



Access Public transportation

Kansai International Airport

65 Min.
airport
limousine bus

Shin-Kobe
Shinkansen/Bullet Train Station

5 Min.
subway

JR Osaka Station

20 Min.
train

Sannomiya
(Downtown Kobe)

90 Min.
expressway
bus

Fukura
Bus
Terminal

3 Min.
walk

Pier for
sightseeing
cruises

Tokushima Awaodori Airport

40 Min.
fixed-route
bus

Naruto Sightseeing Port
or
Naruto Park



To see the whirlpools Ride on the Whirlpool Sightseeing cruise



Website in English
<https://www.uzusio.com/en/>



To learn more about the whirlpools Uzushio Science Museum

Enjoy a firsthand educational experience of the world-class
"Whirlpools of Naruto Strait."



Website in multiple languages
<https://www.uzunomichi.jp/usage-guide-eddy/>

Contact us



鳴門海峡の渦潮を世界遺産へ

Hyogo and Tokushima "Naruto Whirlpools" World Heritage Site Registration Steering Committee

<http://naruto-uzushio.jp/en/>

- Awaji District Administration Office, Hyogo Prefectural Government
2-4-5 Shioya, Sumoto City, Hyogo Prefecture 656-0021 ✉ awajikem@pref.hyogo.lg.jp
- Tokushima Prefectural Government
1-1 Bandaicho, Tokushima City, Tokushima Prefecture 770-8570 ✉ kouikigyouseika@pref.tokushima.jp



Aiming to be registered
as a World Heritage site

The Wondrous World-class Whirlpools of Naruto Strait

Hyogo and Tokushima "Naruto Whirlpools"
World Heritage Site Registration Steering Committee

1

An Extraordinary Natural Wonder: The Whirlpools of Naruto Strait

The Seto Inland Sea in western Japan, at times likened to the Aegean Sea, is one of the world's major archipelagos and is surrounded by the Honshu, Shikoku, and Kyushu islands. Baron Ferdinand Freiherr von Richthofen, a prominent German geographer noted for defining the term "Silk Road," visited this region in 1860 and praised its breathtaking scenery as follows: "Such elegant natural beauty over a vast area - no place in the world could be more beautiful than this. (...) This place has been conserved over long periods of time, and I pray that it will remain protected from here on out."

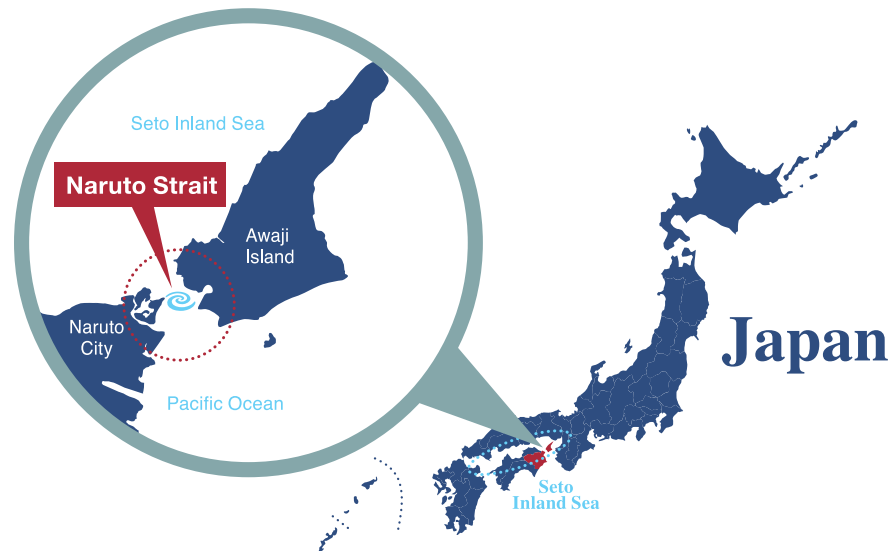
An extraordinary natural beauty, the "Whirlpools of Naruto Strait" may be observed inside this Seto Inland Sea, specifically at Naruto Strait which lies between Awaji Island, the largest island of this sea, and Shikoku. Rapid currents that are generated due to tidal level differences on

two sides of this strait - the Seto Inland Sea and the Pacific Ocean - create some of the largest whirlpools in the world.

