

BUSAN CITY

Coastal Environment and Ocean Policy

Achieving Sustainable Development together with **PNLG**



MAYOR MESSAGE



Byeon, Sung-wan
Acting Mayor

Greetings from Busan City!

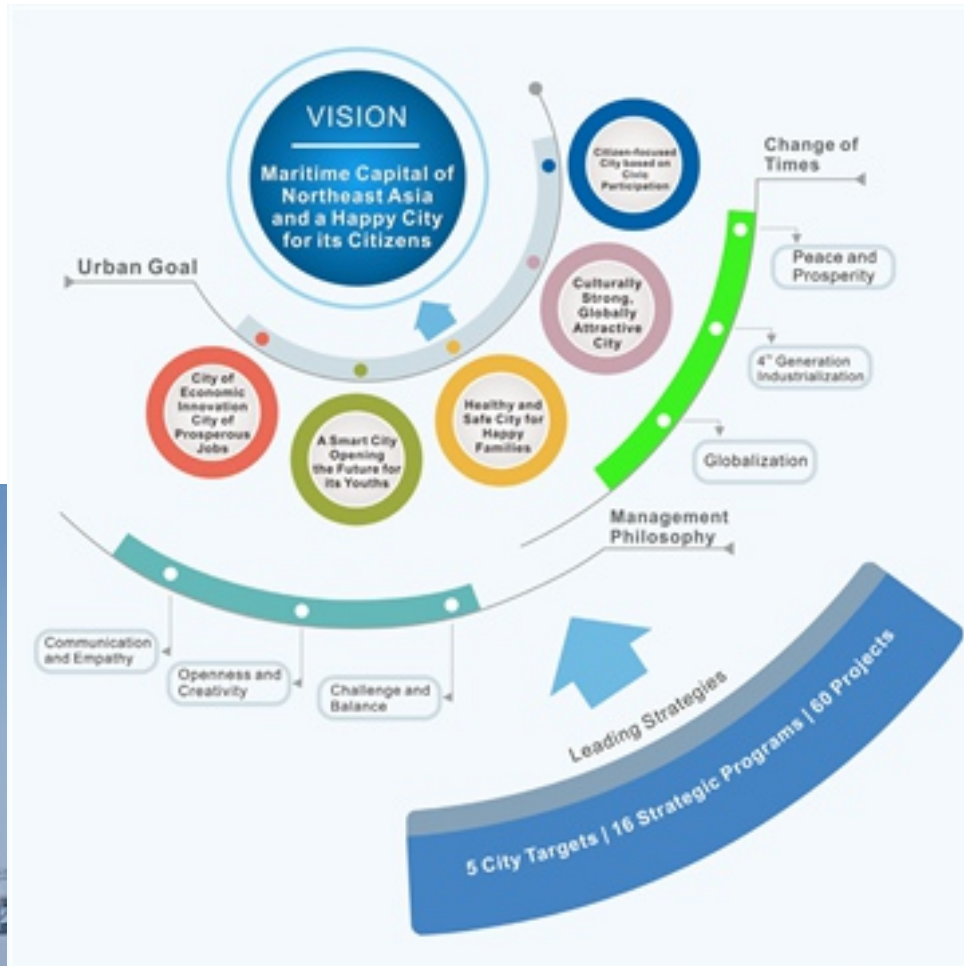
It is my pleasure to inform you that Busan City has joined the PEMSEA Network of Local Governments (PNLG) for Sustainable Development. As Busan City has put considerable efforts to achieve the sustainable development goals and targets, I believe that PNLG will be a useful platform for sharing experiences and lessons-learned around the East Asian Seas region.

As we are all experiencing now, the global community is suffering from the worst case pandemic of COVID-19 in modern history. This pandemic is an alarm for our readiness and preparedness for worst case scenarios. Although the time is against us, we shall exert our best efforts to continue our works on sustainable development. We should build more resilient society through urgently responding to disease control, climate change and transboundary pollution among other issues. We cannot do these tasks alone but we will need to collaborate closer than ever before.

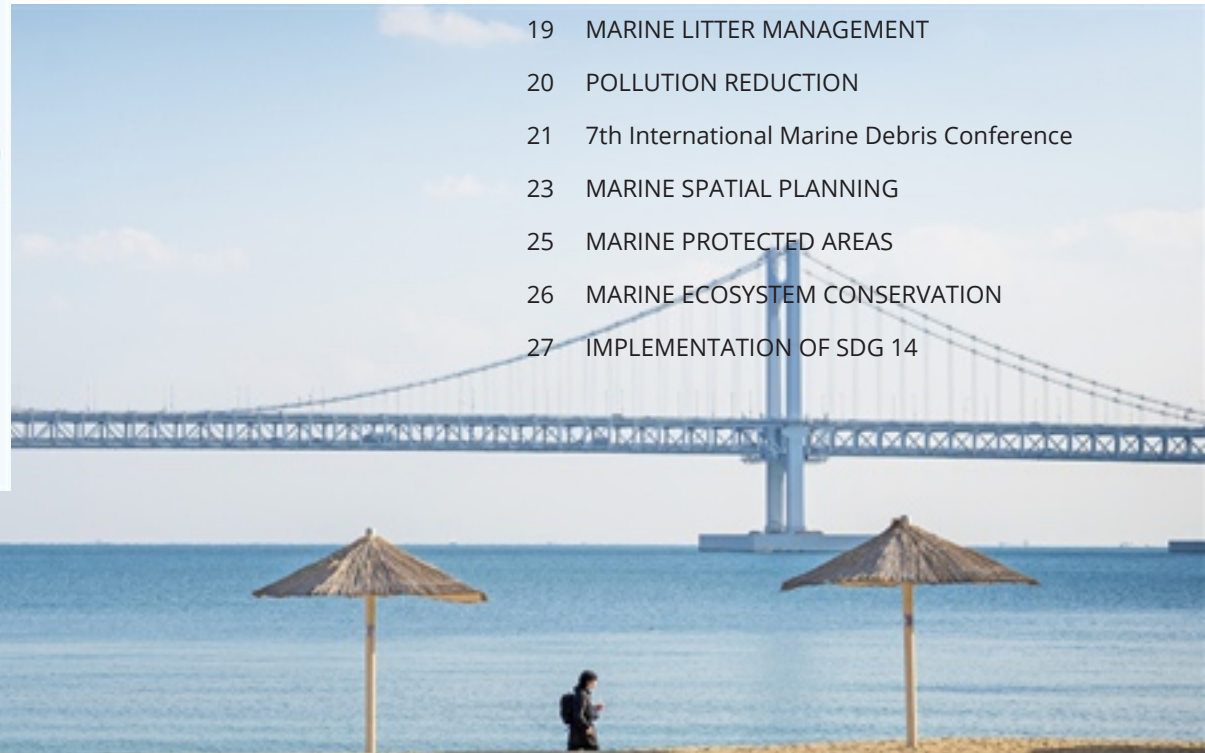
Busan City has set a vision to be a 'Maritime Capital of Northeast Asia and a Happy City for its Citizens' and implementing various policies and programs to achieve the vision. As a part of our efforts, we are hoping to host the 2030 World Expo in Busan. Special programs such as establishing Tri-port platform and promoting ocean economy will lay a firm foundation for Busan City to be one of global leaders in sustainable coastal and ocean development.

