimental health by WHO and USEPA standards. Health impacts would include:

- High blood pressure and cardiovascular disease
- Hearing impairment
- Headaches
- Difficulty understanding speech and sleep disturbance
- Cognitive performance reduction
- Depression
- Drug use
- Academic performance lags as a result of air traffic noise

45dB has significant nighttime impacts on health. 55dB is the WHO threshold for incompatible land uses such as residential, schools, outdoor work like agriculture and fishing, as well as recreation. Dangerous take-off and landing noise would extend 20km into fishing, farming, and residential areas. All Hwaseong beach recreation areas, the sports complex, and Peace Park also fall within the zone of land uses incompatible with an airbase. Noise impacts of the airbase on health should be studied further as should the negative economic impacts on agriculture, fishing, and tourism.

Noise impacts from an airbase likely would destroy all of the outstanding universal values of the Hwaseong Wetlands and the wetland ecological services defined by UNESCO, Ramsar, and World Heritage standards. A dozen endangered or species of concern likely would be locally extirpated. Each time a plane takes off or lands creates a soundwall that hinders birds from accessing essential foraging and resting habitat. Additionally, airstrikes of birds endanger aircraft, pilot safety, and species of special concern.

Research conducted by the University of California, Berkeley of the impacts of an airport on the most endangered spoonbill in the world, *Platalea minor,* illustrates likely outcomes for many species. 40dB causes short-term avoidance. 50dB causes masking agitation and foraging interruption. 70-75dB causes spoonbills to fly away and prolonged avoidance. At 80-85dB spoonbills will not return to the wetland. The Suwon City projected flight noise indicates that all the wetlands presently used by spoonbills would exceed 80dB; based on this, spoonbills, as well as other birds, are likely to be driven out of the wetland if the airbase is constructed.

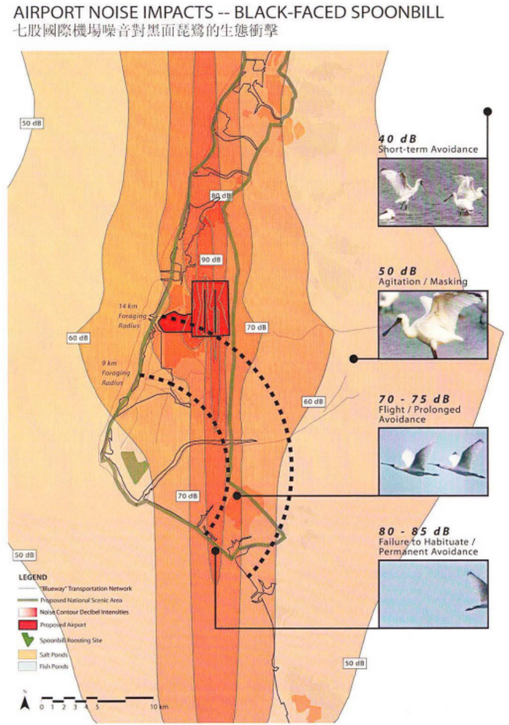


Figure 57: Impacts of airport noise on the Black-Faced Spoonbill.

Informed Decision Making

For Hwaseong Wetlands to preserve its unique and essential values in the Getbol Korean Tidal Flats World Heritage system it must remain healthy and be carefully managed. Its ecosystem services are vital to the livelihoods of many local people and must be stewarded to respect the long-established land uses of tidal flats and wetlands. Balance between the needs of existing industries and sensitive species must be negotiated to minimize disturbance and establish acceptable interactions in the wildland-urban interface. Research and ongoing adaptive management are essential.

This requires shared decision-making. The 2020 Wise Use Plan for Hwaseong Wetlands provides a strong starting point. UNESCO/ World Heritage and Ramsar both provide models. There is an Integrated Management Plan for the Phase One Getbol sites. The table on pages 53-54 augments these models. It describes a method for orderly, informed input and decision-making at the Hwaseong Wetlands. It is both top-down and bottom-up to ensure strong management and community dialog.