The Whirlpools of Naruto Strait are also known for their diversity, such as "*uzuren* (repetitive whirlpools)," of which as many as 7 swirls may be seen at once, and "*uzutsui*," or a pair of whirlpools rotating in opposite directions that drift together.

Since the 18th century, its beauty has been depicted by famous *ukiyo-e* painters including Utagawa Hiroshige and Katsushika Hokusai, attracting many visitors.

Today, a project is under way to advocate that the whirlpools of Naruto Strait be selected and conserved as a World Heritage site, with the cooperation of local residents and local governments. As Baron von Richthofen had hoped, we, as residents of this region, must protect this exceptional natural beauty blessed to us from this earth and pass it down to future generations.



2

How the World's Largest Whirlpools are Generated

World-class Whirlpools

Naruto's whirlpools are caused by a combination of complex factors, such as rapid currents and the geographical features of the seafloor. The rapid currents are triggered due to the rise and fall of the tides, which occurs in approximately 6-hour intervals. Although the whirlpools are formed throughout the year, some of the greatest in size are formed during spring and autumn, when world-class whirlpools of over 20 meters in diameter may be observed.

The Generation Mechanism of the Whirlpools

1. Tidal influences

Tidal currents from the Pacific Ocean are split into two at the Kii Channel, one of which flows to the south side of Naruto Strait and causes a high tide (①). The other flows through Osaka Bay and Akashi Strait, reaching the north side of Naruto Strait after approximately 6 hours and thus raising the tidal level here as well (②).

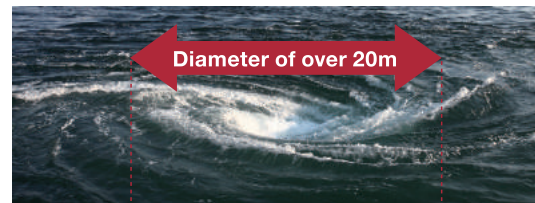
However, by the time the north side of Naruto Strait reaches high tide, the south side is at low tide. This results in a significant difference in the water level between the Kii channel (the Pacific Ocean side) and Harima-nada (the Seto Inland Sea side) of the strait (③). This water level difference (approx. 1.5m) is what triggers the rapid currents of up to 11 knots (approx. 20km/h). This generation mechanism cannot be seen in any other strait in Japan.

2. Geomorphologic factors

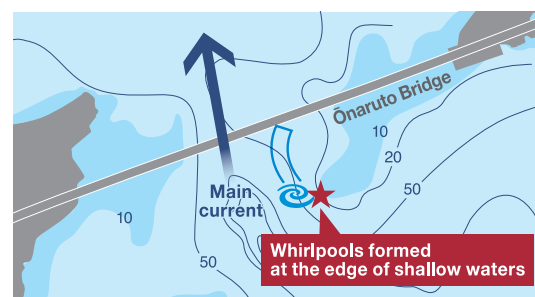
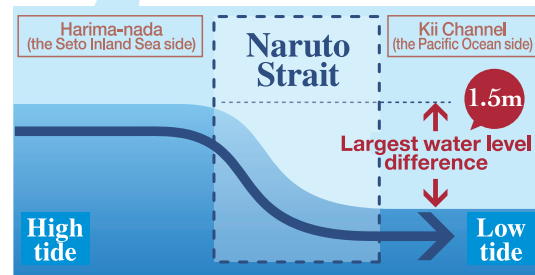
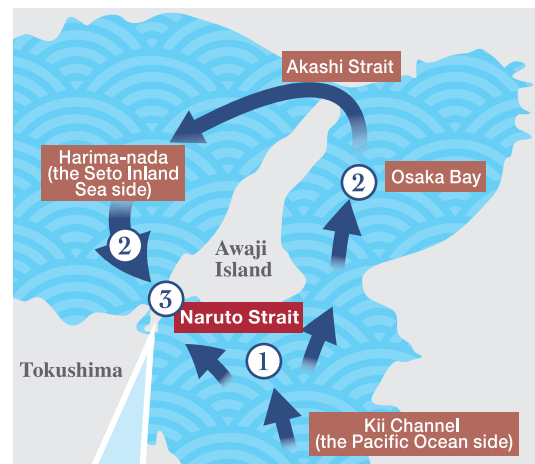
The Naruto Strait lies between the Kii Channel (the Pacific Ocean side) and Harima-nada (the Seto Inland Sea side), and is about 1.3 kilometers wide at its narrowest, the area between the protruding capes of Awaji Island and Naruto City. The seafloor at the point where the two capes are closest (the narrowest point) is V-shaped and is approximately 80 meters deep.