We as PNLG should strive to put more efforts for sustainable development in our region and make progress toward sustainability even during this time of difficulty. In line with this, I am hoping that Busan City will have opportunities to host the PNLG Forum and EAS Congress in near future.

Thank you.



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Busan City Hall

Busan, a bustling city of approximately 3.5 million residents, is located on the southeastern tip of the Korean peninsula. The size of Busan is 770.07km² which is only 0.8% of the whole landmass of the Korean Peninsula. The natural environment of Busan is a harmonious relationship of mountains, rivers and sea. Its geography includes a coastline featuring superb beaches and scenic cliffs, mountains which provide excellent hiking and extraordinary views with hot springs scattered throughout the city. Busan enjoys four distinct seasons and a temperate climate that never gets too hot or too cold.

Busan is the second largest city in Korea. Its deep harbor and gentle tides have allowed it to grow into the largest container handling port in the country and the sixth largest in the world. The city's natural endowments and rich history have resulted in Busan's increasing reputation as a world class city for tourism and culture, and it is also becoming renowned as a hot spot destination for international conventions.

Exceptional sightseeing

Busan is famous for beautiful beaches and tourism spots where both Koreans and foreigners enjoy alike. You will be never tired of finding new things in Busan. Explore and find out the hidden treasure of Asia.



Dongbaek Island in Haeundae



Delicious raw fish in Jagalchi Fish Market

Great seafood

Wherever you go, there are tons of good food served in Busan. As a seafood central of RO Korea, delicious yet affordable seafood are plenty. Visit world's famous Jagalchi fish market and experience wonderful world of seafood of Busan.

Vivid life

Life is dynamic and people are energetic in Busan. The city is virtually operating 24 hours and there are plenty of places to visit even at late night. Explore and experience the vivid life of Busan while enjoying every bit of your time staying in Busan.



International Fireworks Festival at Gwangsan bridge

Port & Logistics

Busan port is world's 6th largest port with 41 berths and trade volume of 21.99M TEU. In terms of transshipment freight, Busan ranked 2nd in the world. Busan port has 30km-long quay with many docking facilities along the quay.

Busan is No.1 marine leisure and tourism city in RO Korea with the three modern cruise terminals and two marinas.



South Port

Maritime Industries

There are 27,187 companies relating to maritime industries in Busan. Among them, 3,600 companies (13.2%) are related to maritime logistics, 6,166 companies (22.7%) for fisheries and 13,383 companies (49.2%) for ocean tourism.

In 2018, 160,023 people were hired for maritime industries. Among them, 47,101 people (29.4%) for maritime logistics, 25,831 (16.1%) for fisheries and 47,957 (30%) for ocean tourism.

Total sales from maritime industries were amounting to US\$281.9B. Among them, maritime logistics earned US\$111.9B (34.1%), fisheries US\$106.2B and shipbuilding US\$63.8B (19.4%).



The Busan Yachting Center





Busy fish vendors at Jagalchi Fish Market



Jagalchi Fish Market Building

Busan is the largest hub port for overseas fisheries in RO Korea with total fishing vessel of 3,469. Gross fisheries production was 498,000 MT with 328,000 MT from off-shore fisheries and 170,000 MT from overseas fisheries. In 2018, Busan City exported about US\$537M worth fisheries products and imported about US\$2,103M.

A total of 6,193 fisheries related companies hired 25,381 people. Busan produces large amount of sea mustard (*Undaria pinnatifida*), laver (*Pyropia teneta*), laminaria (*Saccharina japonica*) and other seaweed species.

Busan is famous for its renowned Jagalchi Fish Market and Busan International Fish Market where both wholesalers and retailers are visiting daily to buy fresh seafood. These modern fish trade facilities provide clean and sanitary environment for both fish dealers and customers.



