10 Seto Inland Sea

Overview
The Seto Inland Sea is the largest inland sea in Japan. 11 prefectures border it, and 2 additional inland prefectures are close to it on the islands of Honshu, Shikoku, and Kyushu. The Sea stretches up to 450 km east to west, and 15 km to 55 km north to south. It is connected to the Pacific Ocean through the Kii Channel on the east and to the Sea of Japan through Bungo Channel and Kanmon Strait on the west.

Location

<table>
<thead>
<tr>
<th>Basic information</th>
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<tbody>
<tr>
<td>Surface area : 23,203 km²</td>
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<tr>
<td>Volume : 881.5 km³</td>
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<tr>
<td>Average depth : 38 m</td>
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<td>Maximum depth : 465 m</td>
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</table>

Nature

< Background >
Seto Inland Sea is the largest inland sea of Japan and is surrounded by Honshu, Shikoku and Kyushu. Seto Inland Sea has approximately 700 islands and a long coastline of 7,230 km. The Seto Inland Sea is approximately 450 km wide from west to east and has a maximum north to south distance of 15–55 km and its surface area is 23,203 km². The average water depth is 38 m and the volume is 881.5 km³. There are a lot of bays and reefs in Seto Inland Sea, and it connects to Pacific Ocean by Kii Channel and Bungo Channel. Seto Inland Sea is also connect to the Sea of Japan by Kanmon Strait.¹,⁹

Climate
The Seto Inland Sea region is relatively warm and low rainfall region whose average temperature is about 15°C and annual rainfall is about 1,000–1,600 mm. According to "Climate Change Monitoring Report 2009" of the Japan Meteorological Agency, it said that increase of average temperature and that of tropical night is remarkable in the Seto Inland Sea area.

Topography
It is about 30 m water depth of most of the Seto Inland Sea. Water depth of the center of the Kii Channel, an east opening is 70 m and that of the Bungo Channel, a west opening is about 100 m.²

Hydrology
Features of the Seto Inland Sea is fast tide due to a big difference of high and low tide. There are high tides and two low tide twice a day. Water level difference between high tide and low tide is called "tidal range" which is 1–3 m in the east and is 3–4 m in west. Due to tidal range, tide of several knots occurs, and it will be 5 knots (2.5 m/sec) in the narrow strait, such as Naruto Strait and Hayami Strait.²
< Surrounding environment >
In the Seto Inland Sea, there are a variety of nature, such as so many rivers, reed bed, tideland, the straits whose tide is fast, and calm water flow area called Nada. Emergence of about 3,400 animal species, 430 fish species and the emergence of about 800 plant species has been reported.¹

Habitat
In the Seto Inland Sea, there are a lot of seaweed such as eelgrass (6,381 ha), sargassum (5,511 ha) and other algae (sea trumpet, sea lettuce, ecklonia cava. 14,532 ha).⁵

< Tourism >
Seto Inland Sea, as the first national park in Japan, was designated in 1934, and its area is about 67,000 ha (land only). Characteristics of the Seto Inland Sea National Park are multi-island, strait, observatory to look at the sea. The number of visitors of the Seto Inland Sea National Park in 2007 fiscal year is 39.73 million people which occupies the 11.2% of the whole National Park visitors. It is the second largest popular national park behind the Fuji–Hakone–Izu National Park.¹

Itsukushima Shrine (a World Heritage site in the Seto Inland area)
Itsukushima Shrine was built in the 12th century by Taira-no-Kiyomori, one of the men in power during the Heian Period. The shrine stands in the sea and is surrounded by steep lush mountains in the background. It is highly appreciated for its unique and beautiful Japanese-style architecture, and was declared as a World Heritage site in December 1996.

History · Culture
In the early modern period of the Seto Inland Sea, reclamation, cotton cultivation and salt production is carried out actively. In the high economic growth period, after the World War II, its industrial structure is changed from primary industry to secondary industry and tertiary industry.

Seto Inland Sea has been important route of maritime goods transportation from long ago. Especially in the early modern period, Seto Inland Sea was used as important route to transport the product, such as salt to Osaka area. In addition, Korean envoys passed through the Seto Inland Sea in order to go to Edo.