Tidal currents caused by a difference in water level of up to 1.5 meters between the two sides of Naruto Strait - the Pacific Ocean side and the Seto Inland Sea side - concentrate into the narrowest point between the two capes, therefore creating a strong current.

These currents create whirlpools that originate at the edge of the shallow waters of Awaji Island. Furthermore, with the seafloor's contour line as the border, speed differences between the center of the current (main current) and its two sides cause the whirlpools to grow larger as they float along the border.



The whirlpools of Naruto Strait flow in downward spirals. Their size is defined by the distance between two points on the outer rim, the highest above the ocean's surface.



3

Strata and Geologic Features of Naruto Strait

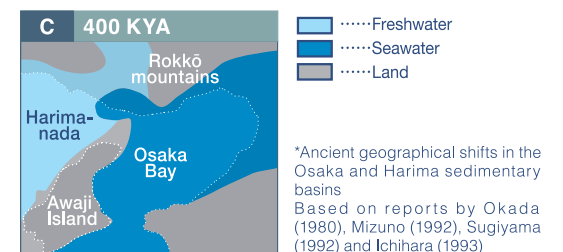
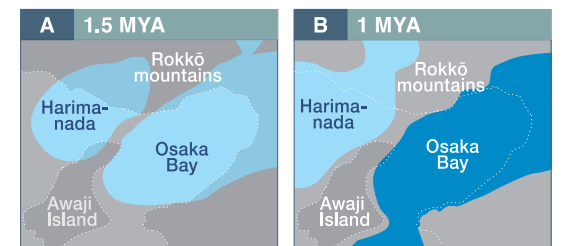
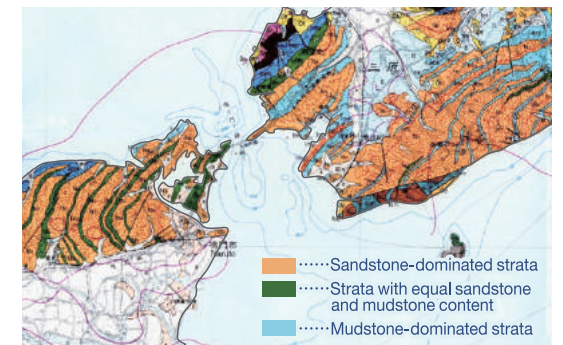
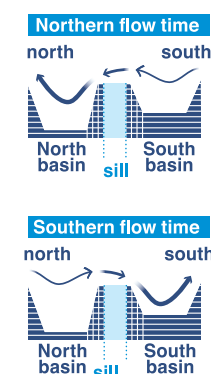
The narrow terrain of the Naruto Strait is thought to have been formed due to the configuration of the rock strata in the area. The Izumi Group strata on the side of Awaji Island lies just about perpendicular to Naruto Strait, with sandstone-dominated strata (colored in orange) protruding toward the sea, with valleys that were created along the mudstone-dominated strata (colored in blue) due to erosion. On the other hand, the coastline of Naruto City has been comparatively moderately eroded especially along the sandstone-dominated units.