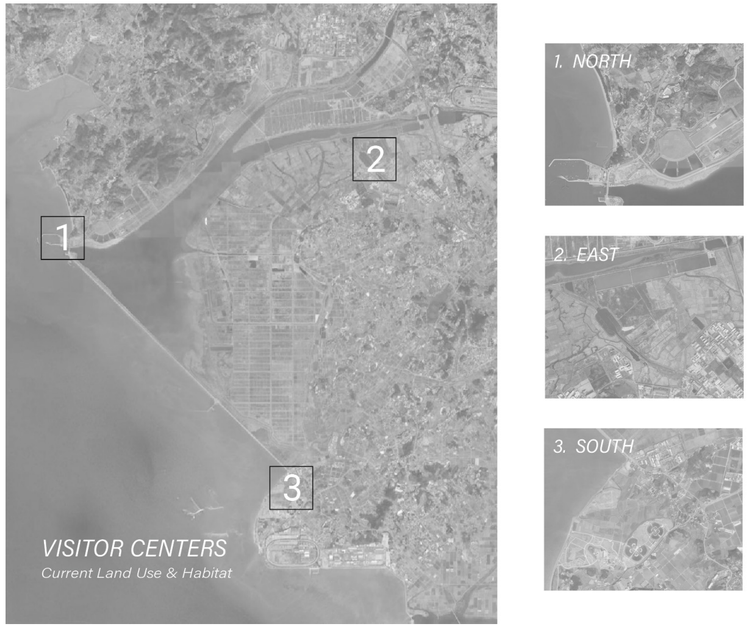


Figure 58: Contextual aerial imagery for informed decision making.

VISITOR CENTER	CURRENT LAND USES	PROPOSED LAND USES
1. North	• Fishing port • Baekmiri fishing village • Gunpyeong-ri Beach • Community park • Water treatment ponds • Fishnet drying	• Sea Stewards and Agriculture visitor center • Restored wetland, high tide bird rests and nesting • Trails, bird and sea watching • Education and exhibits (ponds and wetland) • RV agriculture camp • Transportation hub, Kia van route, drop-off
2. East	• Water treatment ponds • Rice fields • Nearby restaurants and markets • Urban development	• Visitor center • Restored habitat • Trails, bird watching, and hides • Education, exhibits, hands-on (ponds, habitat, agriculture) • Kia van route, drop-off
3. South	• Sports center • Peace park and viewing tower • Peace museum and artillery exhibit • Urban development and housing	• Visitor center • Bird watching center • Eco campus • Corporate retreat • Forest hotel, homestay, eco lodge and permit camping, peace camp • Restored wetland, high tide bird rests and nesting • Trails, bird watching, and hides • Education, exhibits, hands-on, interactive workspace, research (biodiversity, habitat, agriculture) • Kia van route, drop-off

GOALS & OBJECTIVES

To preserve OUVs

1. Provide protection for ecological systems, processes, and habitats of Hwaseong Wetlands Outstanding Universal Values
2. Support and expand diverse economies based on the unique natural values that benefit local residents and businesses nearby the wetlands and in the regional economy
3. Create soft infrastructure for the mindful tourist with visitor centers offering ecological and cultural education to show the interdependence of ecosystem and community well-being, and to advance scientific knowledge and sound management of natural treasures

IDENTIFY OUVs and Existing Land Uses

Environment and Biodiversity
- Summer stopover
- Roosting and feeding for expansive congregations and endangered, internationally important bird species
- 9 habitat types
- Fisheries
- Tidal ecosystem functions

Economic
- Gyeonggi Bay
- Tidal flats
- Farmland

Waters, Fishery, and Agriculture
- Gyeonggi Bay fishing zones
- Gyeonggi Bay shipping lanes
- Rice farms
- Tidal flats and salt marshes
- Freshwater and saltwater ponds
- Reclamation lake

Fallow Land
- Reclaimed land with unused rice fields
- Reed and grassland

Commercial Activity and Development
- Port
- Restaurants
- Fish markets
- Boat tours
- Amusement park

Private Industry
- KIA
- Small scale manufacturing
- Shophouse craftmaking

Civic and Parks
- Peace Park
- Sports Complex
- Peace museum and artillery exhibit
- Gungpyeongi-ri Beach

Villages and Residential

SCIENCE & DATA ANALYSIS

- Habitat types
- Bird numbers and diversity
- Water: coastal inundation and flooding
- Bird sensitivity: disturbance, migration, density

PROPOSALS

Tourism and Education
- visitor centers
- programs
- exhibits
- guided tours, seasonal tours
- hands-on experiences
- accommodations, eateries, shopping
- regional tours

Infrastructure to support mindful interaction with birdlife and habitat
- trails
- blinds, towers, and platforms
- shuttle system, routes, and drop-offs

Shared Management (Hwaseong Wetland Management Committee)
- Delineate boundary, buffer, and commit to conservation
- Set priorities
- Develop management plan
- Develop budget, commit to funding
- Control water levels for habitat
- Conduct research and monitoring
- Oversee restoration projects
- Train tourist operators, trail guides, rangers
- Address problems as they arise

Reduce threats to ecological health
- Designate Hwaseong Wetlands as World Heritage Site
- Design/build wetlands and landscape restoration
- Develop monitoring metrics and monitor