Busan International Fish Market



Market Meeting Hall



Wholesale Market Hall

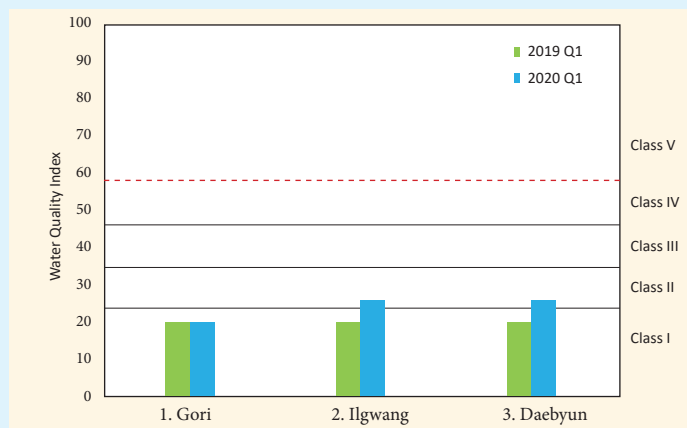


Night View of Busan International Fish Market



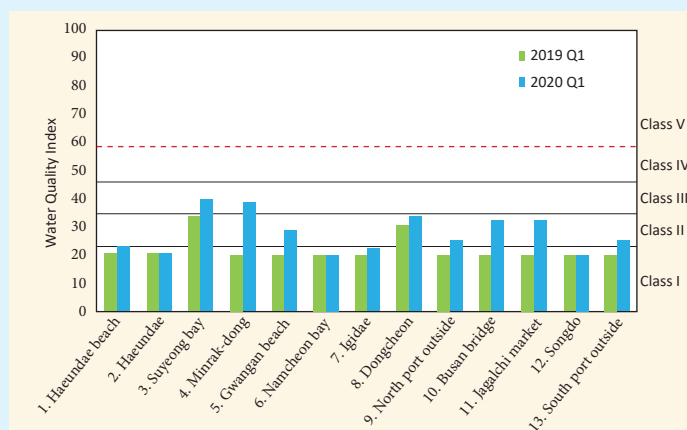
Night View of Advanced Seafood Processing Complex in Busan

Coastal water quality



The 3 monitoring stations for coastal water quality program are located in Gijang-gun where water is deep and water exchange rate is good. The results showed fairly good quality with WQI between Class I and II.

Environmental Management Sea Area



Environmental Management Sea Area covers highly populated city centers and recreational beaches of Busan. Most of the 13 monitoring stations showed good quality (below Class II) except for the 2 stations in 1st quarter of 2020 which were above Class II.

Protecting coastal water quality is ensured by periodic monitoring of water samples. Along the Busan coastal lines, four water quality monitoring programs with 30 sampling stations are in operation. The programs adopt different water quality parameters depending on the purpose and type of the monitoring. These programs include: i) coastal water quality monitoring; ii) environmental management sea area monitoring; iii) port water monitoring; and iv) estuary monitoring. The water samples of 30 monitoring stations are collected quarterly and analyzed at the environmental laboratories located in Busan.

The results of water quality analysis are posted in the Marine Environment Information System (www.meis.go.kr) for sharing with general public. The quality of water is expressed in Water Quality Index (WQI) which is calculated from many water quality parameters in a formula. The government classifies five water quality classes: Class I for excellent water quality; Class II for good quality; Class III for moderate quality; Class IV for bad quality and Class V for very bad quality.

4 monitoring programs and 30 sampling stations

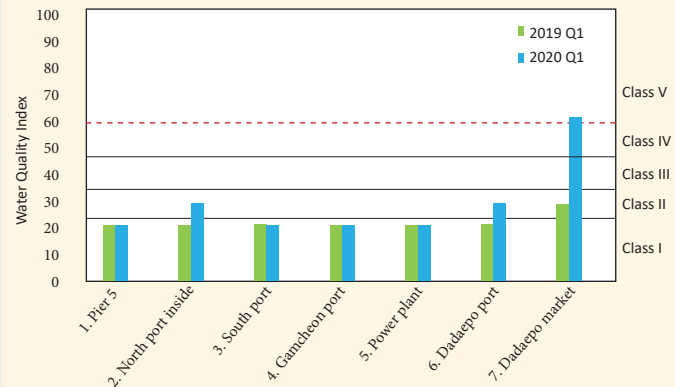


Water sampling at Haeundae beach



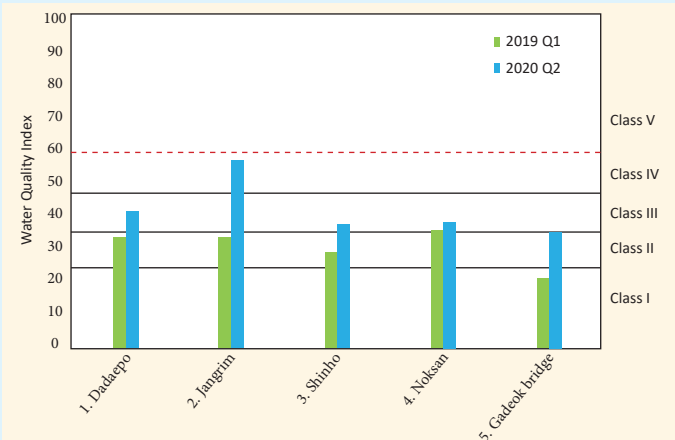
Water sample analysis at Busan Institute of Health and Environment

Port water quality



Busan port is under constant threat of water quality deterioration due to heavy vessel traffic and land-based nutrient loading. With the 6 monitoring stations within Busan port, the port water quality is regularly monitored. The results of analysis showed that majority of locations were under good quality (below Class II) with the only exception of Dadaepo market inside the Dadaepo port which showed above Class V (very bad quality). The results indicate that management intervention should be applied more intensively to improve the water quality inside the Dadaepo port.

Estuary Water Quality



Nakdong River is the longest river in RO Korea. Its estuary is an important ecosystem which hosts numerous marine species and migratory water fowls. The 5 monitoring stations showed that water quality is acceptable (below Class IV) with one exception at Jangrim station (below Class V) due to the significant loading from the land-based sources of pollution from the upstream.