How the Naruto Strait was formed

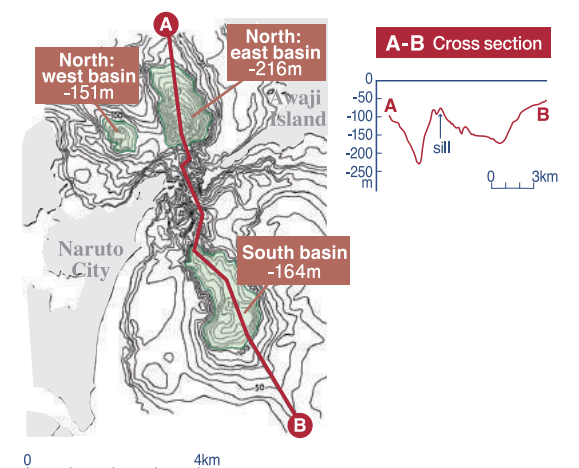
The formation of Naruto Strait is deeply related to the development of “dips,” referring to the Osaka Bay and Harima-nada, and “ascents” such as Awaji Island which separates those two waters. The transformation began approximately 1.5 million years ago, with land subsidence (Osaka Bay and Harima-nada) occurring in a north east direction and an uplift of the surfaces (Rokkō mountains and Awaji Island) in between. Sunken areas of Osaka Bay connected with the Kii Channel about 1.2 million years ago, allowing seawater to flow into the bay, while the Harima-nada area was still occupied with lakes and lowlands. Then, about 500,000 to 1 million years ago, active faults underneath Rokkō mountains and Awaji Island shifted horizontally, causing the Akashi Strait to sink, which led seawater to flow into Harima-nada about 400,000 years ago thus creating a bay. Vast coastal terraces along the Harima-nada coast developed about 200,000 years ago, which indicates that most areas of Harima-nada were filled with seawater by that time. On the other hand, a study on the Osaka Group strata surrounding the Akashi Strait points out that the present state of the sea is similar to that of around 120,000 to 130,000 years ago, which means that the Naruto Strait had already been formed by this time.

Seabed basins

The seabed terrain of Naruto Strait is unique for having basins on both the north and south sides of its narrowest point (approx. 80m deep), called the twin basins. The north basin is divided into two, of which the east basin is 216 meters deep and the west basin is 151 meters deep. A theory suggests that these basins were formed due to rapid down-flowing streams, generated from forcefully converged currents in the Naruto Strait, scraping the ocean floor.



Seabed basins of Naruto Strait and a north-south cross section graphic



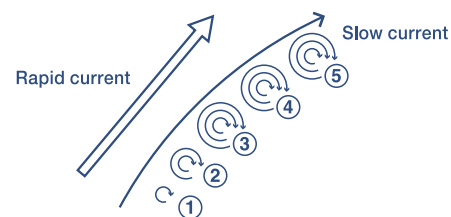
4

The Uniqueness and Diversity of the Whirlpools of Naruto Strait

In 2017, the Hyogo and Tokushima "Naruto Whirlpools" World Heritage Site Registration Steering Committee performed research into Naruto Strait and other marine waters in Japan that have similar geomorphologic features. As a result, various whirlpool configurations and unique features were identified, which could only be observed in the Naruto Strait.

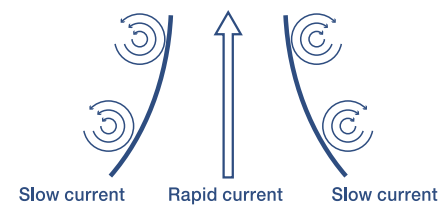
1 Uzuren (Repetitive whirlpools)

Uzuren is a phenomenon that whirlpools occur one after another, with new whirlpools appearing before the disappearance of older swirls, which makes them seem aligned. As many as seven whirlpools may be observed at once during peak times.



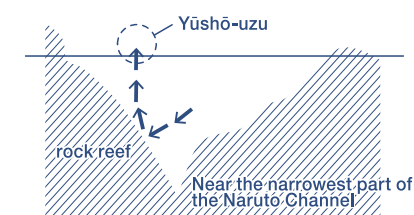
2 Uzutsui (A pair of whirlpools spinning in opposite directions)

A pair of whirlpools spinning in opposite directions, each of which is formed at each side end across the fast stream flowing through the center of the Naruto Strait, is defined as *Uzutsui*.

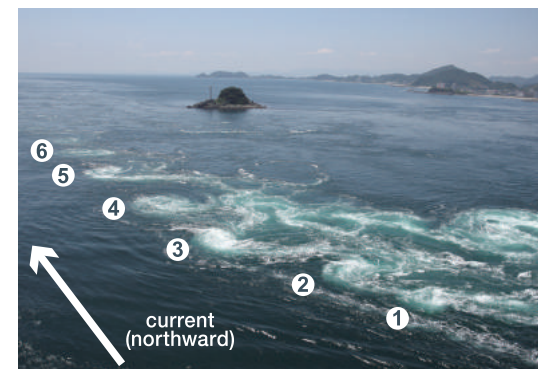


3 Yūshō-uzu (Circular water mass created by upward flow)

Yūshō-uzu is a phenomenon when the ocean's surface rises in a circular form, which is caused by an upward flow due to the ocean floor's geomorphologic features. This variety of whirlpool is also known as a "whirl flower" because of its shape.