In the Seto Inland Sea, a lot of traditional events are take place such as fire festival, bow praying, Kangen music festival, boat rowing and Setouchi International Art Festival.¹

Social Environment
< Population >
The total area of the 13 prefectures surrounding the Seto Inland Sea is about 68,000 km², accounting for 18% of the total land area of Japan. In 2009, the Seto Inland Sea area has a total population of approximately 35 million, which is nearly 28% of Japan's entire population. The population density of the region in 2009 is 518 people /km² which is 1.5 times as many as the national average. The number has increased 1.5 times since 1950 and is still increasing, although at a slower pace.¹

< Industry >
The total production value of related 13 prefectures in 2007 fiscal year was 134 trillion and 894 billion yen which grew by about 16 times since 1965. In addition, prefectures in the total production of the relationship 13 prefectures in 2007 fiscal year account for about one quarter of gross domestic product. For industry composition ratio, primary industry and the secondary
industry is on the decline. On the other hand, the composition ratio of tertiary industry is increasing. Industry production value composition ratio of 2007 fiscal year of related 13 prefectures of the first industry is 0.7%, that of the secondary industry is 25.2% and that of the tertiary industry is 74.0%.\(^1\)

**Fisheries**

In 2007, Sea fishery production in the Seto Inland Sea is 190,000 tons which account for 4.4% of sea fishery production of Japan, 4.4 million tons. Sea aquaculture production in the sea is 280,000 tons which account for 23% of Sea aquaculture production of Japan, 1.24 million tons.

Characteristics of the fishery in the Seto Inland Sea is that the proportion of sea aquaculture production is large which is 1.5 times as many as the sea fishery production. Firearms farming accounts for 46% of sea aquaculture production, and laver aquaculture accounted for 43% of that. Sea farming Laver production of the Seto Inland Sea 122,000 tons and it accounts for 30.8% of the production of Japan.\(^1\)

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**Environmental Problems**

*<Water and Sediment Quality>*

The Sea is greatly influenced by incoming rivers due to its relatively shallow depth. Seasonal fluctuation in water temperature and salinity, influenced by rainfall, makes the area susceptible to episodic events, such as red tides.

- **Water Quality**

COD, nitrogen and phosphorus pollution from the land has been greatly reduced by efforts of sixth-order term water quality total reduction. In the Osaka Bay, COD, nitrogen, phosphorus concentration is improved, but they are high in the Seto Inland Sea.\(^1\)
Changes in Nitrogen pollution load generation in the Seto Inland Sea

Changes in Phosphorus pollution load generation in the Seto Inland Sea

Changes of COD in the Seto Inland Sea
Red tides

Annual red tide occurrence of 1975 was about 200-300, but in recent years, it was reduced to about 100. Fishery damage to aquaculture fish by red tide occurred 29 times in 1975, but now, 10 times in a year. Today, red tide of diatoms which causes discoloration of Laver is reported in the Seto Inland Sea, and give a severe damage to laver farming.\(^4\)
< Environmental protection measures >

In the Seto Inland Sea, environmental destruction got worse due to the concentration of heavy and chemical industries and population in high economic growth period. Under the national uniform specific laws and regulations, it was difficult to stop the pollution of the Seto Inland Sea, so Setouchi environmental protection Temporary Measures Law was enacted in 1972. Only by the regulation of concentration standards, it was difficult to achieve the water quality environmental standards in the closed water areas. There was a need to comprehensively reduce the pollution load to the waters, including the inland prefectures. In 1978, the Water Pollution Control Law and the Seto Inland Sea environmental protection Temporary Measures Law was amended and water quality total reduction system was introduced. On the basis of this law, the first-order total reduction for COD has been carried out from 1979, but the problem that occurs due to the eutrophication of occurrence, such as red tide still occurred. Environmental standards of nitrogen and phosphorus

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<th>Progress of a comprehensive water quality conservation measures of the Seto Inland Sea</th>
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<td>October 1973</td>
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<td>June 1979</td>
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<td>January 1987</td>
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<td>January 1991</td>
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are set in 1993, after that, they designated as the target in the total reduction. In 2006, 6th total reduction of basic policy has been formulated in order to reduce the COD (Chemical Oxygen Demand), nitrogen, phosphorus in Osaka bay, and not to worsen the COD of the Seto Inland Sea, and to maintain the actual condition of nitrogen and phosphorus.\(^1\)\(^2\)

In addition, sewage improvement has been continuing, penetration rate of sewage treatment reached 80% in 2012.

![Graph showing changes in sewage treatment population and penetration rate of sewage treatment population](image)

**Related organizations and NGOs**
- Seto Inland Sea environmental conservation governor, mayor meeting <http://gmc-seto.jp/>
- Health organizations Federation <http://www.zeneiren.or.jp/>
- The Association for the Environmental Conservation of Seto Inland Sea
  <http://www.seto.or.jp/>

**References**