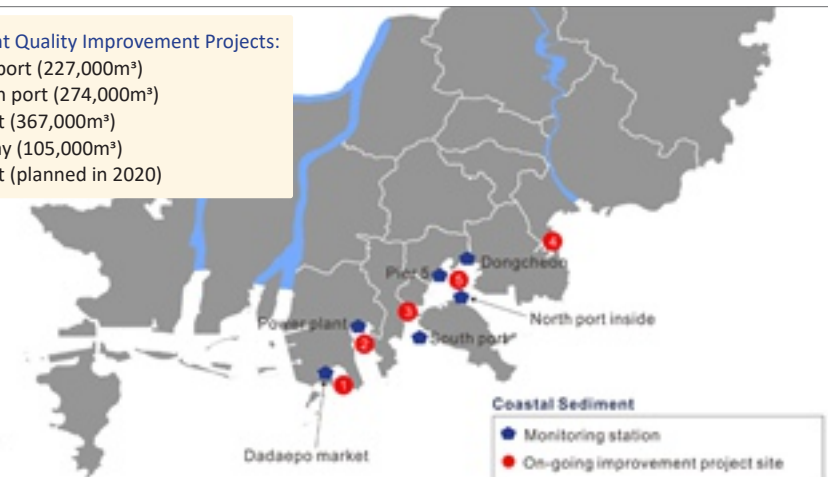
Coastal Sediment Quality

Ports are usually located inside bay where ocean currents are slow. In this environment, sediment deposition is naturally occurring and deterioration of water quality follows due to decomposition of nutrients inside the sediments. Busan City is monitoring sediment quality through 6 monitoring stations at Pier 5, North port inside, South Port, Gamcheon port, Dongcheon and Dadaepo port. The results of sediment analysis showed COD level of 9.99 - 50.36mg/g-dry weight at all monitoring stations. The mouth of Dongcheon (a stream) recorded the highest COD level due to direct input from the land-based sources of nutrients. Heavy metal concentrations were within the manageable range.

Sites with polluted sediments are continuously cleaned and improved through dredging projects. Dredged sediments are properly treated and disposed on land. Currently, four projects are on-going or completed and one project is in the planning process. These sediment quality improvement projects are essential in maintaining good coastal water quality around the City.

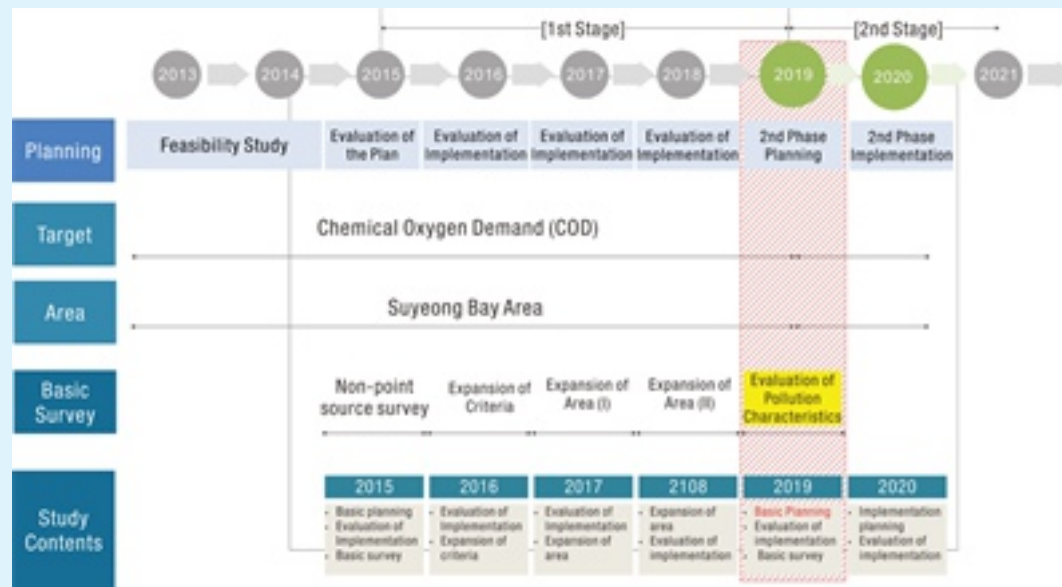
Port Sediment Quality Improvement Projects:

1. Dadaepo port (227,000m³)
2. Gamcheon port (274,000m³)
3. South port (367,000m³)
4. Yongho bay (105,000m³)
5. North port (planned in 2020)



Operation of a sediment improvement project at Dadaepo port. Polluted sediments are dredged to a barge (right photo) to transport to land where sediments are properly treated and disposed of.

History of TMDL in Busan

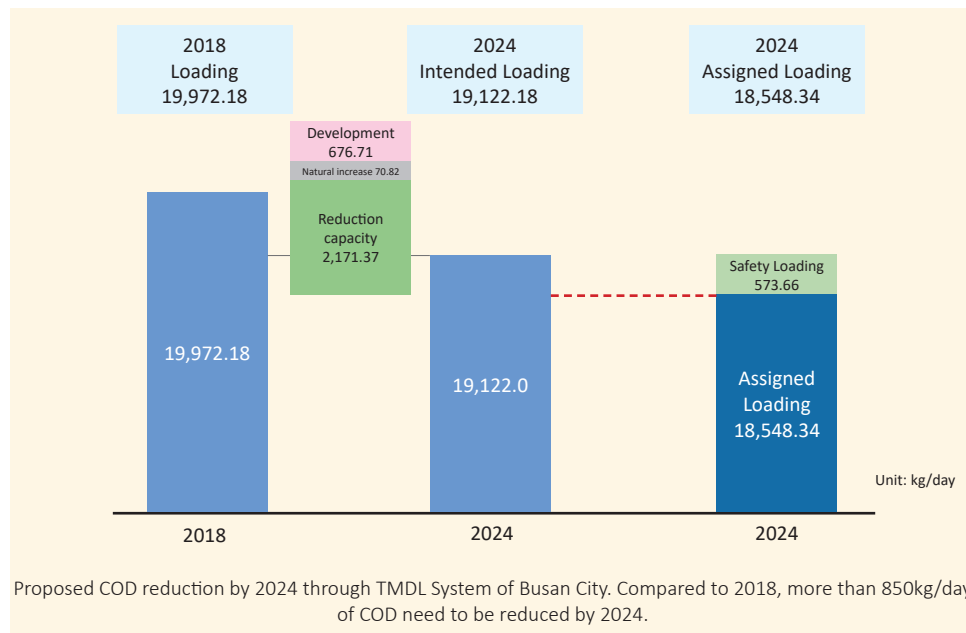


With more than 3.5M population and major industries including world's 6th largest port in container cargo, Busan City has become a marine capital of RO Korea. As Busan port is a major gateway for trade goods for the country, the City is always busy with numerous commercial vessels such as cargos, tankers and fishing vessels as well as passenger vessels around its coastal waters. Therefore, the coastal waters of Busan City are under the threats of pollution from not only land-based sources but also sea-based sources. In this reason, the central government of RO Korea designated the entire coastal waters of Busan City as a 'Specially Managed Sea Area' in 1982 due to its vulnerable conditions to various hazards from the seas.