1 Uzuren at Naruto Strait



2 Uzutsui at Naruto Strait



3 Yūshō-uzu at Naruto Strait



5

Conservation and Preservation of Naruto Strait

Handing down the Naruto Strait to future generations

Natural World Heritage sites require appropriate preservation efforts to be made to maintain their worth into the future. Hence, these sites must be conserved in accordance with Japanese laws and applicable procedures related to national parks and nature conservation areas.

With the goal of being registered as a World Heritage site, the Naruto Strait and its neighboring regions must also be properly conserved according to science-based management, with the cooperation of community organizations, administrative bodies, and scholars.

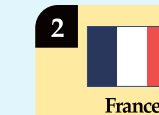


Whirlpools in the world

Whirlpools are a phenomena that can be observed in several other areas of water. Some of our prospective research topics include investigating the mechanisms that generate each whirlpool, and comparing them with Naruto Strait.



1 Pentland Firth



2 Rance River estuary



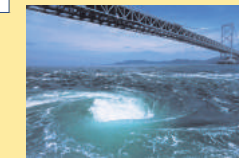
3 Strait of Saltstraumen



4 Strait of Messina



5 Naruto Strait



6 Seymour Narrows



Naruto Strait is believed to be one of the world's three strongest tidal currents, alongside the Strait of Messina in Italy and Seymour Narrows in Canada.

6

Naruto Whirlpools' Cultural Influences

Since ancient times, the whirlpools of Naruto Strait have been drawn and painted by many artists. The rich bounty of the sea in Naruto Strait, due to its unique ecosystem such as its tidal currents and whirlpools, have always supported the lives of local residents. The following are some of the cultural influences of the Naruto whirlpools.

1. Ukiyo-es of Naruto Strait during Edo period

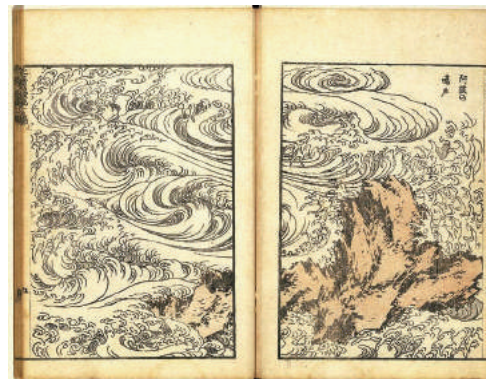
The whirlpools of Naruto Strait have been depicted in ways that highlight their intensity, by famous ukiyo-e painters such as Utagawa Hiroshige and Katsushika Hokusai. In an acclaimed *ukiyo-e* by Hiroshige titled “Awa Naruto no fūkei” and published in 1857, the whirlpools of Naruto Strait are illustrated to resemble flowers, combined with realistic depictions of spacial depth.



Utagawa Hiroshige
Awa Naruto no fūkei (View of Naruto strait)
Tokyo National Museum, Tokyo Prefecture



Utagawa Hiroshige
Naruto Whirlpools, Awa Province from the series *Views of Famous Places in the Sixty-Odd Provinces*
The Metropolitan Museum of Art, New York



Katsushika Hokusai
Awa no Naruto from the series *Hokusai Manga, volume 7*
Hagi Urugami Museum, Yamaguchi Prefecture