JURISDICTION & STAKEHOLDERS

Government:
Hwaseong City
- Environment Management Bureau of Hwaseong
- Water Management Division of Hwaseong
- Marine and Fisheries Division of Hwaseong
- Urban Policies Division of Hwaseong
- Tourism Promotion Division of Hwaseong
- Cultural Heritage Division of Hwaseong
- Local Development Division of Hwaseong
- Response Management Division for the Relocation of Airforce Base of Hwaseong
- Agricultural Policies Division of Hwaseong

Gyeonggi Province
- Maritime and Fisheries Department of Gyeonggi Province

Pyeongtaek Regional Office of the Ministry of Oceans and Fisheries *(Office in charge of the management of the national protected area in Hwaseong FNS)*

Cooperative Representative(s)
- Fisherfolk
- Rice Farmers

Scientists

NGOs
- Hwaseong Korea Federation for Environmental Movements
- Hwaseong Eco Foundation
- EAAFP Secretariat
- Birds Korea

Concessions and Business
- Kia
- Tourism operators
- Local business
- Crafts people

World Heritage/UNESCO
- Site management
- Staff

SUPPORT COMMUNITY DIALOG

- Local seminars to introduce World Heritage program, outstanding Universal resources, research
- Community workshops to discuss master plan, visitor centers, and shuttle proposals
- Events to design and build World Heritage identifiers (banners, totems, hides)
- Community meetings to plan for sea level rise and coastal retreat

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LAEP and SAVE International have partnered since 1997 to create sustainable alternative plans that benefit the globally endangered Black-faced Spoonbill, the human communities with which they co-habitat, and the larger ecosystem along the EAAF. The plan proposed in this report advances the thinking by four teams of researchers and environmental planners in a studio at Berkeley (LAEP 205) in the Spring of 2022. The teams worked to define a defensible boundary and management plans for Hwaseong Wetlands World Heritage site. In the UCB/ SAVE tradition, the teams used a combination of land-planning, science, and democratic design to develop plans for the Hwaseong Wetlands area.

The studio was led by Dr. G. Mathias Kondolf and Professors Randolph Hester and Marcia McNally; research team members were: Hannah Hansen, Meg Kirsch, Skyler Lewis, Hailey Malone, Cate Meersman, Kat Palermo, Harrison Raine, Ella Reichental, Sarah Rupper, Maggie Shepherd Farley, Marina Stern, Keira Thompson, Xihan Yao. Key external partners in this effort were Dr. Nial Moores of Birds Korea, Dr. Yves Michelin of WetAgro SUP, Dr. Yekang Ko of University of Oregon, Barbara Butler of the National Park Service Golden Gate National Recreation Area and Fiona Lyon of Portland TriMet. Dr. Moores, Derek Schubert, SAVE International President, and Jun Hanchul of Hwaseong KFEM provided review of the interim draft report.

Credits

Credits
The graphics in this report come from several sources. Many of the graphics (maps, plans, perspectives, and some of the diagrams) are original to this report and are not credited. A few of the graphics are from other sources and are credited as such. A number of the graphics are from work produced by the research teams at LAEP and are credited by team.

Teams
Team 1 Meg Kirsch, Cate Meersman, & Kat Palermo
Team 2 Skyler Lewis, Hailey Malone, Marina Stern
Team 3 Hannah Hansen, Ella Reichental, Maggie Shepherd Farley
Team 4 Harrison Raine, Keira Thompson, Sarah Rupper, Xihan Yao

Credits by page
Page 2 Figure 2 , Marcia McNally; Figure 3, Team 3
Pages 3-4 Vivian Fu/EAAFP, The training workshop for wardens/rangers to conserve Hwaseong wetlands (10 days in August & November, in the RO Korea) - Eaaflyway
Page 8 Figure 4, Marcia McNally
Page 9 Figure 5, Hester et al; Figure 6, Team 3
Page 11 Figure 8, redrawn from map by Birds Korea; Figure 9, Team 1
Page 13 Figure 11, Team 3
Page 15 Figure 13, Hester et al; Figure 14, Birds Korea
Page 17 Figure 16, Hester et al
Page 24 Figure 25, Team 2
Page 33 Figures 32-33, Team 4; Figure 34, Birds Korea
Page 34 Figure 35, Team 4
Page 35 Figures 36-39, Team 3
Page 39 Figure 43, Tide Times and Tide Chart for Hwaseong (tide-forecast.com)
Page 43 Figure 48, Hester et al
Page 44, Figure 50, Team 3
Page 49, Figure 55, redrawn from public information, Suwon City and Hwaseong City
Page 50 Figure 57, UC Berkeley

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Landsat-8 multispectral imagery
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eBird, South Korea - eBird
Radiance light trends map – global radiance levels interactive map