As a Specially Managed Sea Area, coastal waters of Busan City has been well managed with various policy interventions for preventing marine pollution. However, water quality target of Suyeong Bay where famous Gwangang beach is located has not been readily achieved due to development and population growth. As a result, the central government decided to employ a Total Maximum Daily Load (TMDL) System in Suyeong Bay area in 2013. The watershed of Suyeong Bay covered by TMDL is about 245km². The City is aiming to achieve COD level of 1.31mg/L by 2024 in Suyeong Bay. By the agreed target of the TMDL System of Suyeong Bay, it is required to reduce the total loading of COD by 2,171.37kg/day until 2024.

Busan City will scale up the TMDL System to other coastal areas in four stages. The 1st stage was completed during 2015-2019 at Suyeong Bay area. The 2nd stage TMDL will be implemented during 2021-2025 at North port area while Suyeong Bay is entering into its 2nd phase where actual COD reduction will be happening.

Stages and phase of TMDL development in Busan City



Marine litter management programs of Busan City

Program	Feature
Beach litter collection and disposal	<ul style="list-style-type: none"> Port and beach litters collected by residents Disposal expenses paid by the city government 794 MT collected in 2019 with total budget of US\$112,260
Nakdong River Estuary litter collection and disposal	<ul style="list-style-type: none"> Collection of litters at the estuary in time of heavy rain fall and typhoons 60%-70% of litters are wooden materials with the rest composed of plastics and metals 3,064 MT collected in 2019 with total budget of US\$2.6M
Port floating litter collection and disposal	<ul style="list-style-type: none"> Litters from vessels and port facilities collected and disposed Operation by the Korea Marine Environment Management Corporation (KOEM) and South Port Management Corporation 399 MT collected in 2018 with total budget of US\$57,159
Waste fishing gear collection and disposal	<ul style="list-style-type: none"> Fishers are getting paid for returning waste fishing gears to the collection facilities at port Reducing abandoned fishing gears 186 MT collected in 2019 with total budget of US\$83,330

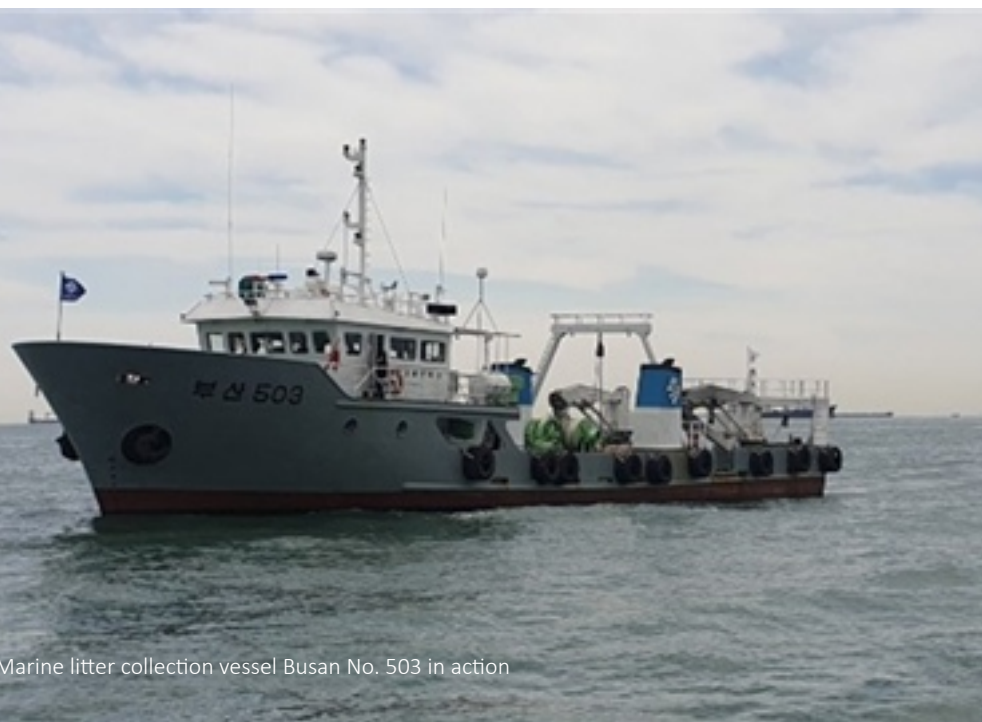
Marine litter is a global issue which requires concerted efforts of all the countries. The government of RO Korea has established a National Marine Litter Management Plan since 2009. With its 1st plan implemented in 2008, the 3rd National Plan is being implemented in 2020. In accordance with the national plan, Busan City is implementing its 3rd local implementation plan (2019-2023). Busan City has allocated US\$2.5M in 2020 for implementing 7 programs and projects.

There are three main sources of marine litter, namely: land-based, sea-based and foreign-born litters. Utilizing its clean-up vessel, Busan No. 503 (118G/T), the City collects about 45 tons of litter/year during 150 days of operation. Through marine litter collection and disposal projects, Busan City is collecting around 5,000 tons annually. Based on a survey in 2018, it was estimated that roughly 7,100 tons of marine litter exist along the Busan coasts. Among them, 4,600 tons are from land-based sources and 2,500 tons are from sea-based sources.