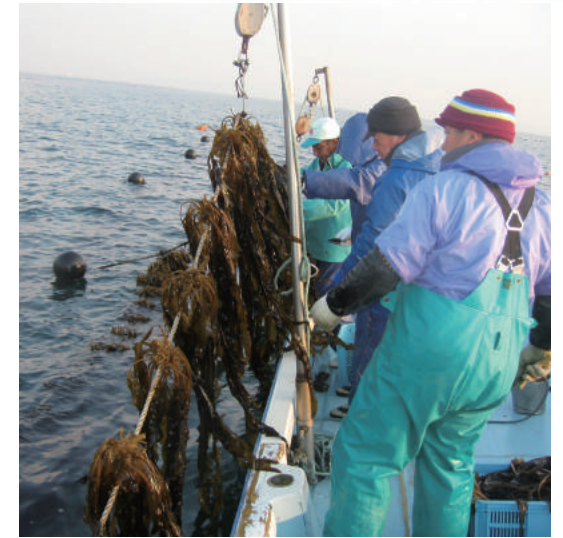
Siebold, Philipp Franz Balthasar von
The whirlpools of Naruto. NIPPON
Fukuoka Prefectural Library, Fukuoka Prefecture.

3. The lives of locals benefited by Naruto Strait

The areas surrounding of Naruto Strait are comprised of rocky reefs covered with natural seaweed farms that function as hideouts and spawning grounds for a variety of sea creatures. The rapid tidal current makes the strait a rich fishing ground as well, providing local residents with the sea’s bounties since ancient times.

Naruto Wakame seaweed

The shores of Naruto Strait have been known as a wakame-producing region since early times. A wood strip from the Heijōkyō period (710-784) has been found, which states that wakame seaweed cultivated at Naruto had been packaged in baskets and delivered as an offering to the Imperial court. Today, wakame seaweed grown in Naruto Strait are famous throughout the country as “Naruto Wakame.”



Naruto wakame seaweed

Naruto sea bream and unique fishing techniques

The seas surrounding the Naruto Strait are known as fishing grounds for sea bream. Although the Naruto Strait is home to the bountiful seas, fishing in these seas was extremely troublesome due to the complex flow of tidal currents. Fishermen of this region have mulled over possible solutions to tackle the intense tidal currents and improve fishing results, and invented various fishing methods and equipments such as *kankobune*, a boat that can easily be controlled with one hand.



Naruto sea bream

Whirlpools of Naruto! Cultural Competition

A cultural competition is held annually to provide opportunities for local residents and students to rediscover the value of the “Whirlpools of Naruto Strait,” and enhance pride in the region. Items to be submitted: “Whirlpools of Naruto Strait” themed posters, haiku poems, and calligraphy



Works by local elementary school students

What are World Heritage sites?

World Heritage sites consist of “outstanding universal value (and particular significance to humanity).” These sites are inscribed on the “World Heritage List” after acknowledgement by the UNESCO World Heritage Committee as heritage sites that must be conserved into the future. World Heritage sites are comprised of natural, cultural, and mixed heritage sites in which both natural and cultural values are combined.

In the hope of being registered as a World Heritage site, the Hyogo and Tokushima “Naruto Whirlpools” World Heritage Site Registration Steering Committee intends to conduct further investigations from both natural and cultural perspectives. The following are the conditions and processes required to be enlisted as a natural heritage.

The 3 conditions to be registered as a Natural World Heritage site

1 Must meet more than one of the following evaluation criteria:

vii	Natural beauty	To contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance [Domestic example] Yakushima (Kagoshima Prefecture)
viii	Geology and Geomorphology	To be outstanding examples representing major stages of Earth's history, including the record of life, significant on-going geological processes in the development of landforms, or significant geomorphic or physiographic features
ix	Ecosystem	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 [Domestic examples] Shiretoko (Hokkaido Prefecture), Shirakami-Sanchi (Aomori and Akita prefectures), Ogasawara Islands (Tokyo Prefecture), Yakushima (Kagoshima Prefecture)
x	Biodiversity	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 [Domestic example] Shiretoko (Hokkaido Prefecture)