The City mainly focuses on three areas of marine litter actions: i) source management, ii) voluntary collection by citizens, and iii) education and awareness building on marine litter. Since the polluters are citizens themselves, it is important to build awareness of citizens on adverse impacts of marine litter to marine ecosystem. Using US\$6B/year, Busan City is endeavouring its efforts to effectively responding to marine litter issue.



Busan citizens participating in International Coastal Cleanup (ICC) activity.



Marine litter collection vessel, Busan No. 503 is salvaging deposited litters at the coastal areas of Busan. Deposited litters are mostly composed of abandoned fishing gears which pose significant threats to fisheries resources through ghost fishing.



POLLUTION REDUCTION

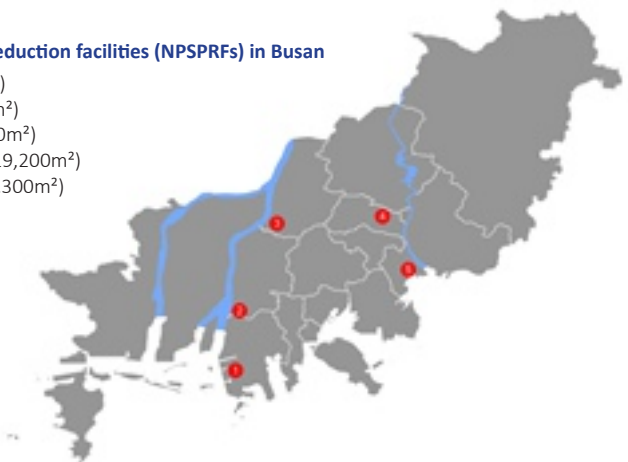
Busan City has established various pollution reduction facilities at strategic locations. There are 13 sewerage treatment facilities with capacity of 1,924,100m³ which treat 70% of total municipal wastewater. Sewer pipes are connecting all over the City and will reach 3,368km in length by 2035.

Busan City will restore 26 covered streams which act as rainwater run-off line into ecosystem friendly streams. Among them, 11 covered streams will be converted into eco-friendly streams which run through the city centers.

As a part of pollution reduction efforts, Busan City also established five non-point source pollution reduction facilities (NPSPRFs) around the city. In addition to sewerage treatment facilities, these NPSPRFs play important roles in reducing pollution loading to coastal waters.

Non-point source pollution reduction facilities (NPSPRFs) in Busan

- 1. Jangrim facility (57,298m²)
- 2. Eomgung facility (61,089m²)
- 3. Deogcheon facility (29,000m²)
- 4. Oncheon stream facility (19,200m²)
- 5. Gwangan beach facility (3,300m²)



Gwangan beach NPSPRF (shown in red box)



7th International Marine Debris Conference

Busan City is hosting the 7th International Marine Debris Conference (IMDC) for 5 days at BEXCO during September 2022. This conference has been a flagship program for the global marine litter community and a venue for forming global and national policies through policy dialogues, technology development, NGO summits, workshops and other side events. Since its 1st Conference at Honolulu, Hawaii, USA in 1984 in collaboration with the National Oceanic and Atmospheric Administration (NOAA) and UN Environment, all the Conferences were held within the US. The 7th Conference is making its debut outside the US.

The government of RO Korea proposed its offer to host the Conference to NOAA and UN Environment and received agreement. Subsequently, the government convened a national dialogue to select an optimal venue for the Conference and selected Busan City as the local host. The hosting of 7th IMDC at Busan in 2022 signifies Busan City's strong program on marine litter management and the image of Busan City as a marine capital of RO Korea.



Participants of World Ocean Forum (WOF) at Busan performing a marine litter awareness action

The 7th IMDC at Busan in 2022 will be a historic event for reaffirming the commitment of the global community for significantly reducing the occurrence of marine debris in accordance with the SDG 14. Busan City is expecting PNLG member cities and local governments to join the 7th IMDC at Busan in 2022.



A session at the World Ocean Forum at BEXCO

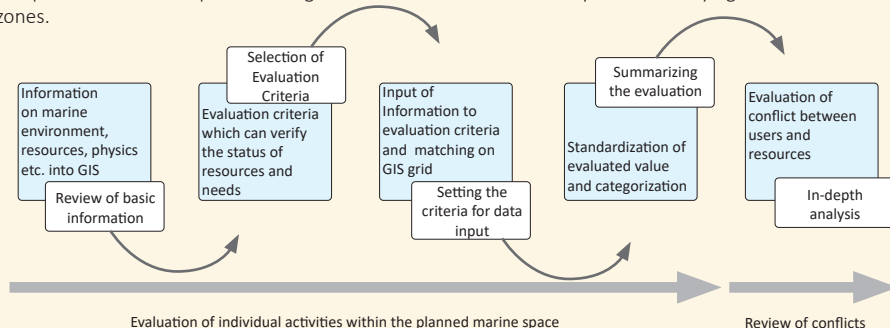
There are nine marine functional zones in the marine spatial planning law of RO Korea. These zones are identified through the marine characteristics analysis which is a rigorous process involving analysis of various utilization and conservation of marine resources.

The draft functional zones are submitted to local government for national and local committee's review as well as public hearings. The Minister of Oceans and Fisheries approves the final marine functional zones. Subsequently, the local government develop a management plan for the marine spatial plan. Busan City has established a marine spatial plan and is preparing its management plan in 2020.

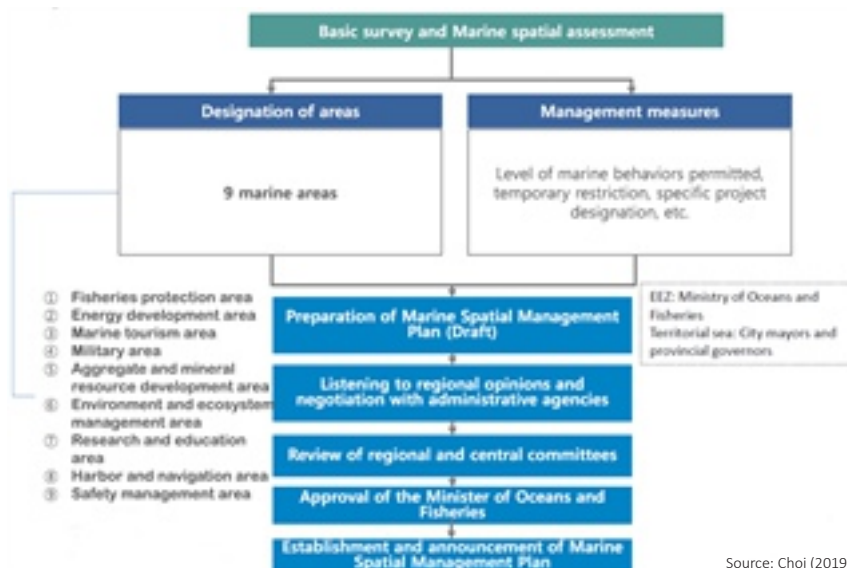
The 9 marine functional zones:

1. Fisheries protection area
2. Energy development area
3. Marine tourism area
4. Military area
5. Aggregate and mineral resource development area
6. Environment and ecosystem management area
7. Research and education area
8. Harbor and navigation area
9. Safety management area

The process and techniques involving the marine characteristics analysis for identifying marine functional zones.



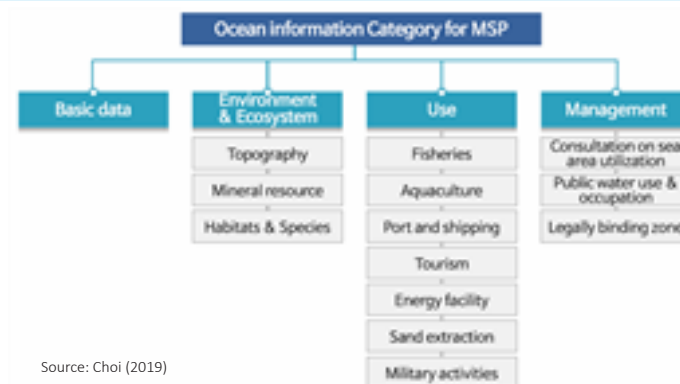
The process of preparation, approval and management plan for the marine spatial plan



Source: Choi (2019)

Marine Spatial Planning is a tool to design marine space for reducing marine ecosystem degradation, avoiding conflicts and promoting efficient and effective use of the coastal resources. The government of RO Korea promulgated the Marine Spatial Planning Law in 2018 through expanding and upgrading the coastal zoning scheme under the Coastal Zone Management Act.

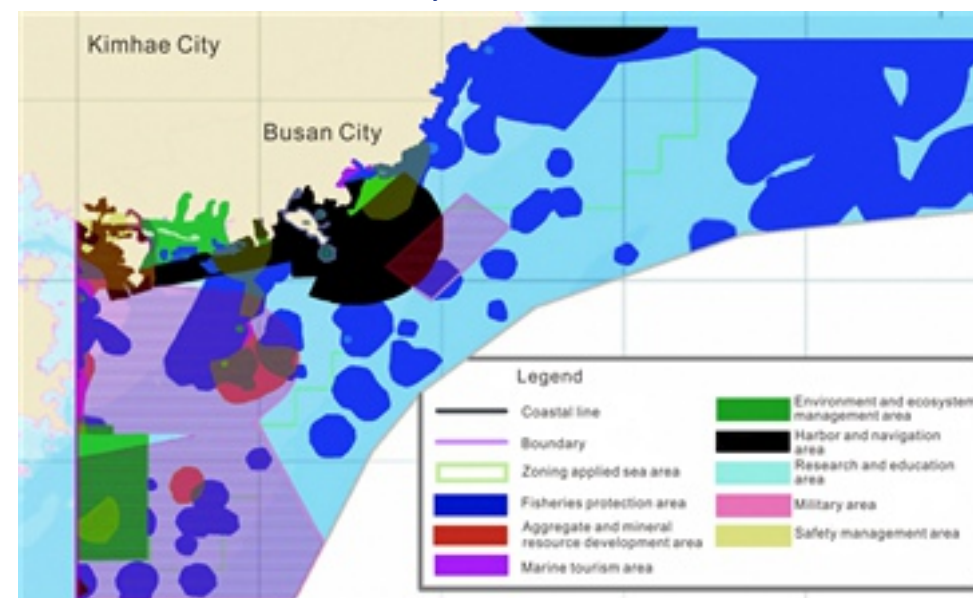
Busan City has developed a marine spatial plan in 2019 in accordance with the Marine Spatial Planning Law. The areal coverage of the coastal waters of Busan City is about 5,526km² encompassing territorial seas of 2,362km² and EEZ of 3,164km². Eight functional zones except for the energy development area were identified. With the marine spatial plan of Busan City, it is expected that marine resources are more efficiently utilized with less conflicts. The MSP will be particularly useful in the cities like Busan where maritime traffic and fisheries activities are heavy.



Source: Choi (2019)

MSP utilizes various information available for the marine area in question. These information and data provide firm foundation for scientifically sound planning of the marine area.