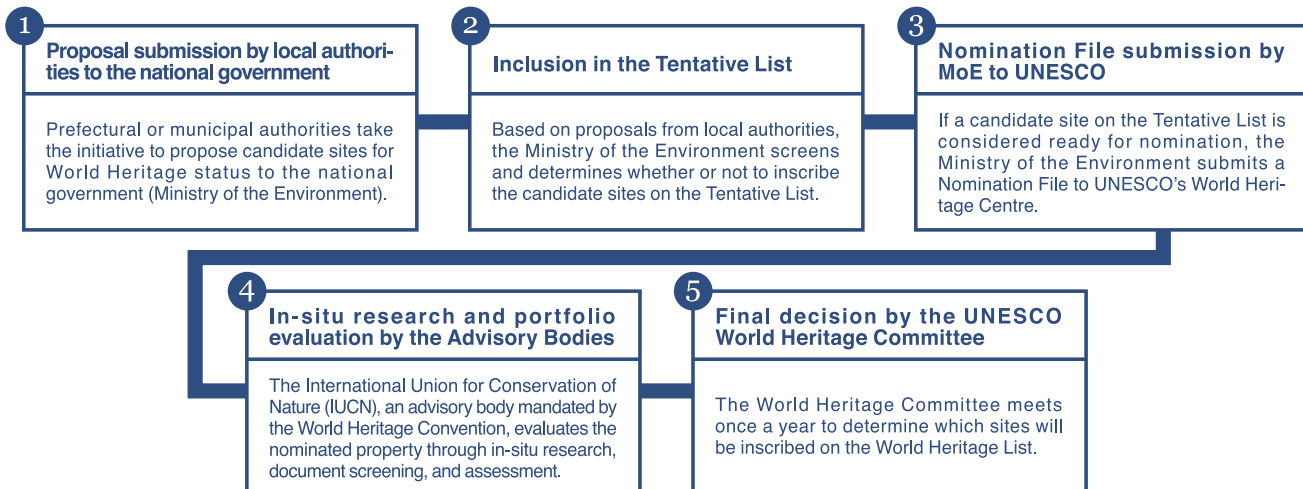
*Numbers (i) through (vi) are cultural criteria.

2 Must fulfill the condition of integrity (e.g. include all the elements necessary to demonstrate outstanding universal value; contain adequate areas; show little influence of development; and maintain its primary natural value).

3 Must be adequately protected and managed in order to maintain its outstanding universal value over the long term.

➡ The whirlpools of Naruto Strait intend to be selected as a Natural World Heritage site under the criteria of (vii) natural beauty and (viii) geology / geomorphology.

Nomination process until inclusion in the Natural World Heritage List



Promotional Activities to Achieve World Heritage Status

Hyogo and Tokushima “Naruto Whirlpools” World Heritage Site Registration Steering Committee

As the momentum to achieve World Heritage status has heightened among citizens and private organizations since 1998, Hyogo and Tokushima prefectures jointly established the “Hyogo/Tokushima ‘Naruto Whirlpools’ World Heritage Site Registration Steering Committee” in December 2014. Today, with the cooperation of citizens, academic sector, and local governments, various endeavors are under way including academic surveys to reveal the whirlpools’ values from both natural and cultural perspectives, as well as educational familiarization activities to publicly promote the whirlpools’ intriguing qualities.



鳴門海峡の渦潮を世界遺産へ

Key activities by the Committee

- **December 2014**
Inaugural meeting of the “Hyogo and Tokushima “Naruto Whirlpools” World Heritage Site Registration Steering Committee”
- **September 2017**
The establishment of academic research commissions and the beginning of full-scale in-situ research
[Research content]
 - Fiscal 2017
 - Generation mechanism of the Naruto whirlpools
 - Comparative study on similar marine assets in Japan
 - Historical and cultural value research of Naruto Whirlpools
 - Fiscal 2018
 - Bibliographic investigation on similar marine assets on the earth
 - Geologic and geomorphologic research at Naruto Strait
 - Landscape and scenery research
 - Historical and cultural value research of Naruto Whirlpools
- **March 2018**
International symposium
[Keynote speech] Hae Un Rii, President, International Scientific Committee (ISC), International Council on Monuments and Sites (ICOMOS)



The Committee was inaugurated with the attendance of the Governors of Hyogo and Tokushima prefectures and the Mayors of Minami Awaji and Naruto cities



Ms. Rii's keynote speech at the international symposium

Rising community actions

Naruto Strait clean-up mission

For the purpose of protecting the surrounding environments of Naruto Strait, community groups such as “Awaji Island Citizens Group to Make the Whirlpools a World Heritage Site” continually conduct clean-up activities.



“Learn about the Whirlpools of Naruto Strait” workshop

In order to enhance understanding of the whirlpools among local children and nurture a sense of pride toward their hometown, workshops are provided at elementary schools on Awaji Island.