Marine Functional Zones of Busan City

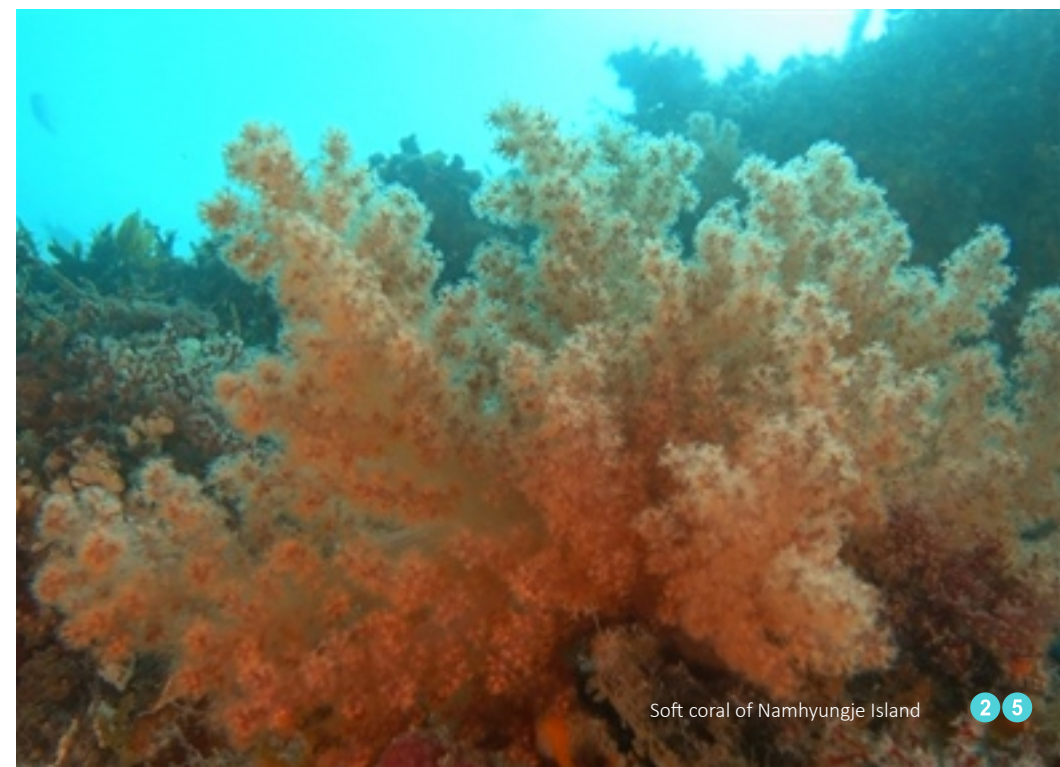


MPA map of Busan City



Busan City is boasting its beautiful coastal and sea areas with teeming marine resources. Some of the key marine ecosystems are protected through designated as Marine Protected Areas. There are three MPAs in Busan City as shown in table below. These MPAs are instrumental in protecting numerous fisheries resources, protected marine organisms and beautiful underwater sceneries. Oryukdo is one of the most famous islands of Busan due to its physical appearances during the tidal movements. Oryukdo appears to be 5 islets during low tides whereas 6 islets during high tides.

MPA	Location/ Area (km ²)	Year	Purpose
Oryukdo and Surrounding Waters	Nam-gu / 0.35	2003	<ul style="list-style-type: none"> Pristine seas with numerous endangered species A small seagrass (marine angiosperms), <i>Phyllospadix japonica</i> Makino is a protected species for its highly valuable marine ecosystem functions as hatching and nursery grounds for fisheries resources as well as carbon sequestration powers.
Surrounding Waters of Namu Island	Saha-gu / 0.275	2013	<ul style="list-style-type: none"> Spectacular underwater scenery with cliff system A sea snail, <i>Charonia lampas sauliae</i> is one of the largest sea snails in RO Korean waters. This species is protected by law and rarely found.
Surrounding Waters of Namhyungje Island	Saga-gu / 0.1	2013	<ul style="list-style-type: none"> Subtropic marine ecosystem This area is a habitat for a soft coral, <i>Dendronephthya castanea Utinomi</i>. This soft coral provides habitats for numerous marine organisms for symbiosis.



Soft coral of Namhyungje Island

MARINE ECOSYSTEM CONSERVATION

Nakdong River has been an important artery to Busan City for feeding numerous marine life and migratory birds through sedimentation and nutrient loading. The delta of Nakdong River provides important agricultural land to the residents nearby. Before the dike was built in 1982, the area was the most famous migratory bird stopover site in RO Korea and rich in fisheries resources.

The government of RO Korea established the delta of Nakdong River as various protected areas including: Natural Monument Protection Area, Natural Environment Conservation Area, Wetland Protected Area, Specially Managed Sea Area among others. As a part of protection and awareness on migratory birds, Busan City set up the Nakdong Estuary Eco Center in 2007.



Nakdong Estuary



Natural Environment Conservation Area



Specially Managed Sea Area



Natural Monument Protection Area



Wetland Protected Area

IMPLEMENTATION OF SDG 14



14-1

In 2019, the government of RO Korea established indicators and 2030 targets for SDGs including SDG 14 Life Below Water. Busan City is committed to implement the policy measures to achieve the goals set by the government. Among the SDG 14, the three targets: 14-1, 14-2 and 14-4 are particularly relevant to Busan City.

Strengthen marine litter collection and proper disposal

Busan City will strengthen the collection and proper disposal of marine litters at coastal areas, floating debris, deposited debris and contaminated sediments using Busan No. 503 and clean-up vessels of KOEM. Busan citizens will be encouraged to join the campaigns against marine litter.



KOEM clean-up vessel in action at a coastal area

14-2

Increase area of marine forests

Acknowledging the importance of marine forest, the government of RO Korea designated May 10 as the day of marine forestation. Busan City will make efforts to increase the area of marine forests in collaboration with its citizens and Korea Fisheries Resources Agency (FIRA) which has its headquarters in Busan.



Seaweed (*Ecklonia cava*) planted during a marine forestation day



14-4

Strengthen compliance of Total Allowable Catch (TAC)

Protecting fisheries resources will ensure regeneration and recruitment of fish stocks. Through the strict implementation of Total Allowable Catch (TAC) policy, Busan City will contribute to sustainable fisheries industry.

TAC (Total Allowable Catch) is a fishery policy that sets regulations for annual catch limits and allowing only a certain amount of catching of each fish stock to ensure sustainability of fisheries resources in a given period. (Source: FIRA)

Target species of TAC in RO Korea



See you in Busan,
a beautiful and clean ocean city!



Busan citizens participating in a coastal clean up activity in 2020